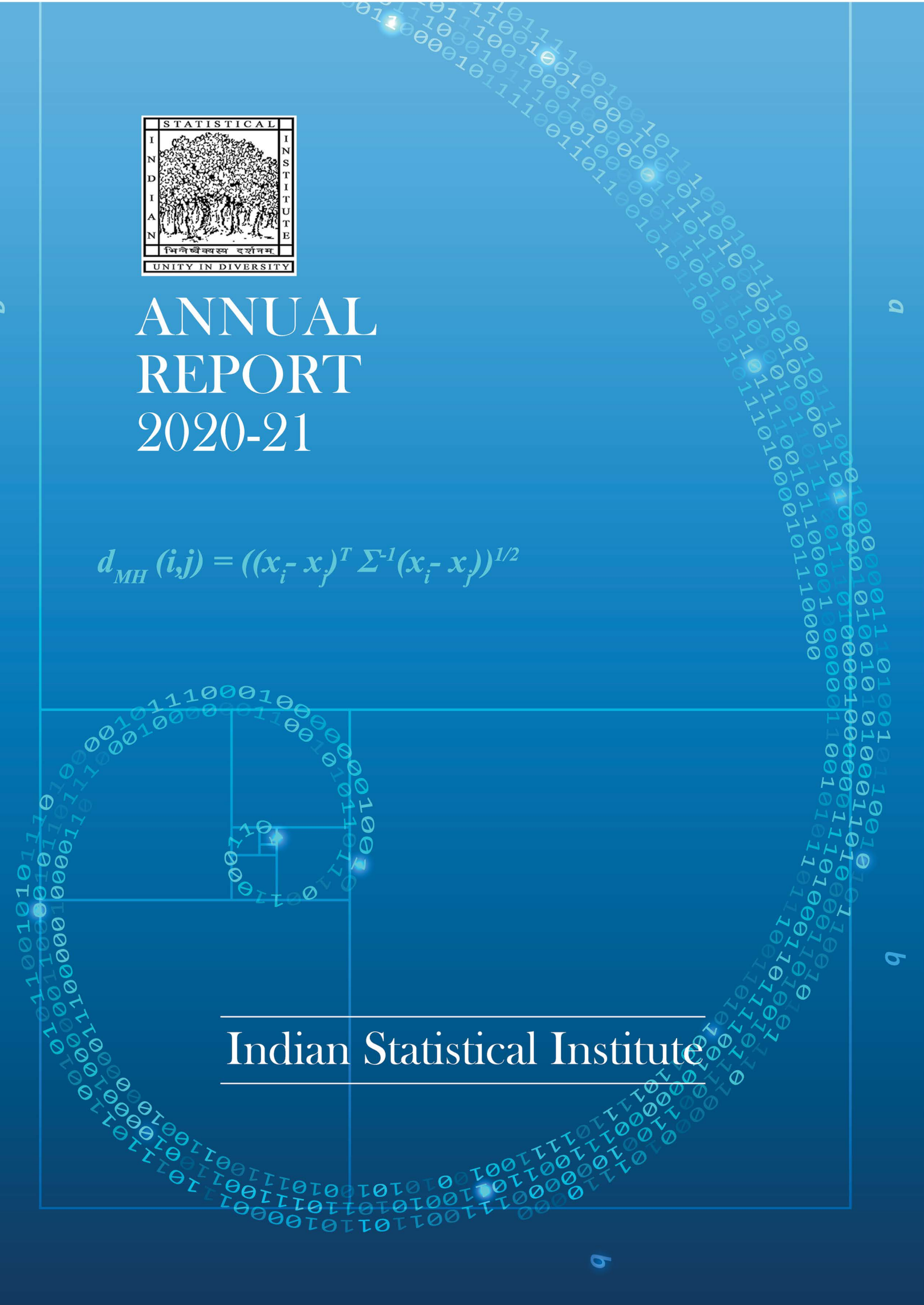
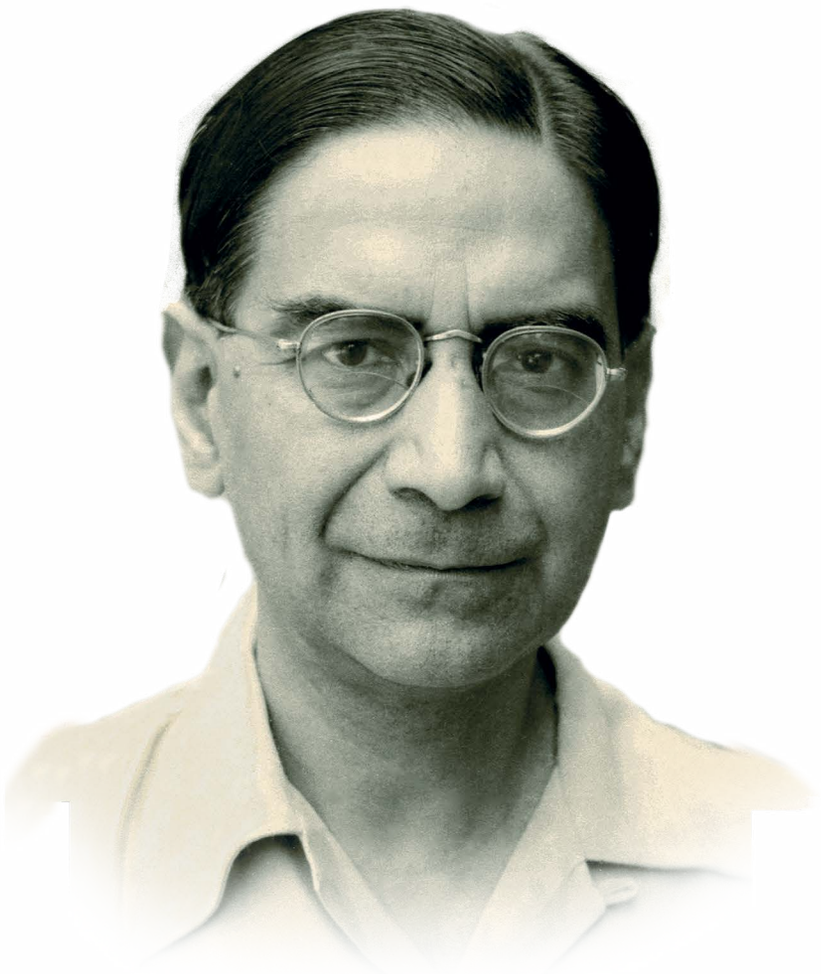
ANNUAL REPORT 2020-21

$$d_{MH}(i,j) = ((x_i - x_j)^T \Sigma^{-1} (x_i - x_j))^{1/2}$$



Indian Statistical Institute

89th Annual Report 2020–21



Indian Statistical Institute

203, Barrackpore Trunk Road, Kolkata – 700108
http://www.isical.ac.in

From the Director's Desk

I am delighted to present before you the Annual Report 2020-21 of the Indian Statistical Institute. The journey that started in December 1931 in Kolkata has metamorphosed into a unique experience of higher learning with a pan India presence. The vision of Prasanta Chandra Mahalanobis, the founder of the Institute, was to establish Statistics as a unifying force between different disciplines and to use this synergistic relationship for the overall development of the nation. The Institute continues to nurture this vision that is all the more relevant today with the ever-expanding role of data for scientific advancement, and with interdisciplinarity being the norm rather than the exception. True to this vision, the Institute scientists lay emphasis on both deep theoretical studies and advanced applications. The Institute scientists also extend their expertise to the government in various capacities, in policy formulation and policy evaluation, and capacity building.

The year 2020-21 saw the Institute continue to flourish under the able leadership and guidance of the Institute President Shri Bibek Debroy and the Chairman of the ISI Council, Dr. Ashok Kumar Lahiri. The Institute conducted its 55th Convocation in January 2021. Dr. Soumya Swaminathan, Chief Scientist, WHO, was the Chief Guest and Professor Peter J. Bickel of the University of California, Berkeley was the Guest of Honour of the event. The graduating students were enthralled by the enchanting world-view of both the speakers.

The Institute faculty members and students continued to bring recognition to the Institute through their scientific contributions in the last year. Rajat S. Hazra received the Shanti Swarup Bhatnagar prize in Mathematical Sciences. Neena Gupta was selected by The World Academy of Sciences as a TWAS Young Affiliate from the Central & South Asia Region. She has also been elected as a Fellow of the Indian Academy of Sciences. Sushmita Mitra has received the J.C. Bose Fellowship. Arup Bose was the winner of the 2020 Prasanta Chandra Mahalanobis Medal from the Indian National Science Academy. Ashish Ghosh and Sanghamitra Bandyopadhyay have been elected Fellows of the International Association of Pattern Recognition. Sanghamitra Bandyopadhyay has also received the Woman Engineer Award by the Indian National Academy of Engineering. Ashis Kr. Chakrabrorty has been awarded P. C. Mahalanobis Award as Distinguished Educator in "Mathematics, Statistics and other Science Disciplines" for the year 2020. Arunava Goswami has been elected as a Fellow of the National Academy of Agricultural Sciences. Susmita Sur-Kolay has received the IIT Kharagpur Distinguished Alumnus Award. Indranil Mukhopadhyay has been elected as Fellow of the West Bengal Academy of Science & Technology. Kiranmoy Das has been awarded the Prof. C.R. Rao National Award in Statistics, 2021 given by the Ministry of Statistics & Programme Implementation, Govt. of India. Antar Bandyopadyay and Krishanu Maulik have been appointed as members of the International Statistical Institute. Malay Bhattacharyya has received the Honor of "Impact Scholars" as a part of the "AI for Social Good" Program of Google. Former Director of the Institute, Bimal K. Roy, continues serving as the Chairman of the National Statistical Commission. Emeritus Professor and former Director Sankar K. Pal was selected the National Science Chair by Science and Engineering Research Board. Our research scholars, Swarup Chattopadhyay, Tanujit Chakraborty and Aparajita Khan have won prizes for their research papers. The Institute is proud of all of them.

The entire year was spent trying to come to terms with the terrible pandemic that has created mayhem in the entire world. ISI scientists made crucial scientific contributions in this regard. Many research articles were published studying the Sars-cov-2 pandemic from various dimensions - biological, mathematical, statistical, computational and economic. The Institute scholars have extended invaluable support in performing RT-PCR tests at NRS Medical College in Kolkata. Our faculty members Mudit Kapoor and Siva Athreya extended their expertise and support to NITI Aayog and Government of Karnataka, respectively, in tracking and providing reports of the pandemic while Malay Bhattacharyya has participated in policy studies as a member of the Lancet COVID-19 Commission India Task Force.

The covid pandemic affected the Institutional activities during 2020-2021 adversely. Despite that, several conferences and workshops were held during this period, primarily in the virtual mode. The Systems Science and informatics Unit at ISI, Bangalore organized a Workshop on HPC in Remote Sensing in April 2020 in collaboration with IEEE, Hyderabad. The Unit in collaboration with IIST, Trivandrum also organized a Workshop on Geospatial Startups - Academia: Opportunities and Challenges at ISI, Bangalore. The Stat-Math Unit at Kolkata conducted the Seminar Series on Number Theory during May to July 2020. In January the Unit in collaboration with the Indo French Centre for Applied Mathematics conducted Lectures in Statistics under an Indo-French Workshop in honour of Professor C.R. Rao who turned 100. A Workshop on Statistics for students from the North Eastern Region was conducted by the Unit jointly with the Theoretical and Applied Sciences Unit at the ISI North-East Centre at Tezpur. The SQC & OR Unit at ISI, Delhi with the sponsorship of the Central Pollution Control Board, Ministry of Environment, Forest and Climate Change, Govt. of

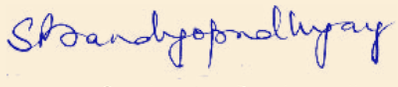
> **An encouraging development in the past year was the establishment of the Technology Innovation Hub (TIH) on Data Science, Data Curation and Data Analytics under the National Mission on Interdisciplinary Cyberphysical Systems of the Government of India.**

India organized workshops on Data Collection, Analysis & Validation for Water Quality, and Environmental Data Interpretation, Compilation and Reporting. The Unit also organized the International Symposium on Computational Operations Research and Algorithmic Game Theory. The Economics Research Unit at ISI Kolkata organized a Workshop on Violence against Women and Children in India. The Centre for AI and ML (CAIML) along with the Agriculture and Ecological Research Unit organized a Workshop on Artificial Intelligence (AI) based Smart Agriculture for Sustainable Development. The Biological Anthropology Unit organized a program on Research Methodology and Statistical Package for Social Science. The Machine Intelligence Unit at ISI, Kolkata, organized the Annual Workshop on Machine Intelligence and Application. The Research Unit at ISI, Kolkata organized a workshop on Correlates of Pro-Environmental Attitude. In March 2021, a Workshop on Game Theory - Efficiency, Matching, Fairness and Manipulation: Some Enduring Issues in Cooperation and Aggregation was organized by the Socio-Economic Research Unit, ISI, Tezpur. The Library Division, Kolkata conducted a number of events including webinars on Covid-19 as Opportunity from Crisis Management to Future-proofing Library, Introduction to RFID Technology & Integration, Books or eBooks - Which is New Normal, Search versus Research and Research Metrics and Ranking through the Lenses of Scopus, to name a few. The PC Mahalanobis Memorial Museum and Archives (PCMMM&A) of the Library Division in collaboration with ICOM India and Bankim Bhavan Gaveshana Kendra, Gurusaday Museum, Kolkata Centre for Creativity and Raja Dinkar Kelkar Museum organized a seminar on 'Resurgence' - On the Return of Audience to Museums. Many more scientific events and activities were organized throughout the year.

The regular academic degree programs of the Institute also had to go online because of the pandemic. The newly introduced post-graduate diploma in statistical methods and applications is going strong in the Chennai Centre of the Institute. A new post-graduate diploma program on Agriculture and Rural Management with Statistical Methods and Analytics has been launched in the Giridih branch of the Institute. The expectation is to educate young graduates and post-graduates so that they can use their knowledge to serve the rural sector effectively using scientific principles. The two-year Post Graduate Diploma in Business Analytics course, conducted jointly with the Indian Institute of Management Calcutta and Indian Institute of Technology, Kharagpur continues to perform well, with the graduating students very well placed. An encouraging development in the past year was the establishment of the Technology Innovation Hub (TIH) on Data Science, Data Curation and Data Analytics under the National Mission on Interdisciplinary Cyberphysical Systems of the Government of India. A Section 8 company called IDEAS Foundation has been set up under this initiative. Several faculty members are involved in the activities of the TIH.

The Institute faculty undertook many externally funded projects and consultancy works over the last year. MoUs have been signed/ extended between ISI and several other organizations from the government, industry and academia including Defense Research and Development Organisation (DRDO); NITI Aayog; National Highway Authority of India;Tata Consultancy Services Limited; Tata Steel; ISI-IEG Research project under EfD Agreement; Airport Authority of India; International Centre for Integrated Mountain Development (ICIMOD), to name just a few. Further details are provided in a section of this Annual Report. The six Institute DBT funded cluster project, SyMeC, studying the systems biology of cancer in nearing completion of the first phase. Besides these, the Institute faculty, particularly those in the SQC&OR division, conducted large number of training programs for the industry.

I remain grateful to the President of the Institute, Shri Bibek Debroy, Chairman of the Economic Advisory Council to the Prime Minister. I am also grateful to Prof. Goverdhan Mehta, who was the Chairman of the ISI Council till September 2020 and Dr. Ashok Kumar Lahiri, Chairman of Council from September 2020 onwards. It is because of the able leadership and guidance provided by these luminaries that ISI continues to excel in all its activities. I am thankful to the Secretary, Ministry of Statistics and Programme Implementation and all other officials of the Ministry of Statistics and Programme Implementation, Government of India and Members of the Section 8(1) Committee for their active support. I also wish to thank all those external experts whose help has been instrumental in various committees of the Institute. Finally, I thank all the scientific and non-scientific workers, students and alumni for extending their cooperation for the all-round development of the Institute.



March 31, 2021

Sanghamitra Bandyopadhyay

PREFACE

The pandemic is far from over and each one of us is still struggling to come to terms with the new normal, both personally and professionally. With everyday functionality getting digitally transformed and with rampant virtual official meetings, we are increasingly realizing the importance of computer technology that has now become a necessity in our everyday lives. As a tribute to our visionary founder, Prof. P.C. Mahalanobis, we are additionally featuring a page on "First computers in ISI" under Brief History of ISI (Chapter 1) in order to reminisce his immense contribution towards the introduction of the first computers in our country. During this reporting year (2020-2021), along with all other reported activities, research and efforts to tackle the COVID-19 situation is continuing at ISI and some of the initiatives undertaken have been highlighted at the very end of this report under "Response of ISI to COVID-19".

We gratefully acknowledge the help and support of everyone who have contributed to this report and we sincerely regret any errors or omissions that may have crept in despite our best efforts.

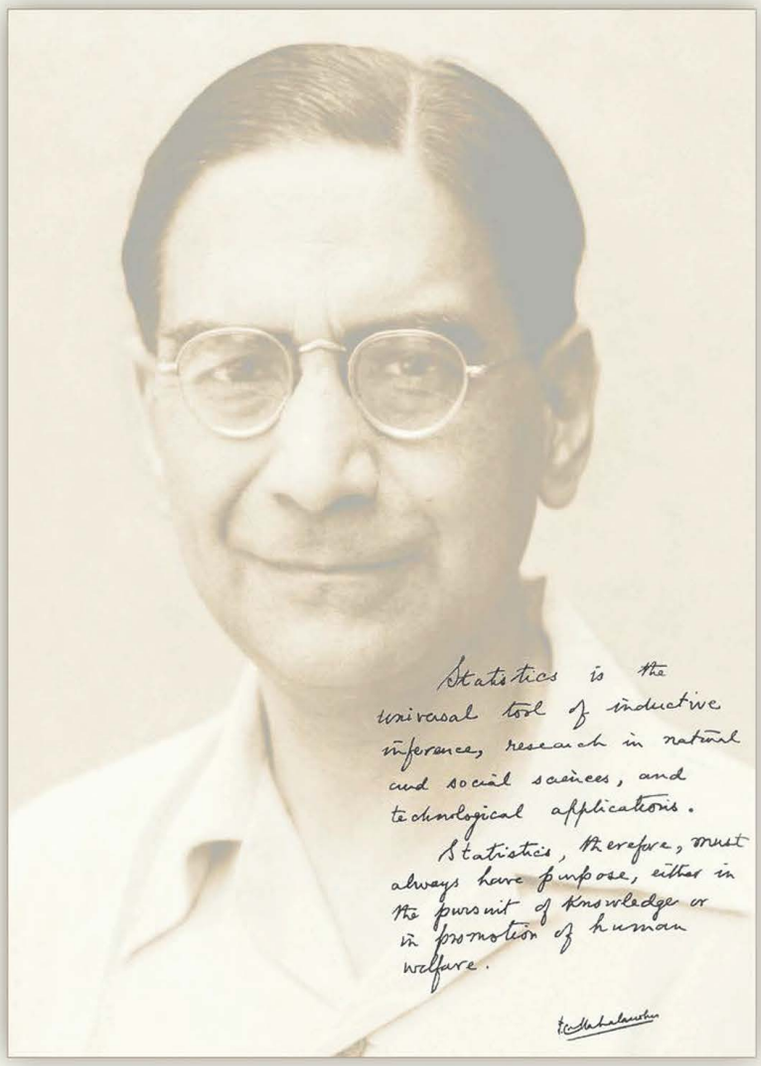
As our future remains uncertain, stay safe and informed and we all hope for a more normal 2022!

The Editorial Board

CONTENTS

CHAPTER 01 THE INSTITUTE

The Indian Statistical Institute, an Institute of national importance, is a premier and internationally acclaimed research, teaching and training institute.



Founder

Professor Prasanta Chandra Mahalanobis

Our Vision:

As envisioned by Professor P.C. Mahalanobis, the Indian Statistical Institute aims at nurturing Statistics as a unifying force across disciplines and encompassing emerging areas of research in all its scientific divisions, while striving towards advancing data driven strategies for national development and social welfare.

Our Mission:

- To promote the study and dissemination of knowledge of Statistics, to develop statistical theory and methods, and their use in research and practical applications generally, with special reference to problems of planning for national development and social welfare;
- To undertake research in various fields of natural and social sciences with a view to the mutual development of Statistics and these sciences;
- To provide for, and undertake, the collection of information, investigations, projects, and operational research for purposes of planning and the improvement of efficiency of management and production; and
- To undertake any other ancillary activities in fulfillment of the objectives stated above.

1.1 LOCATIONS

Campus Locations and SQC&OR Units

The Indian Statistical Institute was formally established in 1932. The Institute has its headquarters in Baranagar, Kolkata. It has four other subsidiary centres at Delhi, Bangalore, Chennai and Tezpur, and a branch at Giridih. The R.C. Bose Centre for Cryptology and Security was created in 2014 and is also located in Kolkata. The various locations are shown on a map of India along with a separate list of units at each campus.

At Kolkata, West Bengal (A)

(I) The Head Quarters of ISI

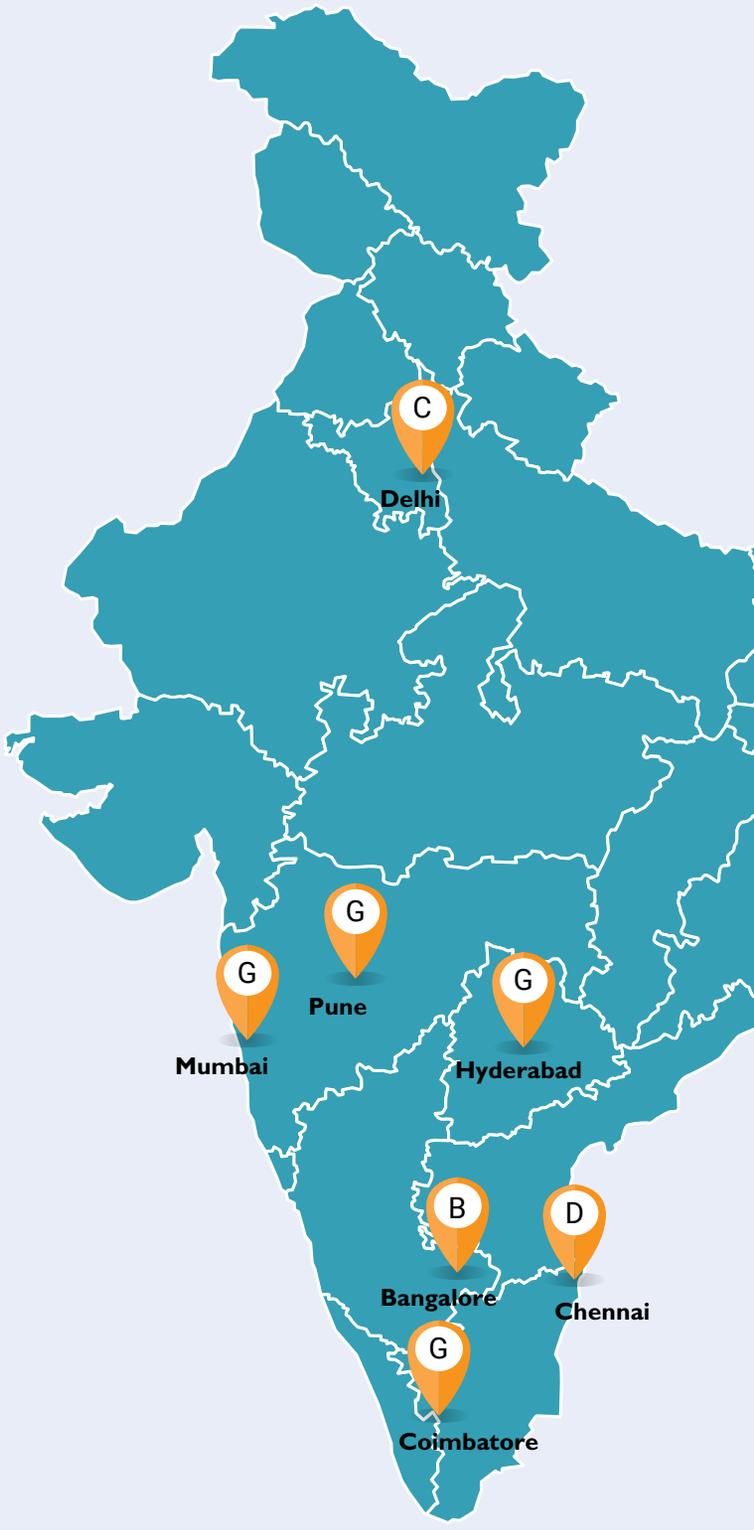
The main headquarters of the Institute, which shifted to its present campus in 1953, has a lush green sprawling campus in the northern fringe of the Kolkata metropolis. It has 19 academic units, a large and vibrant library, a computer and statistical services centre, two museums, two centres of excellence and a Technology Hub, namely -

- Advanced Computing and Microelectronics Unit (ACMU)
- Agricultural and Ecological Research Unit (AERU)
- Applied Statistics Unit (ASU)
- Biological Anthropology Unit (BAU)
- Computer Vision and Pattern Recognition Unit (CVPRU)
- Economic Research Unit (ERU)
- Electronics and Communication Sciences Unit (ECSU)
- Geological Studies Unit (GSU) and the Geology Museum
- Human Genetics Unit (HGU)
- Interdisciplinary Statistical Research Unit (ISRU)
- Linguistic Research Unit (LRU)
- Machine Intelligence Unit (MIU)
- Physics and Applied Mathematics Unit (PAMU)
- Population Studies Unit (PSU)
- Psychology Research Unit (PRU)
- Sampling and Official Statistics Unit (SOSU)
- Sociological Research Unit (SRU)
- Statistical Quality Control& Operations Research Unit (SQC&ORU)
- Stat-Math Unit (SMU)
- Library and the PCM Memorial Museum and Archives
- Centre for Soft Computing Research (CSCR): A National Facility
- Centre for Artificial Intelligence and Machine Learning (CAIML)
- Computer and Statistical Services Centre (CSSC)
- Technology Innovation Hub (TIH)

(II) The RC Bose Centre

The R.C. Bose Centre for Cryptology and Security at Kolkata was created in 2014 as a national hub for cryptographic requirements. This Centre has only one Unit at present.

- Cryptology and Security Research Unit (CSRU)



At Bangalore, Karnataka

The Bangalore Centre, Karnataka

The Bangalore Centre was conceived by Professor P.C. Mahalanobis during the 1960s. The Statistical Quality Control unit was functioning in Bangalore from 1956 and the Documentation Research and Training Centre was set up in 1962. The activities of the Bangalore Centre started in September 1978 in a rented building and the various units moved to the present campus in May 1985. The Bangalore Centre was formally declared as a Centre of ISI in September 1996. The present campus, full of eucalyptus trees, is located on Mysore Road on the outskirts of the city and is close to the Bangalore University campus. The Centre has six units and a library, namely –

- Applied Statistics Unit (ASU)
- Documentation Research and Training Centre (DRTC)
- Economic Analysis Unit (EAU)
- Statistical Quality Control& Operations Research Unit (SQC&ORU)
- Stat-Math Unit(SMU)
- Systems Science and Informatics Unit (SSIU)
- Library

The Statistical Quality Control & Operations Research (SQC & OR) Units

The Institute has a network of eight Statistical Quality Control& Operations Research (SQC&OR) units spread across the country. In addition to the units functioning from its headquarters at Kolkata and from other centres in Delhi, Bangalore and Chennai, the other four units are located in-

- Coimbatore, Tamil Nadu
- Hyderabad, Telangana
- Mumbai, Maharashtra
- Pune, Maharashtra

At Delhi

The Delhi Centre, Delhi

The Delhi Centre was established in 1974 within the Planning Commission premises. It shifted to its present campus in 1975 which is located in a part of South Delhi known as the Qutub Institutional Area. The Centre has three units, a centre of excellence (established on July 24, 2020 pursuant to the decision of the ISI Council in its meeting held on June 09, 2020) as well as a library, namely-

- Economics and Planning Unit (EPU)
- Statistical Quality Control & Operations Research Unit (SQC&ORU)
- Stat-Math Unit (SMU)
- Library
- Centre for Research on the Economics of Climate, Food, Energy and Environment (CECFEE)'

At Chennai, Tamil Nadu

The Chennai Centre, Tamil Nadu

The Chennai centre came into existence in 2008 and is presently located at 37, Nelson Manickam Road (First floor), Aminjikarai, Chennai. The Centre has three units and a library, namely -

- Applied Statistics Unit (ASU)
- Computer Science Unit (CSU)
- Statistical Quality Control& Operations Research Unit (SQC&ORU)
- Library

At Tezpur, Assam

The North-East Centre

The North-East Centre at Tezpur was established in 2011 and is presently located at Punioni, Solmara which is north of Tezpur and is close to Tezpur University, the Defence Research Laboratory (DRL) and the Defence Research & Development Organization (DRDO). The Centre has the following three units and a library-

- Applied and Official Statistics Unit (AOSU)
- Socio-Economic Research Unit (SERU)
- Theoretical and Applied Sciences Unit (TASU)
- Library

At Giridih, Jharkhand

The Giridih Branch

The Giridih branch was in 1931 and is situated at the heart of Giridih town. The sprawling campus of the Giridih branch includes three land parcels. Besides the office buildings, Giridih has two large agricultural farms adjacent to the river Ushri. The farms with different land situations (high, mid and low) are ideal for conducting agricultural experiments and have well-equipped laboratories as well. The Giridih branch has two operational units functioning under the respective units in Kolkata-

- Agricultural & Ecological Research Unit (AERU)
- Sociological Research Unit (SRU)

1.2 ORGANIZATIONAL CHART

Academic Divisions

01 Applied Statistics Division (ASD)

- Applied and Official Statistics Unit (AOSU), North-East Centre, Tezpur
- Applied Statistics Unit (ASU), Bangalore
- Applied Statistics Unit (ASU), Chennai
- Applied Statistics Unit (ASU), Kolkata
- Interdisciplinary Statistical Research Unit (ISRU), Kolkata

02 Biological Sciences Division (BSD)

- Agricultural & Ecological Research Unit (AERU), Kolkata & Giridih
- Biological Anthropology Unit (BAU), Kolkata
- Human Genetics Unit (HGU), Kolkata

03 Computer and Communications Sciences Division (CCSD)

- Advanced Computing and Microelectronics Unit (ACMU), Kolkata
- Computer Science Unit (CSU), Chennai
- Computer Vision and Pattern Recognition Unit (CVPRU), Kolkata
- Cryptology and Security Research Unit (CSRU), Kolkata
- Documentation Research and Training Centre (DRTC), Bangalore
- Electronics and Communication Sciences Unit (ECSU), Kolkata
- Machine Intelligence Unit (MIU), Kolkata
- Systems Science and Informatics Unit (SSIU), Bangalore

04 Library, Documentation and Information Sciences Division (LDISD)

- Library, Bangalore
- Library, Chennai
- Library, Delhi
- Library, Kolkata
  - Prasanta Chandra Mahalanobis Memorial Museum & Archives
- Library, North-East Centre, Tezpur

05 Physics and Earth Sciences Division (PESD)

- Geological Studies Unit (GSU), Kolkata
  - Geological Museum
- Physics and Applied Mathematics Unit (PAMU), Kolkata
- Theoretical and Applied Sciences Unit (TASU), North-East Centre, Tezpur

06 Social Sciences Division (SSD)

- Economic Analysis Unit (EAU), Bangalore
- Economics and Planning Unit(EPU), Delhi
- Economic Research Unit (ERU), Kolkata
- Linguistic Research Unit (LRU), Kolkata
- Population Studies Unit (PSU), Kolkata
- Psychology Research Unit (PRU), Kolkata
- Sampling and Official Statistics Unit (SOSU), Kolkata
- Socio-Economic Research Unit (SERU), North-East Centre, Tezpur
- Sociological Research Unit (SRU), Kolkata & Giridih

07 Statistical Quality Control and Operations Research Division (SQCOR)

- SQC & OR Unit, Bangalore
- SQC & OR Unit, Chennai
- SQC & OR Unit, Coimbatore
- SQC & OR Unit, Delhi
- SQC & OR Unit, Hyderabad
- SQC & OR Unit, Kolkata
- SQC & OR Unit, Mumbai
- SQC & OR Unit, Pune

08 Theoretical Statistics and Mathematics Division (TSMD)

- Theoretical Statistics and Mathematics Unit (SMU), Bangalore
- Theoretical Statistics and Mathematics Unit (SMU), Delhi
- Theoretical Statistics and Mathematics Unit (SMU), Kolkata

Teaching and Training

01 Dean's Office

02 Placement Cell

Associate Institutions

01 Center for Soft Computing Research (CSCR): A National Facility, Kolkata

02 International Statistical Education Centre (ISEC), Kolkata

Centres of Excellence

01 Centre for Artificial Inteligence and Machine Learning (CAIML)

02 Centre for Research on the Economics of Climate, Food, Energy and Environment (CECFEE)

Technology Innovations Hub (TIH)

New initiative started in 2020

Computer and Statistical Services Centre (CSSC), Kolkata

Administrative Services Division

01 Director's Office

- Cell for Co-operation with Academia, Industry & Research labs (CCAIR)
- Faculty Recruitment Cell
- PhD/ DSc Cell
- ST/SC/OBC Liaison Cell

02 CE (A&F)'s Office

- Accounts Section
- Audio Visual Unit
- Canteen
- Cash Unit
- Central Stores
- Council Section
- Despatch Unit
- Electrical Maintenance Unit
- Engineering Unit
- Estate Office
- Guest House
- Hostels
- Human Resource Development Unit
- Medical Expenses Reimbursement Unit
- Medical Welfare Unit
- Personnel Unit
- Provident Fund Unit
- Public Relations Unit
- Printing and Publication Unit
- Security Unit
- Telephone Unit
- Transport Unit
- House Building Advance Cell
- Internal Audit Cell
- Legal Cell
- Official Language Cell
- Retirement Benefit Cell
- RTI, Grievance, Complain Cell
- Import/Travel Cell

1.3 JOURNEY OF THE INSTITUTE

Snapshots!

1931 to 1980:

- PC Mahalanobis establishes ISI in 1931
- First international journal of Statistics in India, Sankhya, foreword by Rabindranath Tagore in 1933
- Path-breaking discoveries by ISI scientists:
  - Mahalanobis distance, large scale sample survey method - PC Mahalanobis
  - Cramer-Rao Bound, Rao-Blackwell Theorem - CR Rao
  - BCH Error-correcting codes - RC Bose
  - Theory of large deviations - SRS Varadhan
  - Bahadur Efficiency and Basu's Theorem in Statistics
- National Sample Survey (NSS) was conceived for the collection of socio-economic data in 1950
- UNESCO empowers ISI to train statisticians of developing countries – International Statistical Education Centre (ISEC) established in 1950
- Second Five-Year Plan drafted in 1954
- ISI designs the first analog computer in India in 1954
- ISI imports and installs the first digital computer in India, HEC-2M, in 1955
- Dinosaur fossil, *Barapasaurus tagorei*, discovered by ISI geologists
- ISI recognized as an institute of national importance by a Central Act in 1959
- First digital computer (ISI-JU-1) built and commissioned (1961-1966)
- Delhi Centre of ISI established in 1974
- Bangalore Centre of ISI established in 1978

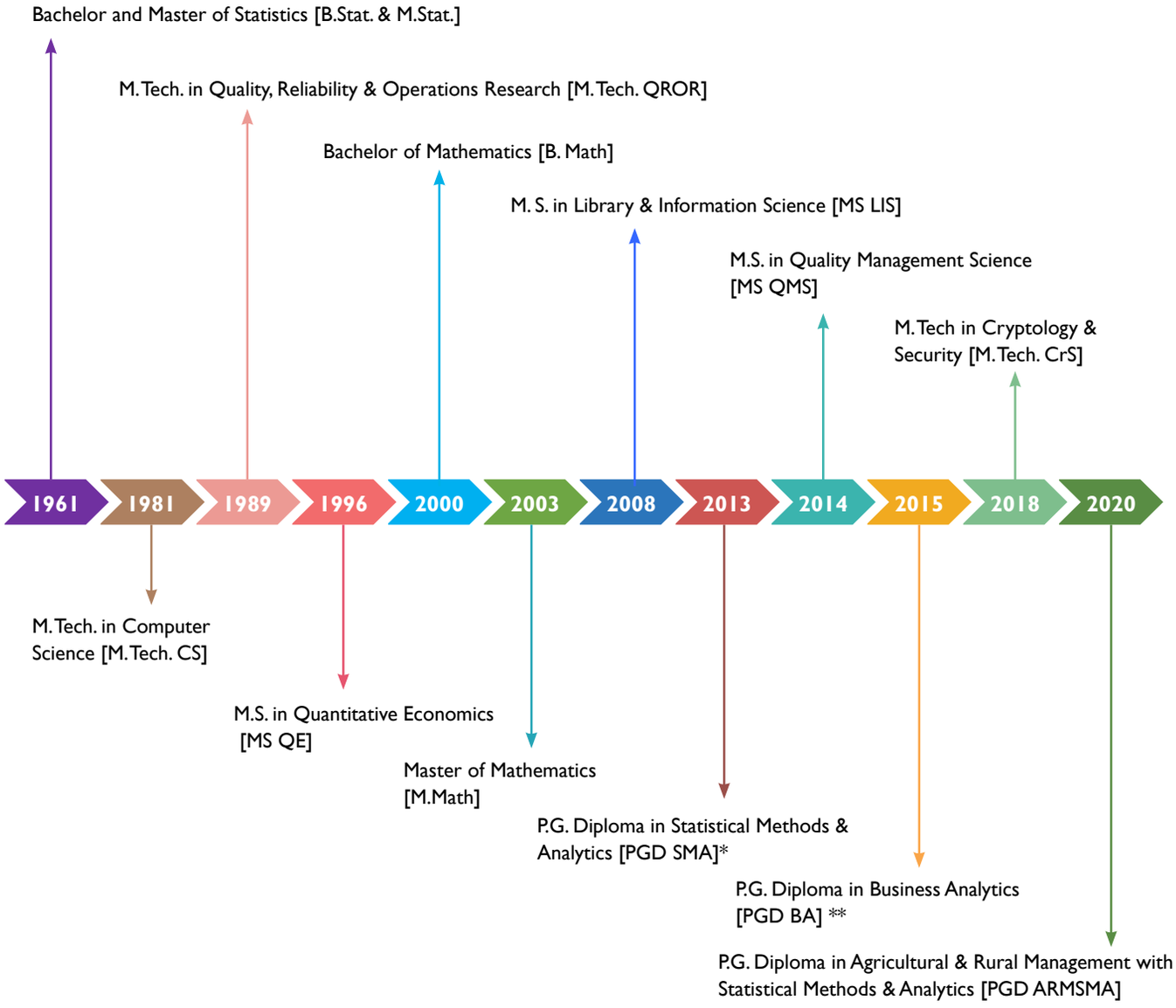
1981 till date

- Nodal Centre for a 5th Generation Knowledge-Based Computer Systems (FGCS/ KBCS) in the fields of Pattern Recognition, Computer Vision, Image Processing and Artificial Intelligence established in 1987
- Computer-based dictionary in the Indian Language (Bangla) developed for use by blind persons in 1996
- Introduction of Soft Computing in India and establishment of the first Centre for Soft Computing Research in Asia in 2005
- Outreach program: North-East and Jharkhand
- 29th June declared as the National Statistics Day during the Platinum Jubilee celebrations at ISI by the then Prime Minister, Dr. Manmohan Singh in 2006
- Chennai Centre of ISI established in 2008
- Pioneering work in Artificial Intelligence and Machine Learning, Bioinformatics, Computational Genetics, Cryptology, Indian Language Technologies, Population Genomics, Soft Computing Technology
- North-east Centre of ISI established for the development of the region in 2011
- RC Bose Centre for Cryptology and Security established in 2014
- Teaching and training in Official Statistics & Policy Research initiated
- Seminal contributions in Game theory, Algebraic Geometry, Poverty and Inequality measures, Disease Genetics, Granular Computing
- Discovery of *Shringasaurus indicus* in 2017
- Centre for Artificial Intelligence and Machine Learning established in 2019
- Computational and experimental biology research; cancer, auto-immune and neuro-degenerative diseases
- Centre for Research on the Economics of Climate, Food, Energy and Environment, Delhi recognized as Centre and Technology Innovation Hub, Kolkata established in 2020
- Technology Innovation Hub established in 2020

Thinking Ahead of Times!

Academic programmes introduced in ISI

- The Institute began offering its internationally-acclaimed UG and PG programmes in Statistics, (B.Stat. and M.Stat.) in 1961, empowered by The Indian Statistical Institute Act of 1959 to award degrees.
- This Act was amended by the Parliament of India in 1995 to empower the Institute to award Degrees/Diplomas not only in Statistics but also in Mathematics, Quantitative Economics, Computer Science and other subjects related to Statistics as may be determined by the Institute from time to time.
- ISI also started awarding Ph.D. degrees in the areas of Mathematics, Quantitative Economics, Computer Science as well as Quality, Reliability and Operations Research, in addition to the original discipline, namely, Statistics.
- Several degree/diploma programmes have been introduced subsequently. A timeline of the innovative programmes introduced in ISI are as follows –



*The PGDSMA was initially introduced in 2011-12 as PG Diploma in Statistical Methods with Applications at the North-East Centre and later renamed in 2013. The programme has been running successfully at Tezpur, with 50% of its seats reserved for candidates domiciled in the Northeast region. Since 2019, this programme is also being offered simultaneously at the Chennai centre for candidates from all over India.

** This course is offered with IIM, Kolkata & IIT Kharagpur

1.4 A BRIEF HISTORY OF THE INSTITUTE

In the 1920's, Prasanta Chandra Mahalanobis, then a Professor at Presidency College, Calcutta conducted several studies employing statistical methods with results that vindicated his ideas about the efficacy and possibilities of the emerging science of Statistics.

The Indian Statistical Institute (ISI) was formally established on 17 Dec 1931 in a meeting presided by Sir R.N. Mukherjee, the first President of the Institute, and Prasanta Chandra Mahalanobis was appointed as the Honorary Secretary.

On April 28 1932 the Indian Statistical Institute was registered as a non-government and non-profit distributing learned society under the Societies Registration Act No. XXI of 1860. The Institute is now registered under the West Bengal Societies Registration Act XXVI of 1961, as amended in 1964.

The Institute started functioning initially from a room of the then Presidency College (now Presidency University) with enduring support from several distinguished personalities and devoted scholars in Calcutta. Over the first two decades, which turned out to be a glorious chapter in the annals of Indian science and institution building, the ISI embarked upon a series of pioneering programmes involving the application of Statistics in search of the solution to the urgent and live problems of the country. Such programmes included innovative projects on sample surveys of yield and land utilization of crops, socio-economic after-effects of the Bengal famine and problems of flood research. These innovations and methodological research have since become classics in Statistics. At the same time, the training of scientific personnel began to grow. This also encouraged high-level research and brought into focus the need for publication of the research results, for which ***Sankhyā***, the first international journal of Statistics in the country came into being in 1933.

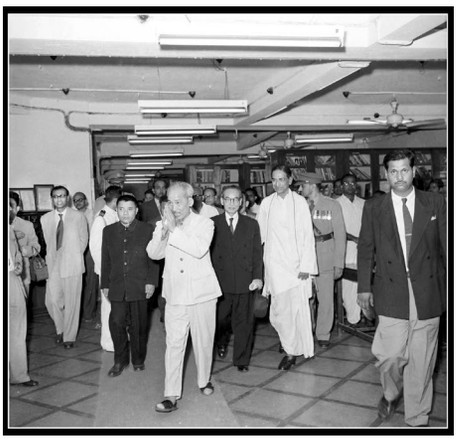
When India became independent, the Institute held a pivotal role in the task of nation-building through the brilliant choice of the area of surveys, which were socially and nationally relevant. The patronage and invaluable contribution of Sir Ronald A. Fisher played an important role. Led by Professor Mahalanobis and a very able group of younger statisticians including R.C. Bose, S.N. Roy and C.R. Rao, the Institute was poised to take on the larger role. In 1954 Pandit Jawaharlal Nehru, the then Prime Minister of India, entrusted Professor Mahalanobis and ISI with the responsibility of preparing the draft Second Five-Year Plan for the country. The draft submitted by Professor Mahalanobis and the planning models formulated by him and his colleagues have since been regarded as major contributions to economic planning in India. The formal recognition came in December 1959, when the then Prime Minister, Pandit Jawaharlal Nehru piloted the enactment of the Indian Statistical Institute Act of 1959 in the Parliament. This Act designated ISI as an 'Institution of National Importance'. The activities of ISI steadily grew, existing interests became more broad-based and a number of science units were created in the interest of live interaction between Statistics and Natural and Social Sciences. Empowered by the Act to award degrees, the Institute started the B. Stat. and M. Stat. courses. An excellent library was established at Kolkata and the Documentation Research and Training Centre began functioning in Bangalore. Other developments in infrastructure also began.

On December 24, 2006, during the Platinum Jubilee celebrations of the Institute (2006-07), Dr. Manmohan Singh, the then Prime Minister of India declared the birth anniversary (29th June) of Prof. P.C. Mahalanobis as the National Statistics Day.

Visitors:

The Institute, from its formative period till present times, had many eminent visitors, some of whom were Nobel Laureates. Besides Ronald A. Fisher, J.B.S. Haldane and Walter A. Shewhart, the luminaries included Frederic and Irene Curie, Neils Bohr, A.N. Kolmogorov, P.M.S. Blackett, J.D. Bernal, Joan Robinson, Genichi Taguchi and George Akerlof (Nobel prize in economics, 2001). Incidentally, George Akerlof was a visiting professor at ISI during 1967-68. During recent times, the visit of Amartya K. Sen, Robert Aumann, Lotfi A. Zadeh, Roger Penrose, Joseph E. Stiglitz, Sir James A. Mirrlees, Eric Maskin, Ei-ichi Negishi, Ada Yonath, David Jonathan Gross and S.R.S. Varadhan (Abel Prize, 2007 for his contributions to probability theory and an alumnus of the institute) may be specially mentioned. The Institute is proud to have C.R. Rao, who has recently celebrated 100th birthday and is among the world leaders in statistical science, in its list of illustrious alumni.

Madame Irene Juliot Curie, Institute of Radium, Paris with P C Mahalanobis and Mrs Mahalanobis at Amrapali in January 1950



Ho Chi-minh, President, People's Republic of Vietnam, acknowledging ovation by Institute workers during his visit to ISI on 13.02.1956

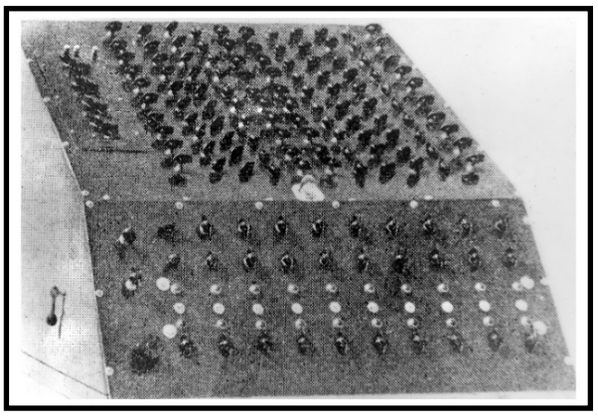
P C Mahalanobis, Henry A Kissinger, Consultant of President Kennedy and Professor, Harvard University, Mrs. Kissinger during a visit on 19.01.1962

1.5 ISI AND THE FIRST COMPUTERS IN INDIA

The outbreak of the COVID-19 pandemic has created the largest disruption of education systems in human mankind. It has completely changed the higher education delivery system; it has brought the focus on the role of computer / IT in the teachinglearning process. Therefore, it is interesting to know how ISI played a major role in the journey of developing computing facilities in India.

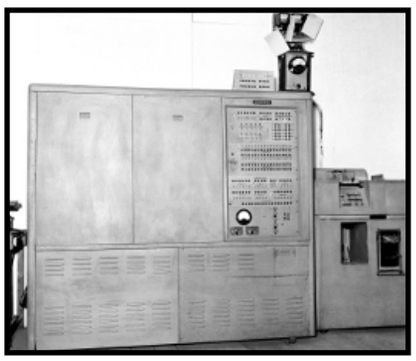
This timeline recapitulates the advent of the first computers in ISI by Prof. Mahalanobis and highlights some of the notable accomplishments, until the turn of this century, using computer-related technology by the faculty of this Institute. During 1943, while conducting estimates of the yield of paddy crop in Bengal after the famine at the request of the Government of Bengal, Prof. Mahalanobis first felt the need for computing machines and introduced the mechanical desk calculators for the first time. Thereafter,

- **In 1943**, the Indian Calculating Machine and Scientific Instrument Research Society was set up to explore the fabrication of such devices locally.
- **In 1950**, the Institute set up an Electronic Computer Laboratory to look into the needs of high-speed computations. The first mechanical hand computing machine, the first Analog computer, the first Punch Card storing machines and the first Solid State Computer in India- were all developed here.
- **In 1953**, India's *first* indigenous electronic *analog computer* for solving linear equations with 10 variables and related problems was developed by ISI (Design: Samerendra Kumar Mitra).

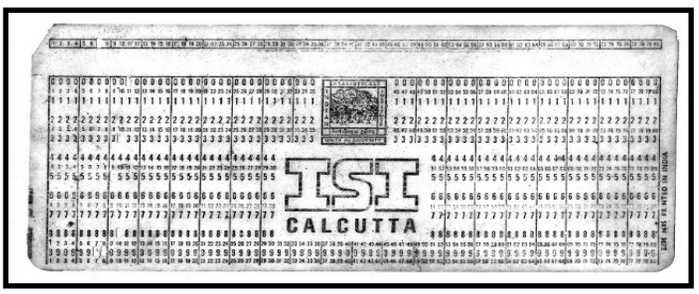


The first Electronic Analogue Computer constructed by ISI in 1953

- **In 1956**, the first electronic digital computer, HEC-2M (Hollerith Electronic Digital Computer-2M) produced by the British Tabulating Machines Works, Letchworth was installed in ISI. This was the first electronic computer to be installed in India and the ISI was the first to turn out trained programmers.

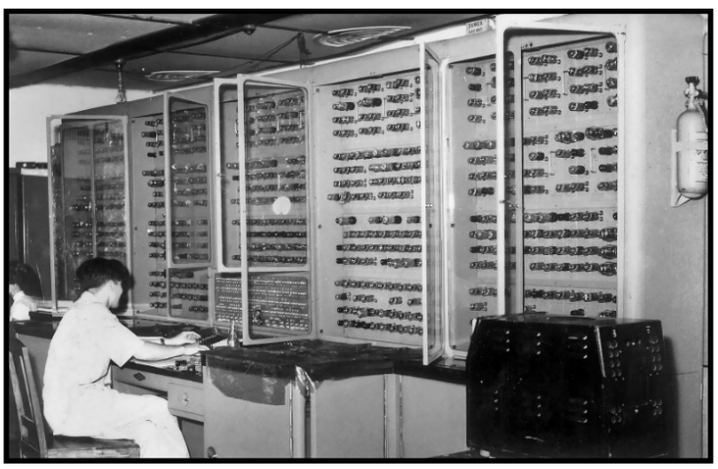


HEC-2M Hollerith Electronic Digital Computer



1956 Punch cards used at ISI

- **In 1958,** a big electronic digital computer called URAL, offered by the USSR Government through the UNTAA (United Nations Technical Aid Administration), was installed in the institute for processing statistical data.



Soviet Electronic computer, URAL (front view), installed in 1958

Neils Bohr, Mrs. Bohr, PC Mahalanobis and Rani Mahalanobis at the URAL computer floor of ISI, 1960

- **In 1961**, ISI in collaboration with Jadavpur University undertook the design, development and fabrication of a fully transistorized digital computer, called ISI-JU-1, which was commissioned in 1966 by Shri M.C. Chagla, then Union Minister of Education. This was the first solid state computer built in India.

The ISI-Jadavpur University (ISI-JU) computer commissioned at Jadavpur University in 1966

- **In 1962,** an Evening Course on Punched Card Systems for imparting training in programming and operation of tabulating and computing machines was organized. This course was renamed Course on Operation of Automatic Data Processing Equipment in 1980.

- **In 1979,** a new third generation computer, EC-1033, from USSR was installed. It had a 256 KB memory with multi-programming facility and two card-readers, four tape-drivers, four disk drivers, two high-speed printers and four terminals as the supporting peripherals.

- **In 1987,** a Nodal Centre for a Fifth Generation Knowledge-Based Computer Systems (FGCS/KBCS) in the fields of Pattern Recognition, Computer Vision, Image Processing and Artificial Intelligence was established.
- **In 1988,** the Computer and Statistical Service Centre (CSSC), equipped with a VAX 8650 system of Digital Equipment Corporation, USA, was set up.
- **In 1991,** computer based Natural Language processing was initiated and the first speech synthesis system for Bengali language, named Bangabani, was developed. A related achievement was a system, called Surobitan, for automatic musical transcription for vocal songs.

- **In 1996,** a landmark development was a computer-based dictionary in the Indian Language (Bangla) that could be used by blind persons as well.
- **In 1998,** the Bangla Script Optical Character Recognition (OCR) systems was built which could read Bangla books published by publishing houses. The development of Devnagari (Hindi) OCR system, Artificial Neural Models and Image Compression Techniques, Remote Sensing and Data Analysis in Atmospheric Science need mention here.
- **In 2005,** the Center for Soft Computing Research: a National Facility was formally inaugurated.

And the journey continues under the umbrella of the current Computer & Communication Sciences Division!

1.6 DISTINGUISHED SCIENTISTS AND STATESMEN WHO HAVE SERVED THE INSTITUTE SINCE INCEPTION

Presidents

1	Sir Rajendra Nath Mookerjee	1932-35
2	Shri E.C. Benthall	1936-37
3	Shri James Reid-Kay	1938
4	Shri Badridas Goenka	1939-41
5	Dr. Nalini Ranjan Sarkar	1942-43
6	Dr. Chintaman D. Deshmukh	1944-63
7	Shri Y.B. Chavan	1964-66
8	Prof. Satyendra Nath Bose	1967-75
9	Shri Subimal Dutt	1976-89
10	Prof. M.G.K. Menon	1990-2012
11	Dr. C. Rangarajan	2012-16
12	Dr. Vijay Kelkar	2016-18
13	Shri Bibek Debroy	2018-till date

Chairmen

1	Shri B. Rama Rao	1954
2	Shri D.N. Mitra	1955-63
3	Shri K.P.S. Menon	1964-70
4	Shri S.C. Roy	1971
5	Dr. Atma Ram	1972
6	Shri. P.N. Haksar	1973-97
7	Dr. Bimal Jalan	1998-2001
8	Dr. N.R. Madhava Menon	2002-03
9	Shri Pranab Mukherjee	2004-12
10	Shri A.K. Antony	2012-14
11	Dr. Arun Shourie	2014-16
12	Prof. Goverdhan Mehta	2016- 20
13	Dr. Ashok Kumar Lahiri	2020-till date

Directors

1	Prof. P.C. Mahalanobis	Dec	1931	-	June	1972
2	Prof. C.R. Rao	July	1972	-	June	1976
3	Prof. G. Kallianpur	July	1976	-	Sept	1978
4	Prof. B.P. Adhikari	Aug	1979	-	Oct	1983
5	Prof. Ashok Maitra	Apri	1984	-	Jan	1987
6	Prof. J.K. Ghosh	Jan	1987	-	Jan	1992
7	Prof. B.L.S. Prakasa Rao	Jun	1992	-	Feb	1995
8	Prof. S.B. Rao	July	1995	-	July	2000
9	Prof. K.B. Sinha	Aug	2000	-	July	2005
10	Prof. S.K. Pal	Aug	2005	-	July	2010
11	Prof. Bimal K. Roy	Aug	2010	-	July	2015
12	Prof. Sanghamitra Bandyopadhyay	Aug	2015	-	till date	

D.Sc. (Honoris Causa) awardees

Feb 1962	Prof. Satyendra Nath Bose, Prof. Ronald A. Fisher, Pandit Jawaharlal Nehru, Dr. Walter A. Shewhart
Apr 1962	Prof. A.N. Kolmogorov
May 1965	Dr. Chintaman Dwarkanath Deshmukh
Dec 1974	Prof. Raj Chandra Bose, Dr. M.V. Keldysh, Prof. Jerzy Neyman
Feb 1977	Prof. Harald Cramer
Feb 1978	Shri Morarji Desai, Prof. L.V. Kantorovich
Dec 1989	Prof. C.R. Rao
Jan 2001	Prof. Gopinath Kallianpur
Feb 2004	Prof. S.R. Srinivasa Varadhan
Mar 2006	Prof. L.A. Zadeh
Dec 2006	Dr. Manmohan Singh
Feb 2011	Dr. Subhas Mukherjee (Posthumously)
Jan 2013	Prof. K.R. Parthasarathy, Prof. Jayanta Kr. Ghosh, Prof. Pranab Bardhan

1.7 THE COUNCIL & KEY COMMITTEES

Council

The two year tenure of the present ISI council ended on 17th September 2020 and the new council of the Institute for the term 2020-2022 was appointed pursuant to the decision of the ISI Council in its meeting held on 4th September, 2020 (both physically and online). The new Council took over from 18th September, 2020. The members of the Council who served the Institute during the period 1st April, 2020 to 31st March, 2021 are as follows-

President

Shri Bibek Debroy
Chairman, Economic Advisory Council to the Prime Minister (EAC-PM)

From 1st April 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Chairman **Prof. Goverdhan Mehta**, FNA, FRS Dr. Kallam Anji Reddy Chair School of Chemistry University of Hyderabad, Hyderabad.	**Chairman** **Dr. Ashok Kumar Lahiri** Member, 15th Finance Commission Finance Commission of India
Director **Prof. Sanghamitra Bandyopadhyay** [Up to 31st July, 2020]	**Officiating Director** **Prof. Dipti Prasad Mukherjee** [18th to 29th September, 2020 (FN)]
Officiating Director **Prof. Dipti Prasad Mukherjee** [1st August to 17th September, 2020]	**Director** **Prof. Sanghamitra Bandyopadhyay** [29th September, 2020 (AN) to 31st March 2021]

Representatives of the Government of India

Shri Ali R. Rizvi
Special Secretary and Financial Advisor, Government of India
Ministry of Statistics and Programme Implementation, New Delhi

Smt. Mamta Saxena
DG (Co-ordination and Administration), Government of India
Ministry of Statistics and Programme Implementation, New Delhi

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Shri Pramod Kumar Das Additional Secretary, Government of India, Ministry of Finance Department of Expenditure, New Delhi	**Shri Subash Chandra Malik** Dy. Director General, Government of India, Ministry of Finance, Department of Expenditure, New Delhi (He has been transferred as informed on 13.11.2020)
Dr. Praveer Asthana Adviser/Scientist-G, Government of India Ministry of Science and Technology, New Delhi	**Dr. Rajiv Kumar Tayal** Scientist 'G', Government of India Ministry of Science and Technology, New Delhi
Dr. Rajiv Ranjan Adviser and Officer-in-Charge Department of Economic and Policy Research Reserve Bank of India, Mumbai	**Dr. O.P. Mall** Executive Director Reserve Bank of India

Shri Madan Mohan
ADG (HE), Government of India
Ministry of Human Resource Development, New Delhi

Representative of the ICSSR

Prof. V.K. Malhotra
Member-Secretary, Indian Council of Social Science Research, New Delhi

Representatives of the INSA

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Prof. Manindra Agrawal Department of Computer Science Indian Institute of Technology, Kanpur	**Prof. Manindra Agrawal** N Rama Rao Chair Professor Department of Computer Science Indian Institute of Technology, Kanpur
Prof. B.L.S. Prakasa Rao Ph. D, FNA, FASc, FNASc., FAPAS Former Director ISI, INSA Senior Scientist CR Rao Advance Institute of Mathematics Statistics and Computer Science, Hyderabad	**Prof. Rohini M. Godbole, FNA** Centre for High Energy Physics Indian Institute of Science Bangalore
Dr. Madhu Dikshit THSTI National Chair NCR Biotech Science Cluster Faridabad, Haryana	**Prof. Shahid Jameel, Ph. D** Chief Executive Officer The Wellcome Trust/DBT India, Alliance New Delhi
Prof. Yadati Narahari Department of Computer Science & Automation Indian Institute of Science, Bangalore	**Prof. Rahul Mukherjee, FNA** National Science Chair Indian Institute of Management , Calcutta

Representative of the NITI Aayog

Ms. Anna Roy
Adviser (DM&A), Government of India, NITI Aayog, New Delhi

Representative of the University Grants Commission

Prof. Umesh Singh
Department of Statistics, Institute of Science, Banaras Hindu University, Varanasi

Scientists co-opted by the Council

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Prof. Rohini M. Godbole, FNA Centre for High Energy Physics Indian Institute of Science, Bangalore	**Prof. Usha Vijayraghavan** Dean, Microbiology and Cell Biology Indian Institute of Science, Bangalore
Dr. Ravi P. Singh Secretary General of Quality Council of India an independent organization under Department of Industrial Policy and Promotion Government of India	**Prof. Dipendra Prasad** Indian Institute of Technology Bombay

Elected representatives of the Institute members not employed in the Institute

From 1st April 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Dr. Shibdas Bandyopadhyay Kolkata	**Shri Rabindra Narayan Das** Kolkata
Dr. Aditya Bagchi Kolkata	**Dr. Sashi Mohan Srivastava** Kolkata
Dr. I.K. Ravichandra Rao Bangalore	**Dr. T.S.S.R.K. Rao** Bangalore

Elected representatives of the employees of the Institute

Dr. Partha Pratim Mohanta
Representative of the Scientific Workers

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Shri Gouri Sankar Acharya Representative of the Non-Scientific Workers	**Shri Swarup Ghara** Representative of the Non-Scientific Workers

Officers of the Institute

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Prof. B.V. Rajarama Bhat Professor-in-Charge Theoretical Statistics and Mathematics Division	**Prof. Antar Bandyopadhyay** Professor-in-Charge Theoretical Statistics and Mathematics Division
Prof. Sumitra Purkayastha Professor-in-Charge Applied Statistics Division	**Prof. Mridul Nandi** Professor-in-Charge Applied Statistics Division
Prof. Susmita Mukhopadhyay Professor-in-Charge Biological Sciences Division	**Dr. Raghunath Chatterjee** Professor-in-Charge Biological Sciences Division
Prof. E. Somanathan Professor-in-Charge Social Sciences Division	**Prof. Manipushpak Mitra** Professor-in-Charge Social Sciences Division
Prof. Bhabatosh Chanda Professor-in-Charge Computer and Communication Sciences Division	**Prof. Krishnendu Mukhopadhyaya**, Professor-in-Charge Computer and Communication Sciences Division
Prof. Parthasarathi Ghosh Professor-in-Charge Physics and Earth Sciences Division	**Prof. Preeti Parashar** Professor-in-Charge Physics and Earth Sciences Division
Dr. Ashis Kr. Chakraborty Head, SQC & OR Division	**Dr. Arup Ranjan Mukhopadhyay** Head, SQC & OR Division
Prof. S.K. Neogy Head, Delhi Centre	
Prof. C.R.E. Raja Head, Bangalore Centre	
Dr. D. Sampangi Raman, Acting Head, Chennai Centre	

From 1st April, 2020 – 17th September, 2020	18th September, 2020 - 31st March, 2021
Prof. Goutam Mukherjee Dean of Studies	**Prof. Debasis Sengupta** Dean of Studies

Non-Member Secretary

Brigadier Jagdish Narayan Pandey (Retd)
Chief Executive (Administration & Finance)

Academic Council

Sanghamitra Bandyopadhyay
Director (Chairperson)

Debasis Sengupta
Dean of Studies (Convener)

Applied Statistics Division

Amita Pal
Anup Dewanji
Atanu Biswas
Ayanendranath Basu
Bimal Kr. Roy
Debapriya Sengupta
Debasis Sengupta
Kishan Chand Gupta
Mausumi Bose
Mridul Nandi
Palash Sarkar
Rita Saha Ray
Rituparna Sen
Smarajit Bose
Subhamoy Maitra
Subir Kumar Bhandari
Sudheesh Kumar Kattumannil
Sumitra Purkayastha
Sushama M. Bendre
Tapas Samanta

Biological Sciences Division

Abhisek Mukherjee
Anjana Dewanji
Arunava Goswami
Indranil Mukhopadhyay
Joydev Chattopadhyay
Pabitra Banik
Rabi Ranjan Chattopadhyay
Raghunath Chatterjee
Sabyasachi Bhattacharya
Saurabh Ghosh Subrata Kr. Roy
Susmita Mukhopadhyay

Computer and Communication Sciences Division

Anisur Rahaman Molla
Ashish Ghosh
Ayineedi Venkateswarlu
B.S. Daya Sagar
Bhabatosh Chanda
Devika P. Madalli
Dipti Prasad Mukherjee
Kausik Kumar Majumdar
Krishnendu Mukhopadhyaya
Nabanita Das
Nikhil Ranjan Pal
Pradipta Maji
Rajat Kumar De
Sandip Das
Sanghamitra Bandyopadhyay
Srimanta Pal
Subhas Chandra Nandy
Sushmita Mitra
Susmita Sur-Kolay
Umapada Pal
Utpal Garain

Physics and Earth Sciences Division

Banasri Basu
Chandan Chakraborty
Dhurjati Prasad Sengupta
Guruprasad Kar
Parthasarathi Ghosh
Preeti Parashar
Santanu Kumar Maity
Shiladri Shekhar Das
Subir Ghosh

Social Sciences Division

Abhiroop Mukhopadhyay
Arunava Sen
Chetan Ghate
Debasis Mishra
Diganta Mukherjee
E. Somanathan
Farzana Afridi
Indraneel Dasgupta
Madhura Swaminathan
Manash Ranjan Gupta
Manipushpak Mitra
Molly Chattopadhyay
Monisankar Bishnu
Niladri Sekhar Dash
Prabal Roy Chowdhury
Samarjit Das
Souvik Roy
Tarun Kabiraj
Tridip Ray

Statistical Quality Control and Operations Research Division

A.L.N. Murthy
Abhijit Gupta
Amit Kr. Biswas
Amitava Bandyopadhyay
Arup Kumar Das
Arup Ranjan Mukhopadhyay
Ashis Kr. Chakraborty
Ashok Sarkar
Biswabrata Pradhan
Dipak Kr. Manna
E.V. Gijo
G. Ravindran
G.S.R. Murthy
Md. Zafar Anis
Nandini Das
Prasun Das
Ranjan Sett
Sagar Sikder
Samir Kr. Neogy
Sanjit Ray
Surajit Pal
Susanta Kr. Gauri
U. Haridas Acharya

Theoretical Statistics and Mathematics Division

Abhay Gopal Bhatt
Amartya Kumar Dutta
Anil Kumar Ghosh
Anish Sarkar
Antar Bandyopadhyay
Arup Bose
Arup Kumar Pal
B. Rajeev
B. Sury
B.V. Rajarama Bhat
C. Robinson Edward Raja
Debashish Goswami
Gopal Krishna Basak
Goutam Mukherjee
Isha (Bagai) Dewan
Jaydeb Sarkar
Mahuya Datta
Manish Kumar
Mohana Delampady
Mrinal Kanti Das
Paramita Das
Partha Sarathi Chakraborty
Pradipta Bandyopadhyay
Probal Chaudhuri
Rahul Roy
Ritabrata Munshi
Rudra Pada Sarkar
Siva Athreya
Swagato Kumar Ray

Computer and Statistical Service Centre

Deba Prasad Mandal

Library, Documentation and Information Sciences Division

Kishor Chandra Satpathy

Member-Secretary, International Statistical Education Center

Amita Pal

Finance Committee

Director
(Chairperson)

Government Representative
(MOS&PI)

Government Representative
(Ministry of Finance)

Deputy Director
ISI

Sarbani Patranabis Deb
ISI, Kolkata

Ayanendranath Basu
ISI, Kolkata

Samarjit Das
ISI, Kolkata

Kaushik Kumar Majumdar
ISI, Bangalore

Ranjan Sett
ISI, Kolkata

Head
Delhi Centre

Head,
Bangalore Centre

Head
Chennai Centre

Dr. Partha P. Mohanta

Shri Gour Krishna Pattanyak
Finance Officer
Jadavpur University (External Expert)

Chief Executive (A&F)

Shri Sudip K. Chakraborty
(Convener)

Works Advisory Committee

Bangalore

Professor S.V. Venkatesh
(Chairperson)

Professor B.K. Keshavan
External Expert (Electrical Engineering)

Dr. P. Raghuveer Rao
External Expert (Civil Engineering)

Head
ISI, Bangalore

Head
TSMU, ISI, Bangalore or his/her nominee

Head
DRTC, ISI, Bangalore or his/her nominee

Head
SQC & OR Unit
ISI, Bangalore or his/her nominee

Head
SSIU, ISI, Bangalore or his/her nominee

Sr. Accounts Officer
ISI, Bangalore

Sr. Administrative Officer
ISI, Bangalore (Convener)

Delhi

Professor B. Bhattacharjee
Civil Engineering Department, IIT, Delhi
(Chairman)

Mr. G.K. Taneja
Executive Engineer, IIT, Delhi– Expert (Electrical)

Mr. R. Upadhyay
Executive Engineer (Civil)

Shri Lal Bahadur National Sanskrit University– Expert (Civil)

Mr. Madhav Naik
(Architect)

Head
ISI, Delhi

Professor Anish Sarkar
ISI, Delhi

Professor Moni Shankar Bishnu
ISI, Delhi

Mr. Parama Gogoi
ISI, Delhi

Deputy Chief Executive (A)
ISI, Delhi (Convener)

Kolkata

Professor Anandapran Gupta
(Chairperson)

Dr. Ashis K. Chakraborty
(Vice-Chairperson)

Professor Shashi Mohan Srivastava

Professor Nabanita Das

Professor Indranil Dasgupta

Dr. Sankar Sarkar

Dr. Bhaskar Sengupta
[Expert (Civil)]

Professor Siddhartha Datta
[Expert (Architecture)]

Shri Asim Sinha
[Expert (Electrical)]

Chief Executive (A&F)

Shri Swarup Ghara

Shri Amitava Mukherjee

In-Charge
EMU

In-Charge
Engg. Unit (Convener)

Ph.D. / D.Sc. Committees

Computer Science

Director
(Chairperson)

Dean of Studies

Subhamoy Maitra

Sandip Das

Ansuman Banerjee

Swagatam Das

Sarbani Palit

Debrup Chakraborty

Kaushik Kumar Majumdar

Pradipta Maji
(Convener)

Mathematics

Director
(Chairperson)

Dean of Studies

B.V. Rajarama Bhat

Arup Bose

Mahuya Datta

Arup K. Pal

Rahul Roy

Swagata K. Roy

Jaydeb Sarkar

Maneesh Thakur

Parthanil Roy

Mrinal K. Das
(Convener)

Quantitative Economics

Director
(Chairperson)

Dean of Studies

Tarun Kabiraj

Manipushpak Mitra

Prabal Roy Chowdhury

Madhura Swaminathan

Debasis Mishra

Abhiroop Mukhopadhyay

Indraneel Dasgupta
(Convener)

Statistical Quality Control and Operations Research

Director
(Chairperson)

Dean of Studies

Samir K. Neogy

G. Ravindran

Arup Ranjan Mukhopadhyay

Prasun Das

Md. Zafar Anis

Sushanta Kumar Gauri

Anup Dewanji

Sumitra Purkayastha

Dipak K. Manna
(Convener)

Statistics

Director
(Chairperson)

Dean of Studies

Siva Athreya

Atanu Biswas

Arijit Chakraborty

Kiranmoy Das

Saurabh Ghosh

Krishanu Maulik

Tapas Samanta

Anish Sarkar

Anil K. Ghosh
(Convener)

Policy Planning and Evaluation Committee (PPEC)

Chairman of ISI Council
(Chairperson)

Director
(Vice-Chairperson)

Director General
CSO

Financial Advisor
MOS & PI

Professor Subhasis Chaudhuri
Director, IIT, Bombay

Professor Partha P. Majumder
National Science Chair, NIBMG

Professor Rahul Mukherjee
National Science Chair, IIM, Calcutta

Dr. Manju Sharma
Former Secretary, DBT, Govt. of India

Professor Malabika Pramanik
Dept. of Mathematics, University of British Columbia, Canada & Director Banff International Research Station

Professor Ritabrata Munshi
ISI, Kolkata Professor E. Somanathan ISI, Delhi

Professor Dipti P. Mukherjee
ISI (Convener)

Technical Advisory Committees (TAC)

Applied Statistics Division

Director, ISI (Chairperson)

Professor Rahul Mukerjee
National Science Chair, IIM, Calcutta

Debasis Kundu
Department of Mathematics and Statistics, IIT, Kanpur

Professor R.L. Karandikar
Director, Chennai Mathematical Institute, Chennai

Professor Veni Madhavan
Dept. of Computer Science and Automation, IISc, Bangalore

Professor-in-Charge
Applied Statistics Division (Convener)

Biological Sciences Division

Director, ISI (Chairperson)

Dr. Anurag Agrawal
Director, CSIR-IGIB, Mall Road New Delhi

Dr. A.R. Sharma
Director Research, Rani Lakshmi Bai Central Agricultural University Jhansi, UP

Professor Gaurangadeb Chattopadhyay
Department of Statistics University of Calcutta, Kolkata

Dr. Giriraj Ratan Chandak
CSIR- Centre for Cellular and Molecular Biology (CCMB), Hyderabad

Dr. H. Pathak, Director
ICAR-National Institute of Abiotic Stress Management, Baramati, Pune

Professor M.P. Sachdeva
Department of Anthropology, University of Delhi, Delhi

Professor-in-Charge
Biological Sciences Division (Convener)

Computer and Communication Sciences Division

Director, ISI (Chairperson)

Professor P. Nagabhushan
Director, IIIT, Allahabad

Professor Santanu Chaudhury
Director, IIT, Jodhpur

Professor Partha P. Chakrabarti
Department. of Computer Science & Engineering, IIT, Kharagpur

Dr. Pijushkanti Panigrahi
Professor & Dean, Department of Library & Information Science, University of Calcutta

Professor Pallab Dasgupta
Department of Computer Science & Engineering, IIT, Kharagpur

Professor Jaikumar Radhakrishnan
School of Technology and Computer Science, TIFR, Mumbai

Professor Chiranjib Bhattacharyya
Department of Computer Science & Automation, IISc, Bangalore

Professor-in-Charge
Computer & Communication Sciences Division (Convener)

Library, Documentation and Information Sciences Division

Director, ISI (Chairperson)

Dr. Anand T. Byrappa
Librarian & Head, J.R.D. Tata Memorial Library, IISc, Bangalore

Dr. K. Rama Patnaik
Librarian, IIM, Bangalore

Dr. Sujit Bhattacharya
Professor, Academy of Scientific & Innovative Research, Chief Scientist (CSIR-NISTADS), Pusa Campus New Delhi

Dr. Venkat Srinivasan
Archivist, Archives, NCBS, TIFR Bangalore

Kishor Chandra Satpathy
Chief Librarian (Convener)

Physics and Earth Sciences Division

Director, ISI (Chairperson)

Professor Santanu Banerjee,
Department of Earth Sciences, IIT Bombay, Mumbai

Professor Suman Chakraborty
Mechanical Engineering Department, IIT Kharagpu

Professor Archan S. Majumda
S.N. Bose National Centre for Basic Sciences, Salt Lake, Kolkata

Professor Manju Mohan
Centre for Atmospheric Sciences, IIT New Delhi

Professor N.V. Chalapathi Rao
Center for Advanced Study in Geology BHU, Varanasi

Professor Ashok Sahni
Emeritus Professor, Punjab University

Professor-in-Charge
Physics & Earth Sciences Division (Convener)

Social Sciences Division

Director, ISI (Chairperson)

Professor Jyotsna Jalan
Center for Studies in Social Sciences Kolkata

Professor Sugata Marjit
Distinguished Professor (and Former VC of Calcutta University), Indian Institute of Foreign Trade, Kolkata

Professor Arvind Pandey
Ex-Advisor, ICMR-NIMS & Ex-Director National Institute of Medical Statistics ICMR, New Delhi

Professor K.S. James
Director and Sr. Professor, International Institute of Population Sciences, Mumbai

Professor Rajni Palriwala (Retired)
Department of Sociology, Delhi University, Delhi

Professor Girish Nath Jha
Professor of Computational Linguistics School for Sanskrit and Indic Studies Jawaharlal Nehru University, New Delhi

Professor-in-Charge
Social Sciences Division (Convener)

Statistical Quality Control and Operations Research Division

Director, ISI (Chairperson)

Professor Debasis Kundu
IIT, Kanpur

Professor Saibal Chattopadhyay
IIM, Calcutta

Mr. Rajaram Majali
Director, Demand Planning Customer Support, Supply Chain HP India Sales Pvt. Ltd Channai

Dr. Surinder Singh
Vice-Chancellor, JSS Academy of Higher Education & Research

Head
SQC & OR Division (Convener)

Theoretical Statistics and Mathematics Division

Director, ISI (Chairperson)

Professor Tathagata Bandyopadhyay
IIM, Ahmedabad

Professor V.S. Borkar
IIT, Mumbai

Professor Saibal Chattopadhyay
IIM, Calcutta

Professor Srikanth K. Iyer
Indian Institute of Science, Bangalore

Professor Mahan Mj.
TIFR, Mumbai

Professor Kapil Hari Paranjape
IISER, Mohali

Professor-in-Charge
Statistics & Mathematics Division (Convener)

1.8 FUNDING:

The Ministry of Statistics & Programme Implementation, Government of India provides full funding to the Institute. Their support and constant encouragement are among the major factors that help the Institute to sustain its academic growth and excellence.

CHAPTER 02 TEACHING AND TRAINING

Dean of Studies:

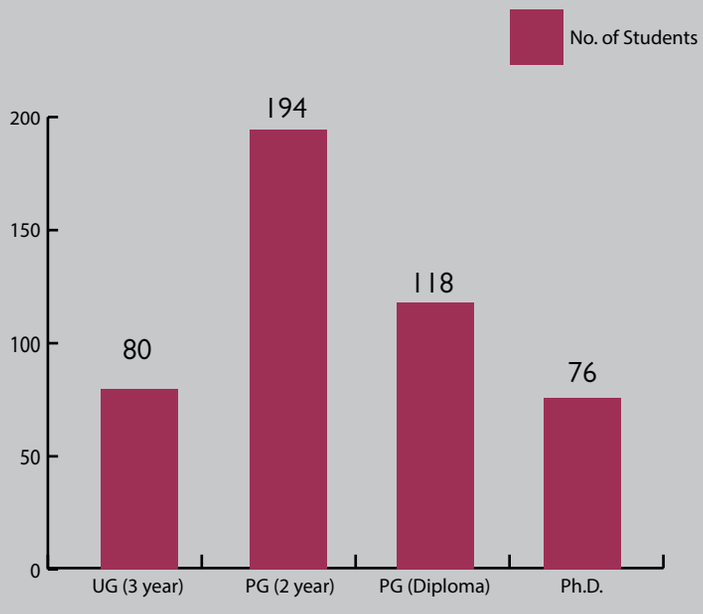
Prof. Debasis Sengupta, ASU Kolkata (18th Sep 2020 - 31st Mar 2021)
Prof. Gautam Mukherjee, SMU Kolkata (1st Apr 2020 – 17th Sep 2020)

Office:

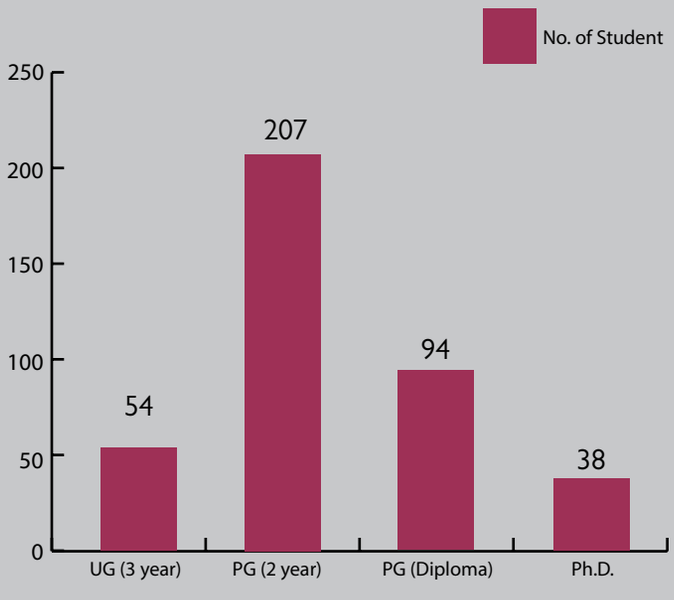
5th floor, S.N. Bose Bhawan, ISI, Kolkata-700 108

No of Scientific Staff : Two (2)
No of non-scientific staff : Twelve (12)

Admission across programmes



Human Resources Generated



2.1 Programmes Offered

ISI, a premier institute in India, is renowned for its first internationally acclaimed under graduate and post graduate degree programmes in Statistics introduced in 1961 by its founder, Prof. P.C. Mahalanobis.

The following academic programmes were offered during the academic session 2020-21:

Undergraduate Programmes (three-year)

Bachelor of Statistics - B. Stat. (Hons.)	:	Kolkata
Bachelor of Mathematics - B. Math. (Hons.)	:	Bangalore

Postgraduate Programmes (two-year)

Master of Statistics - M. Stat.	:	Delhi - Kolkata
Master of Mathematics - M. Math.	:	Kolkata
Master of Science (M.S.) in Quantitative Economics - MSQE	:	Delhi and Kolkata
Master of Science (M.S.) in Quality Management Science - MSQMS	:	Bangalore - Hyderabad
Master of Science (M.S.) in Library and Information Science – MSLIS	:	Bangalore
M. Tech. in Computer Science (CS)	:	Kolkata
M. Tech. in Cryptology and Security (CrS)	:	Kolkata
M. Tech. in Quality, Reliability and Operations Research (QROR)	:	Kolkata

Postgraduate Diploma Programmes (two-year)

Post Graduate Diploma in Business Analytics (PGDBA) Jointly conducted by IIM Kolkata, IIT, Kharagpur and ISI, Kolkata	:	Kolkata

Postgraduate Diploma Programmes (one-year)

Post Graduate Diploma in Statistical Methods and Analytics (PGDSMA)	:	Chennai and North-East Centre, Tezpur
Post Graduate Diploma in Agricultural and Rural Management with Statistical Methods and Analytics (PGDARMSMA)	:	Giridih

Doctoral Programmes

Research Fellowships and degrees awarded by ISI in Statistics, Mathematics, Quantitative Economics, Computer Science, Quality, Reliability and Operations Research	:	Bangalore, Chennai, Delhi, Giridih & Kolkata
Research Fellowships awarded by ISI and degrees awarded by other academic bodies in areas including Physics, Development Studies, Biological Sciences and Library & Information Science.	:	Bangalore, Chennai, Delhi, Giridih & Kolkata
Research Fellowships awarded by government bodies (e.g. CSIR, DST, INSPIRE, NBHM, UGC) and degrees awarded by ISI/other academic bodies.	:	Bangalore, Chennai, Delhi, Giridih & Kolkata

Short-term Training Programmes (4 weeks-6 months)

This training is provided to UG/PG students from other reputed Universities/Institutions as part of their curriculum requirements for enhancement of knowledge and application skills, under the guidance of faculty members of the Institute.

2.2 Admissions

Degree, Diploma and Ph.D. programmes:

An all-India entrance examination for all programmes (except PG Diploma courses), is conducted annually by the Dean's Office.

The two-year Post Graduate Diploma in Business Analytics (PGDBA) programme, jointly offered by IIM Calcutta, IIT, Kharagpur and ISI, Kolkata, aims to deliver a cutting-edge interdisciplinary educational experience to graduates aspiring to build a career in the rapidly expanding field of business analytics. The first semester of this programme is conducted every year in ISI. The selection and admission process for the programme is carried out by the three institutes on a rotation basis. ISI, Kolkata conducted the Admission test in 2020-2021.

Date of ISI Admission test: 20.09.2020

Date of PGDSMA Admission test (Chennai & Tezpur): 20.09.2020

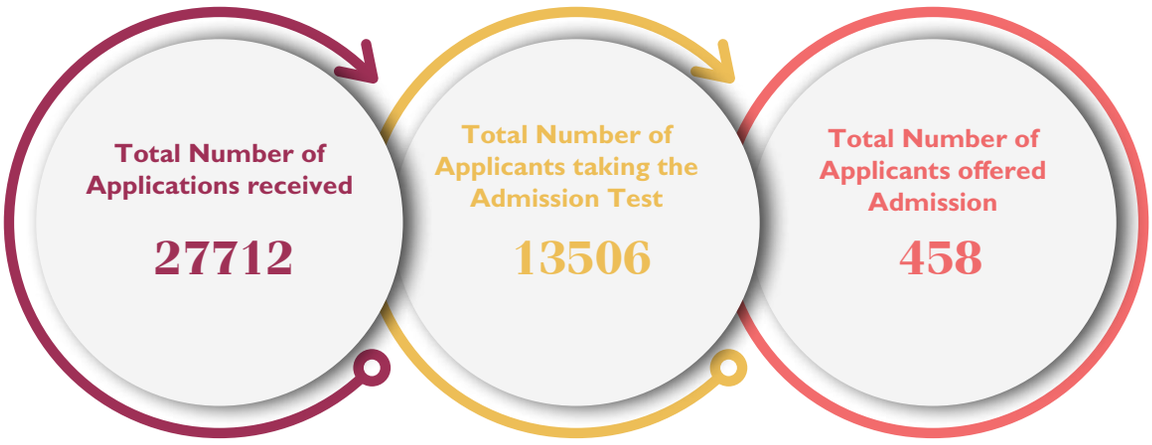
Date of PGDARSMA Admission test (Giridih): 20.09.2020

Date of PGDBA Admission test: 16.02.2020

	Programmes	Number of Applications received	Number of Applicants taking the Admission Test	Number of Applicants offered Admission
UG	Bachelor of Statistics - B. Stat. (Hons.)	5748	2320	46
	Bachelor of Mathematics - B. Math. (Hons.)	4617	1950	34
POST GRADUATE (PG)	Master of Statistics - M. Stat.	1446	489	25
	Master of Mathematics - M. Math.	1242	500	18
	Master of Science in Quantitative Economics - MSQE	2199	922	42
	Master of Science in Quality Management Science - MSQMS	501	244	14
	Master of Science in Library and Information Science – MSLIS	164	85	10
	M. Tech. in Computer Science (CS)	1685	470	40
	M. Tech. in Cryptology and Security (CrS)	345	146	24
	M. Tech. in Quality, Reliability and Operations Research (QROR)	927	326	22
PG DIPLOMA	Post Graduate Diploma in Business Analytics* (PGDBA)	6847	5293	62
	Post Graduate Diploma in Statistical Methods and Analytics (PGDSMA)	319	118	41
	Post Graduate Diploma in Agricultural and Rural Management with Statistical Methods and Analytics (PGDARSMA)	91	44	15
	Junior Research Fellowship*	1581	599	65

* Interviews were conducted only for the PGDBA and the Junior Research Fellowship programmes

Enrolment in Degree-Diploma Programs:



PROGRAMME		Number Enrolled
Undergraduate Programmes		**80**
Postgraduate Programmes		**194**
Postgraduate Diploma Programmes (2-year)		**62**
Postgraduate Diploma Programmes (1-year)		**56**
Junior Research Fellows		**76**
ISI-funded	(62)	
Externally-funded JRF Programmes	(14)	

Short-term Training Programmes

Nineteen students from different Universities/Academic institutions received training under the guidance of Faculty members working in the different Divisions in ISI, Kolkata. Numbers were low this year due to the prevailing pandemic situation.

2.3 Graduating Students

The number of students graduating, under the different programmes, are as follows-

PROGRAMME	Number Graduating	Program Total
Undergraduate Programmes		**54**
Bachelor of Statistics - B. Stat. (Hons.)	29	
Bachelor of Mathematics - B. Math. (Hons.)	24	
Bachelor of Mathematics - B. Math.	01	
Postgraduate Programmes		**207**
Master of Statistics - M. Stat.	53	
Master of Mathematics - M. Math.	25	
Master of Science in Quantitative Economics - MSQE	36	
Master of Science in Quality Management Science - MSQMS	16	
Master of Science in Library and Information Science - MSLIS	08	
M. Tech. in Computer Science (CS)	36	
M. Tech. in Cryptology and Security (CrS)	12	
M. Tech. in Quality, Reliability and Operations Research (QROR)	21	
Postgraduate Diploma Programmes (two-year)		**57**
Post Graduate Diploma in Business Analytics (PGDBA)	57	
Postgraduate Diploma Programmes (one-year)		**37**
Post Graduate Diploma in Statistical Methods and Analytics (PGDSMA)	34	
Post Graduate Diploma in Computer Applications (PGDCA)	03	
Ph.D. Degrees Mathematics (07), Statistics (04), Computer Science (10), Economics (07), Quality Reliability and Operations Research (05), Physics (01), Biological Science (04).		**38**

Recipients of Prizes

During the 55th Convocation of the Indian Statistical Institute held on 27th January, 2021, students were felicitated with prestigious medals and prizes in recognition of their outstanding performance for the session ending 2020, under the following programmes -

UNDERGRADUATE

Aditya Ghosh

B.Stat.

ISIAA – Mrs. M. R. Iyer Memorial Gold Medal for outstanding overall performance

Nikhilesh Bhattacharya Memorial Gold Medal for best performance in Statistics

Archi De

B.Stat.

Usri Gangopadhyay Memorial Medal for the best female student

Tannistha Mondal

B.Stat.

Mukul Chaudhuri Cash Award for the best female student in the second year

Shrivathsa Pandelu

B.Stat.

S. H. Aravind Gold Medal for outstanding performance

POSTGRADUATE

Abhinav Chakraborty

M.Stat.

ISIAA – J. K. Ghosh Memorial Gold Medal for outstanding performance

P. C. Mahalanobis Memorial Gold Medal for outstanding performance

Ananya Roy

M.Stat.

Sabyasachi Roy Memorial Gold Medal for doing the best project work in second year

Soumik Ghosh

M.Math

ISIAA – P. C. Panesar Memorial Gold Medal for outstanding overall performance

Shreya Bhar

MS (QE)

Dr. N. S. Iyenger Award for best student of Econometrics

Aroon Narayanan

MS (QE)

Sanghamitra Das Memorial Gold Medal for outstanding overall performance

Suyash Bhutada

M.Tech (CS)

ISIAA – Rashi Ray Memorial Medal for outstanding overall performance

Kaustav Sengupta

M.Tech. (QROR)

ISIAA – Mrs. M. R. Iyer Memorial Gold Medal for outstanding overall performance

PhD Degrees Awarded by ISI

The following students were conferred PhD degrees after having successfully completed their requirements for the award of PhD degree -

Sl. No.	Name of the Scholar	Name(s) of the Supervisor(s)	Title of the Thesis	Subject area
1.	**Suman Sarkar**	Prof. Atanu Biswas ASU, ISI, Kolkata	Some Sequential Methodologies on Different Types of Odds Ratios in Clinical Trials	Statistics
2.	**Arnab Chakrabarti**	Dr. Rituparna Sen ASU, ISI, Bangalore	Some Statistical Aspects of High Frequency Nonsynchronous Stock Price Data	Statistics
3.	**Suman Guha**	Dr. Sourabh Bhattacharya ISRU, ISI, Kolkata	Some Theoretical and Methodological Contributions to the Dynamic Modeling of Discrete-Time Spatial Time Series Data	Statistics
4.	**Angshuman Roy**	Prof. Anil Kumar Ghosh SMU, ISI, Kolkata	On Tests of Independence among Multiple Random Vectors of Arbitrary Dimensions	Statistics
5.	**Biltu Dan**	Dr. Rajat Subhra Hazra SMU, ISI, Kolkata	Scaling limits of some random interface models	Mathematics
6.	**Sukrit Chakraborty**	Dr. Rajat Subhra Hazra SMU, ISI, Kolkata and Dr. Arijit Chakrabarty SMU, ISI, Kolkata	Some contributions to free probability and random matrices	Mathematics
7.	**Vijaya Kumar U.**	Prof. B.V. Rajarama Bhat SMU, ISI, Bangalore	Quantum Markov Maps: Structure and Asymptotics	Mathematics
8.	**Soumyadip Das**	Dr. Manish Kumar SMU, ISI, Bangalore	On the Inertia Conjecture and its generalizations	Mathematics
9.	**Mohan R.**	Dr. Ramesh Sreekantan SMU, ISI Bangalore	Some topics in Leavitt path algebras and their generalizations	Mathematics
10.	**Suvrajit Bhattacharjee**	Prof. Debashish Goswami SMU, ISI, Kolkata	Quantum Symmetries in Noncommutative Geometry	Mathematics
11.	**Sankar T.R.**	Prof. Jaydeb Sarkar SMU, ISI Bangalore	Commuting Isometries and Invariant Subspaces in Several Variables	Mathematics
12.	**Prachi Singh**	Prof. Abhiroop Mukhopadhyay EPU, ISI, Delhi	Essays on Environmental and Health Economics	Quantitative Economics
13.	**Priyanka Kothari**	Prof. Prabal Roy Chowdhury EPU, ISI, Delhi	Essays on Behavioral Industrial Organization and Welfare	Quantitative Economics
14.	**Gaurav Jakhu**	Prof. Prabal Roy Chowdhury EPU, ISI, Delhi	Essays on Regulation of Platform Markets	Quantitative Economics
15.	**Sarvesh Bandhu**	Prof. Arunava Sen EPU, ISI, Delhi	Essays in Behavioral Social Choice Theory	Quantitative Economics
16.	**Soumyarup Sadhukhan**	Dr. Souvik Roy ERU, ISI, Kolkata	Essays on Random Social Choice Theory	Quantitative Economics
17.	**Aditya Bhan**	Prof. Tarun Kabiraj ERU, ISI, Kolkata	Terrorism and Counter-Terrorism: A Game Theoretic Approach	Quantitative Economics
18.	**Dripto Bakshi**	Prof. Indraneel Dasgupta ERU, ISI, Kolkata	Three Essays on the Political Economics of Conflict	Quantitative Economics
19.	**Avijit Dutta**	Dr. Mridul Nandi ASU, ISI, Kolkata	Design and Analysis of Beyond Birthday Secure Message Authentication Codes	Computer Science

Sl. No.	Name of the Scholar	Name(s) of the Supervisor(s)	Title of the Thesis	Subject area
20.	**Ashwin Jha**	Dr. Mridul Nandi ASU, ISI, Kolkata	Provable Security of Symmetric-key Cryptographic Schemes	Computer Science
21.	**Manjari Pradhan**	Prof.Bhargab B. Bhattacharya ACMU, ISI, Kolkata	Studies on Diagnostic Coverage and X-Sensitivity in Logic Circuits: Combinatorial and Machine-Learning Based Approaches	Computer Science
22	**Dibyayan Chakraborty**	Prof. Sandip Das ACMU, ISI, Kolkata	Recognition and domination on intersection and overlap graphs of rectangles	Computer Science
23.	**Sujoy Madhab Roy**	Prof. Ashish Ghosh MIU, ISI, Kolkata	Pixel information based odelling for moving object detection from video scenes in real time	Computer Science
24.	**Payel Sadhukhan**	Dr. Sarbani Palit CVPRU, ISI, Kolkata	Dealing with classification irregularities in real-world scenarios	Computer Science
25.	**Rishika Sen**	Prof. Rajat Kumar De MIU, ISI, Kolkata	In silico Identification on Toxins and Their Effect on Host Pathways: Feature Extraction, Classification and Pathway Prediction	Computer Science
26.	**Sanchayan Santra**	Prof. Bhabatosh Chanda ECSU, ISI, Kolkata	Image dehazing from the perspective of environmental illumination	Computer Science
27.	**Sankha Subhra Mullick**	Dr. Swagatam Das ECSU, ISI, Kolkata	On Class Imbalanced Learning: Design of Non-parametric Classifiers, Performance Indices, and Deep Oversampling Strategies	Computer Science
28.	**Monalisa Pal**	Prof. Sanghamitra Bandyopadhyay MIU, ISI, Kolkata	Many Objective Evolutionary Algorithms: Objective Reduction, Decomposition and Multi-Modality	Computer Science
29.	**Soham Chakraborty**	Dr. Pathik Mandal SQC & OR Unit, ISI, Kolkata	Integrated Shift and Drift Control of a Nonlinear Growth Process	Quality, Reliability and Operations Research
30.	**Tanujit Chakraborty**	Dr. Ashis Kumar Chakraborty SQC & OR Unit, ISI, Kolkata	Some Nonparametric Hybrid Predictive Models : Asymptotic Properties and Applications	Quality, Reliability and Operations Research
31.	**T.R. Lalita**	Dr.G.S.R. Murthy SQC & OR Unit, ISI, Hyderabad	Mathematical Formulations for Complex Resource Scheduling Problems	Quality, Reliability and Operations Research

PhD Degrees Awarded by Other Academic bodies

A. Research Fellows (with ISI-fellowships) who have been awarded Ph. D degree by Academic Bodies other than ISI for work done in ISI.

Sl. No.	Name of the Scholar	Name(s) of the Supervisor(s)	Title of the Thesis	Department where submitted	University
1.	**Soumen Majhi**	Dr. Dibakar Ghosh PAMU, ISI, Kolkata	Study on the aspects of synchronization in multilayer and time varying dynamical networks	Department of Applied Mathematics	University of Calcutta

B. Research Fellows (with other fellowships)/Personnel who have been awarded Ph. D degree by Academic Bodies other than ISI for work done in ISI.

Sl. No.	Name of the Scholar	Name(s) of the Supervisor(s)	Title of the Thesis	Department where submitted	University
1.	**Moumita Patra**	Dr. Santanu K. Maiti PAMU, ISI, Kolkata	Theoretical aspects of quantum transport in low-dimensional systems	Department of Physics	University of Calcutta
2.	**Madhumita Saha**	Dr. Santanu K. Maiti PAMU, ISI, Kolkata	Theoretical study of quantum transport in interacting systems	Department of Physics	University of Calcutta
3.	**Sarmistha Das**	Prof. Indranil Mukhopadhyay HGU, ISI, Kolkata	Statistical methods to integrate different types of data in genetic association study in multi-loci paradigm	Department of Statistics	University of Calcutta
4.	**Shuvrodeb Roy**	Dr. Pradip Bhattacharyya AERU, ISI, Giridih	Synthesis and utilization of biochars for arsenic removal and production of enriched vermicompost: A route towards sustainable agriculture	Department of Life science & Biotechnology	Jadavpur University
5.	**Baidehi Basu**	Dr. Raghunath Chatterjee HGU, ISI, Kolkata	Identification And Validation of DNA Methylation Biomarkers in Oral Squamous Cell Carcinoma Patients of Eastern India	Department of Biochemistry	University of Calcutta
6.	**Dibyendu Sekhar Mandal**	Prof. Joydev Chattopadhyay AERU, ISI, Kolkata	Mathematical Modeling of Interacting Populations on Biological Control With Special Emphasis on Pest Management	Department of Applied Mathematics	University of Calcutta

2.4 PLACEMENT

The Indian Statistical Institute has been conducting a number of degree and diploma programmes in Statistics, Mathematics, Quantitative Economics, Computer Science as well as Quality, Reliability and Operations Research for the past several decades. In particular, its flagship programmes in Statistics, both at the undergraduate and postgraduate levels, are unmatched at the national level and have earned a well-deserved reputation internationally. Depending upon their inclinations and aptitude, students completing postgraduate programmes successfully can opt for higher education or for jobs in industry or the corporate sector.

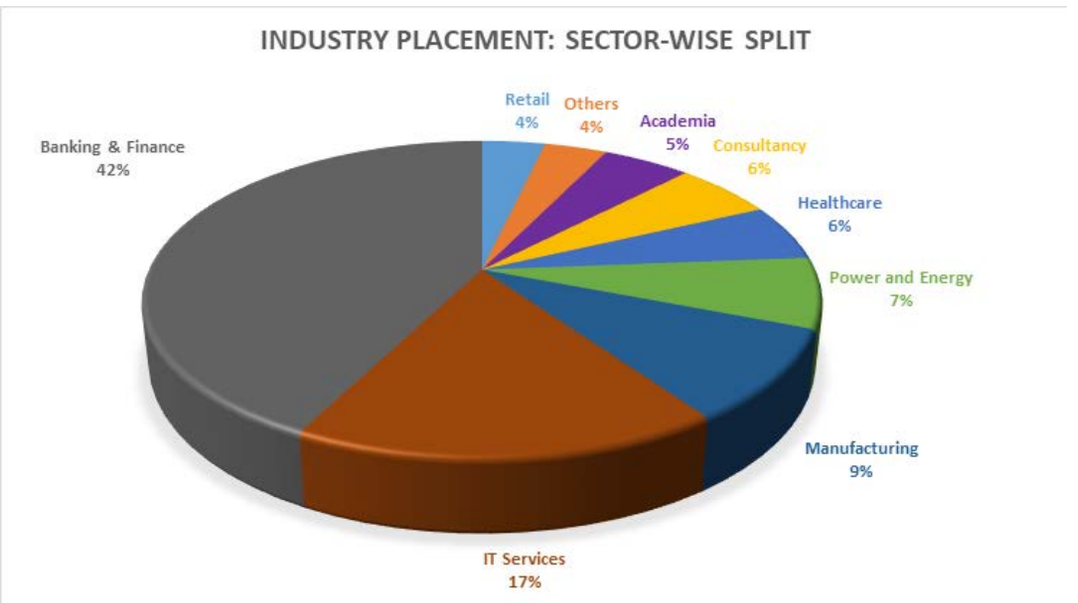
HIGHER EDUCATION

At the conclusion of the academic year 2019-20, many students opted for higher education by joining PhD programmes in the following world-renowned universities and institutions (national and international)-

INDUSTRY

A. Two-year Post Graduate Degree programmes

Postgraduate students who were on the verge of passing out successfully in 2019-2020 were placed with leading companies in the corporate sector through an effective placement programme conducted by the Institute through a Placement Committee at ISI, Kolkata, as well as Placement Cells at the other centres.

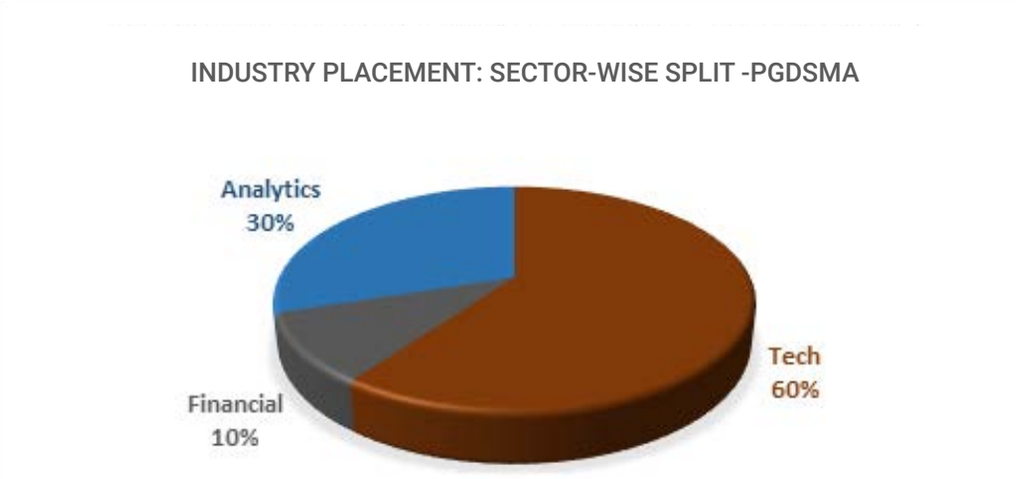


The following are the median packages offered (in Rs. LPA) to the passing out batch of 2018-2020:

Stream	Median package (in LPA)
M. Stat, Kolkata	22.0
MSQE, Delhi & Kolkata	18.0
M. Tech CS, Kolkata	17.0
M. Tech QROR, Kolkata	16.0
MSQMS, Bangalore	15.5
M. Tech CrS, Kolkata	15.0

B. One-year Post Graduate Diploma programme

The passing out batch (2019-2020) of the Post Graduate Diploma in Statistical Methods and Analytics (PGDSMA) from the Chennai and North Centre at Tezpur were successfully placed through the placement programme conducted by the Institute.



Some companies who recruited:

TOSHIBA, Goldman Sachs, UBS, CapitalOne, Dr.Reddy's, BlackRock, TCS, Great Learning, Google Analytics, Reliance Industries Limited, EMBIBE, Finarb, Capgemini, ICICI, citi, Clickscient, Paytm, Google, Bank of America, Flipkart, TATA AIG Insurance, pwc, SAMSUNG, GE, Johnnette, Wizely, Mathsya, Edelweiss, PHILIPS, DELL, wipro, CRISIL, Aditya Birla Group, microenergy credits, Credit Suisse, BINTEX Futures

C. Two-year Post Graduate Diploma in Business Analytics (PGDBA)

The two-year Post Graduate Diploma in Business Analytics (PGDBA) programme, jointly offered by three premier institutes of the country-IIM Calcutta, ISI and IIT, Kharagpur, is a full time residential course which aims to train graduates from diverse disciplines to become top-notch business analytics professionals employable by leading Indian and foreign firms. Given the unique focus of the programme, it is not surprising that all graduating PGDBA students opt for placement in industry and receive handsome offers from leading companies every year. Placement of the graduating PGDBA students is conducted by the placement offices of the three institutes on a rotation basis. Industry internship, which is a mandatory component of the final semester of the programme, is also facilitated through the respective PGDBA placement offices. Students receive attractive internship offers every year from reputed companies.

Statistics Related to PGDBA Internships and Placements

	Placement: 2018-2020 Batch	Internship: 2019-21 Batch
Total Number of Students	57	61
Total Placed	57	61
Maximum Salary/ Stipend	Rs. 41,29, 000 (LPA)	Rs. 2,00,000 (per month)
Average Salary/ Stipend	Rs. 24,59,000 (LPA)	Rs. 1, 25,000 (per month)

Top companies who recruited

D E Shaw & Co, MasterCard, amazon, Flipkart, ebay, AMEX, Mondelēz International, GAMES 24 7, VIACOM, adani, McKinsey & Company, JPMorganChase, Goldman Sachs, NOVARTIS, Piramal, PayPal

2.5 International Training Programme

International Statistical Education Centre (ISEC)

Member Secretary: Prof. Amita Pal, ISRU Kolkata (1st Nov 2020 - 31st Mar 2021)
Prof. Ayanendranath Bau, ISRU Kolkata (1st Apr 2020 – 31st Oct 2020)

Office: C.D. Deshmukh Bhawan, 202, B.T. Road, ISI, Kolkata

No of Scientific Staff: One (1)

No of non-scientific staff: Five (5)

The International Statistical Education Centre (ISEC) was founded in 1950 at Kolkata through the initiative of Professor P.C. Mahalanobis, based on an agreement between the International Statistical Institute and the Indian Statistical Institute (ISI). It is an Associate Institution of ISI as per Regulation no. 14 of the Institute. It functions under a Board of Directors, which has members from ISI, MoSPI and the Ministry of External Affairs (MEA), and whose current Chairman is Professor S.P. Mukherjee. The centre aims to provide training in theoretical and applied statistics at various levels to selected participants from countries of the Middle East, the Far East, South and South-East Asia, as well as the Commonwealth countries of Africa. The primary training programme is a 10-month regular course in Statistics (titled **Statistical Theory and Applications**) leading to a Diploma. In addition, special courses on different topics of varying duration are also organized for international participants.

During the period under review (April 2020-March 2021), the 73rd term of the 10-month ISEC Regular Course on **Statistical Theory and Applications** was in its final phase. In view of the COVID-19 pandemic and the ensuing lockdown, classes had to be held virtually and the examination and evaluation/assessment processes were completed online by the end of May 2020.

In view of the lockdown, a formal convocation of the 73rd batch could not be held. However, the trainees were duly handed their mark sheets and diplomas. The Centre coordinated with the Ministry of External Affairs and the associated consulates for the repatriation of the trainees at the conclusion of the programme.

Special Course

ISEC conducted a four-week specialized online training course on **Big Data Analytics for Policy Planners** from March 11, 2021 to April 07, 2021 under the e-ITEC scheme of the Indian Technical and Economic Co-operation (ITEC) Programme of the Ministry of External Affairs (MEA), Government of India. The objective of the course was to introduce policy planners working in various areas of Government and industry to methodologies that are useful for analysis of Big Data, with the ultimate objective of being able to make more informed decisions leading to better policy-planning. There were 31 participants from 7 countries, namely, Armenia, Cambodia, Fiji, Kenya, Palestine, Thailand and Vietnam. Four ninety-minute lecture-cum-R programming sessions were conducted online every day (from Monday to Friday) on a number of topics ranging from linear and generalized regression models, resampling methods, classification methods, tree-based methods, dimension reduction techniques, support vector machines, cross-validation and time series modelling to predictive analytics and MCDM methods. These sessions were supplemented with quizzes/assignments/projects so that the participants could get a better understanding of the topics. An assessment was made on the basis of the performance of the participants on these components. The lectures were recorded and made available to the participants.

Sl. no.	Name of Special Course	Duration	No. of Participants
1	**Big Data Analytics for Policy Planners**	4 weeks	31

In the current academic year (2020-21), it has not been possible to conduct the 74th term of the regular 10-month course due to the ongoing COVID-19 pandemic and the ensuing restrictions on international air travel and other related constraints.

CHAPTER 03

Research Activities

No. of Internal Projects	:	**74**
New	:	23
Ongoing	:	26
Completed	:	25
No. of External Projects	:	**162**
New	:	34
Ongoing	:	70
Completed	:	58
No. of Government Projects:		**12**
Ongoing	:	11
Completed	:	01

R.A. Fisher Bhavan, ISI, Kolkata

Research Activities

The major thrust of the Institute is on research in various disciplines and the activities of the Institute are organized into Divisions. These Divisions have multi-locational units (*vide* the Locations page, Chapter 1). Scientists of the Institute carry out independent research in their own basic discipline and also undertake interdisciplinary research in collaboration with other units within the Institute and also with other organizations. The Institute also takes up various internally and externally funded projects in diverse fields on challenging problems of national and international importance. As a part of research activities, the scientists of the Institute are also involved in consultancy work. The Institute has a network of units under the Statistical Quality Control and Operations Research Division which, in addition to research and training activities, also specialize in providing technical consultancy to a wide range of public and private organizations for developing quality management systems and in solving critical problems of quality, reliability and productivity.

This chapter provides the principal areas of work and the projects undertaken by the faculty, of the different Divisions, during 2020-2021.

The eight Divisions for research, development and consultancy activities are –

Applied Statistics Division (ASD)	**Biological Sciences Division (BSD)**	**Computer and Communications Sciences Division (CCSD)**	**Physics and Earth Sciences Division (PESD)**
Social Sciences Division (SSD)	**Statistical Quality Control and Operations Research Division (SQC & ORD)**	**Theoretical Statistics and Mathematics Division (TSMD)**	**Library, Documentation and Information Science Division (LDISD)**

One Division providing services -

Computer and Statistical Services Centre (CSSC), Kolkata

Additionally, there are four national facilities –

- **The Centre for Artificial Intelligence and Machine Learning (CAIML), Kolkata**
- **The Centre for research on the Economics of Climate, Food, Energy and Environment (CECFEE), Delhi**
- **The Centre for Soft Computing Research (CSCR), Kolkata**
- **The R C Bose Centre for Cryptology and Security (RCBCCS), Kolkata**

And a new-

- **Technology Innovations Hub, Kolkata**

APPLIED STATISTICS DIVISION (ASD)

Professor In-Charge: MRIDUL NANDI, ASU Kolkata (18th Sep, 2020 - 31st Mar, 2021)
SUMITRA PURKAYASTHA, ASU Kolkata (1st Apr, 2020 – 17th Sep, 2020)

Office: 8th floor, S.N. Bose Bhawan, ISI, Kolkata-700 108

01 Applied and Official Statistics Unit (AOSU), North-East Centre, Tezpur

Head of Unit: TAPAN CHAKRABORTY (1st Apr, 2020 – 30th Nov, 2020)
DIPTI PRASAD MUKHERJEE (1st Dec, 2020 - 31st Mar, 2021)

Number of Faculty/ Faculty-equivalent: One (1)
Number of Visiting Scientists : One (1)
Office : Punioni, Solmara, Tezpur, Assam – 784501

02 Applied Statistics Unit (ASU), Bangalore

Head of Unit : C.R.E. RAJA
Number of Faculty/ Faculty-equivalent: One (1)
Office : 8th Mile, Mysore Road, ISI, Bangalore – 560059

03 Applied Statistics Unit (ASU), Chennai

Head of Unit : D. SAMPANGIRAMAN
Number of Faculty/ Faculty-equivalent: Two (2)
Office : 110, New #37, Nelson Manickam Road, Aminjikarai, Chennai - 600029

04 Applied Statistics Unit (ASU), Kolkata

Head of Unit : SUBHAMOY MAITRA
Number of Faculty/ Faculty-equivalent: Fifteen (15)
Number of Non-Scientific Workers : Seven (7)
Number of Visiting Scientists : One (1)
Office : 8th Floor, S.N. Bose Bhavan, ISI Kolkata-700108

05 Interdisciplinary Statistical Research Unit (ISRU), Kolkata

Head of Unit : RITA SAHARAY
Number of Faculty/ Faculty-equivalent: Nine (9) + One (1) (Inspire Faculty)
Number of Scientific Workers : One (1)
Number of Non-Scientific Workers : Three (3)
Number of Research Scholars : Fourteen (14)
Office : 4th floor, R.A. Fisher Bhavan, ISI, Kolkata-700108

1. APPLIED AND OFFICIAL STATISTICS UNIT (AOSU), NORTH-EAST CENTRE, TEZPUR

The research focus of the Unit is on different areas of applied statistics with emphasis on topics concerning the North-Eastern region and Official Statistics. Short-term training programmes on use of statistics in government decision-making, including survey methodologies and data analysis for N-E state government officials are also undertaken by this Unit.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Holendro Singh Chungkham	Estimation of working life expectancy	Jenny Head, Hugo Westerlund

2. APPLIED STATISTICS UNIT (ASU), BANGALORE

The unit, created in 2019, participates in teaching the B. Math. and M. Math. programmes of the centre in addition to research activities including guiding summer interns and master's projects, serving in scientific programme committees of conferences.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Rituparna Sen	Functional Data Analysis, Risk Measurement, Financial Statistics	A Majumdar, A Chakrabarti, S Biswas, S Das, S. Krishnannair

Projects

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Functional Time Series	E-517	23rd February, 2021	3 years	Rituparna Sen	SERB	6,60,000/-
2	Estimation of Risk Measures	E-515	22nd December, 2021	3 years	Suparna Biswas	DST	28,24,416/-

3. APPLIED STATISTICS UNIT (ASU), CHENNAI

The Unit is actively involved in teaching and research. Main areas of research are survival and Reliability Analysis and Regression Analysis

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Sudheesh KK	Empirical Likelihood	Deepesh Bhati, Isha Dewan
	Linear Transformation Model	Min Xie, Sreedevi EP, Sankaran P. G.

Projects

Internally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Semiparametric Analysis of Transformation Models with Measurement Error in Covariates	2nd December, 2019	3 years	Sudheesh K.K.

4. APPLIED STATISTICS UNIT (ASU), KOLKATA

Scientists of the Applied Statistics Unit (ASU) are involved in various teaching, training, research and development activities.The unit regularly conducts research in various areas of statistics, mathematics and computer science with special emphasis on applications, sometimes in collaboration with scientists of other units of ISI and /or other organisations. This unit also conducts Statistical traineeship programme, scientific oriented lectures, winter/summer schools, North-East training, UGC sponsored refresher courses and workshops.

Current Areas of Research

Faculty name	Research topic(s)
Anup Dewanji	Survival Analysis, Reliability
Atanu Biswas	Problems related to discrete-valued time series, sequential analysis and clinical trials, among others
Debasis Sengupta	Developing statistical models and methods for various types of real data
Mausumi Bose	Combinatorial designs (for obtaining efficient designs for determining the best treatment for total effects)
	Operations research (for obtaining shorter prediction intervals for anonymous individual assessments in group decision making)
	Sampling
Mridul Nandi	Cryptology
Palash Sarkar	Cryptology
Shyamal Krishna De	Cost-effective methods of multiple testing for sequential data.
Subhamoy Maitra	Cryptology
Sumitra Purkayastha	Copula based methods and inference, with focus on Multivariate longitudinal models

Projects

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Cost-effective Methods of Multiple Testing for Sequential Data	147601000016205 or MTR/2017/000503	21st June, 2018	3 years	Shyamal Krishna De	SERB, Govt. of India	6,00,000/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Changes in pattern of irrigation, cultivation and livelihood of rural Bengal: The experience of Jamalpur block of Bardhaman	201K	27th June, 2014	Ongoing	Debasis Sengupta	Department of Science & Technology, Govt. of West Bengal	17,29,435/-
2	Statistical support to QCI towards talent development and carrying out large govern	I070 (As a joint project ASU, SQC&OR Unit)			Sumitra Purkayastha (As a Co-PI of this project)	Quality Council of India	

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Indo-Israel DST Project	E-098	5th June, 2018	4th June, 2020	Mridul Nandi	DST. Govt. of India	13,96,800/-
2	Cryptography & cryptanalysis: How far can we bridge the gap between classical and quantum Paradigm	E027	1st April, 2016	31st March, 2021	Subhamoy Maitra	Department of Atomic Energy, Board of Research in Nuclear Sciences, Govt. of India	78,24,000/-

5. INTERDISCIPLINARY STATISTICAL RESEARCH UNIT (ISRU), KOLKATA

The scientists of Interdisciplinary Statistical Research Unit are actively doing research in diverse areas of Applied and Interdisciplinary Statistics. The primary research areas of the scientists of this unit are Robust Statistical Inference, Statistical Machine Learning, Image Processing, Bayesian Modeling and Inference, Spatio-temporal Data Analysis, Multivariate Analysis, Biostatistics, Statistical Process Control, Applications of Nonparametric Regression, Design of Experiments, Probability Inequality, Multiple Hypothesis Testing, Statistical Inference, to name a few.

They are regularly involved in interdisciplinary projects, internally or externally funded, sometimes in collaboration with scientists of other units of ISI and/or other organisations.

The faculty of ISRU is also involved in various teaching and training activities. Apart from participating in the teaching of all the regular courses of the Institute, they regularly conduct teaching/training program like winter/summer schools, North-East Training, UGC-sponsored refresher courses and workshops.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Abhik Ghosh	Robust Statistical Inference for various Applications	Ayanendranath Basu (ISI, Kolkata), Leandro Pardo (UCM, Madrid, Spain), Nirian Martin (UCM, Madrid, Spain)
	Robust Inference for High and Ultra-high dimensional Data	Leandro Pardo (UCM, Madrid, Spain), Nirian Martin (UCM, Madrid, Spain), Magne Thoresen (UiO, Oslo, Norway)
	Robust Discriminant Analysis	Rita SahaRay (ISI, Kolkata)
	Robust Methods in Bioinformatics	Debarka Sengupta (IIIT, Delhi), Ujjwal Maulik (JU, Kolkata), Sanghamitra Bandyopadhyay (ISI, Kolkata)
	Applications of Statistics within Econophysics & Socio-economic Applications	Banasri Basu (ISI, Kolkata)
	Rainfall Modelling	Arnab Hazra (KAUST, Saudi Arabia)
	Robust Inference for Stochastic Processes	
Amita Pal	Biometric Verification of Identity	
Ayanendranath Basu	Minimum divergence Inference based on the exponentially weighted divergence	Soumik Purkayastha, (University of Michigan)
	Robust inference based on the extended Bregman divergence	Sancharee Basak (SRF, ISI, Kolkata)
	Robust clustering in normal models	Soumya Chakraborty (SRF, ISI), Abhik Ghosh (ISI)
	Robust Inference for skewed data	Amarnath Nandy (JRF, ISI), Abhik Ghosh (ISI)
	Robust tests and model selection in proportion hazards model	Amarnath Nandy (JRF, ISI), Abhik Ghosh (ISI), Leandro Pardo (UCM, Spain)
	Robust generalizations of the Rao test	Abhik Ghosh (ISI), Leandro Pardo (UCM), Nirian Martin (UCM, Spain)
	Robust inference using the exponential-polynomial divergence	Pushpinder Singh (SRF, ISI), Abhijit Mandal (UTEP, USA)
	Inference based on the generalized mean	Soumalya Mukhopadhyay (VBU), Sabyasachi Bhattacharya (ISI, Kolkata)
	Robust inference for ordinal data	Arijit Pyne (SRF, ISI), Subhrajyoty Roy (MStat Student, ISI), Abhik Ghosh (ISI, Kolkata)
Kiranmoy Das	Bayesian Joint Modeling with application to acute lymphocytic leukemia	Dr. Vaskar Saha (Tata Medical Center, Kolkata) Damitri Kundu (ISI, Kolkata)
	Bayesian multivariate quantile regression for joint modelling of longitudinal and survival data	Damitri Kundu (ISI, Kolkata)
	Model selection for data with categorical responses	Rohit Kanrar (Iowa State University, USA)
	Application of IoT in health science and agriculture	Dola Bhattacharya (Jadavpur University, Kolkata)

Faculty name	Research topic(s)	Collaborator(s)
Partha Sarathi Mukherjee	Image denoising using jump regression analysis	
	Image deblurring using jump regression analysis	Dr. Yicheng Kang
	Statistical Process Control	
	Applications of statistical tools in various scientific research	Dr. Lilian Calderon-Garciduenas
Rita SahaRay	Robust Generalised Quadratic Discriminant Analysis	Abhik Ghosh (ISI, Kolkata), Sayan Chakraborty (University of Illinois at Urbana-Champaign, Illinois, USA), Sayan Bhadra(Florida State University, USA)
	Optimal designs for comparing test treatments with controls in the presence of covariates	Ganesh Dutta (Basanti Devi College, Kolkata)
Sourabh Bhattacharya	Bayesian inverse regression, Bayesian variable selection, Bayesian spatio-temporal	
Smarajit Bose	Content Based Image Retrieval	Subhadip Majhi, Optum United Health Group, Bangalore.
	Statistical Algorithms for Big Data Ensemble Classifiers.	Mousumi Banerjee, University of Michigan.
Soumendu Sundar Mukherjee	Scalable inference for network data	Peter Bickel, Purnamrita Sarkar
	Change point detection in networks	Sharmodeep Bhattacharyya, Shirshendu Chatterjee, Shyamal Krishna De
	High-dimensional statistics	Debapratim Banerjee, Arijit Chakrabarti, Subhroshekhar Ghosh, Rajarshi Mukherjee
	Random matrices, free probability	Arup Bose
Subir Kumar Bhandari	Multiple Hypotheses Testing	

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Outlier-Robust Methods in Biostatistics and Bioinformatics using Density Power Divergence	1st April, 2020	3 years	Abhik Ghosh

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Robust Statistical Learning for High-dimensional Biomedical and Omics data	E152	4th December, 2020	2 years	Abhik Ghosh	SERB, Govt. of India	15,32,916/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Robust minimum divergence inferences for Non-Standard data problems: Emphasis on Censored, Longitudinal & High-dimensional data and Machine Learning & Multisample set-ups	E054	2nd November, 2016	31st October, 2021	Abhik Ghosh	DST, Govt. of India	35,00,000/-

BIOLOGICAL SCIENCES DIVISION (BSD)

Professor In-Charge	:	SUSMITA MUKHOPADHYAY, BAU, Kolkata (1st Apr 2020 – 17th Sep 2020)
Office	:	3rd floor, R.A. Fisher Bhavan, ISI, Kolkata-700 108
Professor In-Charge	:	RAGHUNATH CHATTERJEE, HGU, Kolkata (18th Sep 2020 - 31st Mar 2021)
Office	:	2nd floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

01 Agricultural & Ecological Research Unit (AERU), Giridih & Kolkata

Head of Unit	:	PABITRA BANIK
Number of Faculty/ Faculty-equivalent:		Nine (9)
Number of Scientific Workers	:	Eight (8)
Number of Non-Scientific Workers	:	Seven (7)
Number of Research Scholars	:	Thirty-one (31)
Giridih Office	:	New Barganda, ISI, Giridih, Jharkhand - 815301
Kolkata Office	:	2nd floor, R.A. Fisher Bhavan, ISI, Kolkata - 700108

02 Biological Anthropology Unit (BAU), Kolkata

Head of Unit	:	S.K. RAY
Number of Faculty/ Faculty-equivalent:		Two (2)
Number of Scientific Workers	:	One (1)
Number of Research Scholars	:	Five (5)
Office	:	3rd floor, R.A. Fisher Bhavan, ISI, Kolkata-700 108

03 Human Genetics Unit (HGU), Kolkata

Head of Unit	:	INDRANIL MUKHOPADHYAY
Number of Faculty/ Faculty-equivalent:		Three (3)
Number of Non-Scientific Workers	:	Two (2)
Number of Research Scholars	:	Thirteen (13)
Office	:	2nd floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

1. AGRICULTURAL & ECOLOGICAL RESEARCH UNIT (AERU), GIRIDIH & KOLKATA

The Agricultural and Ecological Research Unit (AERU) is based in Kolkata with a branch at Giridih. The unit is comprised of nine faculty members. The Scientific workers of the Unit are engaged in various research and academic activities on Agriculture and Ecology. During the period under consideration, the scientific workers of the Unit have undertaken research on various ecological aspects as invasive plants, zoopankton-phytoplankton interaction, plant - nematode interaction etc. and also in Agriculture and social aspects as technology adoption by farmers, use of nanotechnology in Agriculture and other various topics. The faculty members of the Unit are also engaged in regular teaching in B.Stat. and M.Stat. courses in ISI and also in various departments of other Universities. AERU faculties have launched a Post Graduate Diploma in Agricultural & Rural Management with Statistical Methods and Analytics in the Giridih Branch.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Abhishek Mukherjee	Plant – Nematode interaction	Prof. Matiyar R. Khan Principal Scientist, Division of Nematology, ICAR- Indian Agricultural Research Unit, New Delhi and Dr. Dipankar Chakraborti Head, Department of Genetics, University of Calcutta
	Applications of nanotechnology in agriculture	Dr. Chandan Ghosh, Department of Material Science and Technology, School of Materials Science & Nanotechnology, Jadavpur University
	Biocontrol of pest and diseases	Prof. Birendra Nath Panja Prof. and HoD, Dept. of Plant Pathology Bidhan Chandra Krishi Viswavidyalaya
	Invasive weed ecology and management	Dr. Achyut Banerjee School of Life Sciences, Sun Yat-sen University, China and Dr. Raghu Sathyamurthy, Biosecurity Flagship, CSIRO, Brisbane, Australia
Anjana Dewanji	Invasive plants, Pollution in freshwater bodies, Phytoremediation by aquatic plants	Dr. M. Sudarshan, UGC-DAE Consortium for Scientific Research, Bidhan Nagar, Kolkata
Arunava Goswami	Nano biotechnology	
Joydev Chattopadhyay	Disease modelling including COVID-19	
	Ecological predator prey based model with fear and vigilance impact	
Pradip Bhattacharyya	Phytoremediation of metal contaminated chromium asbestos mines of Jharkhand	Dr. Satya Sundar Bhattacharyya, Tezpur University
	Fluoride decontamination of ground water using exfoliated biochar based sorptive system	Dr. Satya Sundar Bhattacharyya, Tezpur University
Pabitra Banik	Climate change and socioeconomic situation of the Sundarban	Prof. Christopher Edmonds, Associate Professor, Tokyo International University, Japan and Prof. Ilan Noy, Victoria University of Wellington, New Zealand.
	Ecological aspect of the Sundarban area	Dr. K.C. Rath, Dept. of Geography, Utkal University
	Technology adoption by the farmers	Prof. Christipher Edmonds, Tokyo International University, Japan
Rabi Ranjan Chattopadhyay	A search for novel natural alternative to synthetic food preservatives from plant essential oils and their components	Prof. Smarajit Bose, ISRU, ISI, Kolkata
Sabyasachi Bhattacharya	Extended Gompertz family and its applications: Deterministic and stochastic approach.	Prof. Joydev Chattopadhyay
	Growth profile of *Artemia* sp. Under salinity induced stress.	Prof. Santanu Ray, Department of Zoology, Visva-Bharati University, Santiniketan, West Bengal

Faculty name	Research topic(s)	Collaborator(s)
	Identification of migratory pattern, nesting success, and Habitat patches of *Meropsphilippinus*	
	The stochastic dynamics of harvesting population	Dr. Bapi Saha, Govornment College of Engineering & Textile Technology, Berhampore, West Bengal
	Nonsymmetric growth curve modeling with additional negative feedbacks and noises	
	Developing functional response for antipredatory behaviour under stochastic and deterministic setup	
	Dynamics and control of the Canine distemper disease in the wild animals: Deterministic and Stochastic approach	
	Stochasticity in the extended logistic and associated growth curve families through various model setup for comparing for comparing species sustainability and extinction.	
	Network and stability analysis of ecosystem and its health	
	Growth curve modelling for cooperation with fractional calculus and game theory	Dr. Sourav Rana, Department of Statistics, Visva-Bharati, Santiniketan, West Bengal
	Developing statistical methodologies for comparing growth rates and growth curves under various modeling structures.	Dr.Soumalya Mukhopadhyay, Department of Statistics, Visva-Bharati, Santiniketan, West Bengal
Sauren Das	Biochemical, physiological and molecular portrayal of Darjeeling tea cultivars towards the selection of superior clones against abiotic stress.	Dr. Anjan Hazra
Suparna Mandal Biswas	Potential oil resources from underutilized seeds of *Sterculia foetida*, L. - quality assessment and chemical profiling	Prof. Thomas A Hughes and Dr. Arindam Pramanik, School of Medicine, St James's University Hospital, University of Leeds, UK
	Antioxidant, Antimicrobial and DNA Damage Protecting Potential of Hot Taste Spices and their utilization as functional foods	Prof. Prasanta C. Bhowmik, Department of Plant and Soil Sciences, University of Massachusetts, Amherst, USA
	Development of cheap, efficient, non-toxic antisprouting agents of Potato using organic compounds	Prof. Panchanan Pramanik, Former Professor, IIT, Kharagpur

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Fungal endophytic communities associated with root galls of *Meloidogyne graminicola*: exploitation of their role in biocontrol	April, 2021	March, 2024	Abhishek Mukherjee
2	Designing strategies for the enhanced production of cosmetic antiaging "squalene" from the shredded leaves of Moraceae and exploring its novel sources based on molecular cues.	April, 2021	3 yrs	Suparna Mandal Biswas
3	Strategies for improvement of livelihood security of the farming community in the Indian Sundarbans under present scenario of climate change	April, 2021	3 yrs	Pabitra Banik
4	Green synthesis of nanoparticle in plant ethanol extracts and application in various experimental and field model systems	April, 2021	3 yrs	Arunava Goswami

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Understanding electrical signals in *Alternanthera philoxeroides* - physiological and ecological aspects	April, 2020	March, 2022	Anjana Dewanji (AERU) & Kuntal Ghosh (MIU)
2	A search for novel natural alternative to synthetic food preservatives from plant essential oils and their components	April, 2019	March, 2022	R.R. Chattopadhyay
3	Vetiver based phytoremediation of metal contaminated chromium asbestos mines of Jharkhand: A cradle to grave approach through vermitechnology	April, 2021	March, 2024	Pradip Bhattacharyya

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Host-parasite interaction between the rice root knot nematode (*Meloidogyne graminicola*) and rice	April, 2018	March, 2021	Abhishek Mukherjee
2	*Sterculia foetida* – Eco-friendly, cost effective and rich sources of nutritious edible oil, animal food supplements as well as biofuel and its multimodal application to environmental perspectives.	April, 2018	March, 2021	Suparna Mandal Biswas
3	Utilization of Brick factory coal ash through application of vermitechnology	April, 2018	March, 2021	Pradip Bhattacharyya
4	Biochemical, physiological and molecular portrayal of Darjeeling tea cultivars towards the selection of superior clones against abiotic stress.	April, 2018	March, 2021	Sauren Das
5	Strategies for improvement of livelihood security of the farming community in the Indian Sundarbans under present scenario of climate change	April, 2018	March, 2021	Pabitra Banik
6	Cadencing photosystem-II with naturally occurring $CaMn_4O_5$ nano-cluster and nanoparticles of hematite (a-Fe_2O_3)	April, 2018	March, 2021	Arunava Goswami

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	A study on chemical constituents of rice root modulating herbivory by the rice root knot nematode *Meloidogyne graminicola*: a chemical ecology perspective	E158	April, 2021	3 yrs	Abhishek Mukherjee	SERB, DST	21,52,683/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Conducting surveys in India to identify biocontrol agent for *Nymphoides cristata*	F591	Jul, 2020	July, 2023	Abhishek Mukherjee	CSIRO, Australia	14,62,000/-
2	Characterization and hazard prediction of tannery waste sludge in We2st Bengal and resource recovery through vermiremediation	E115	August, 2019	July, 2022	Pradip Bhattacharyya	Department of Science and Technology & Biotechnology, Govt. of West Bengal	15,00,000/-
3	Delaying programme cell death of beneficial in gut bacteria using oxide and complex nanoparticles	E126	2019	2022	Arunava Goswami	ISRO	35,00,000/-
4	Antidotes against dsDNA adenovirus induced kerato conjunctivitis ex vivo platform for nanoformulation development	E130	2019	2022	Arunava Goswami	DBT, GOI	40,00,000/-

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
5	Climate change and livelihoods in disaster-prone coastal areas of Bay of Bengal	F010	2019	2022	Pabitra Banik	Tokyo International University	2,47,280/-

2. BIOLOGICAL ANTHROPOLOGY UNIT (BAU), KOLKATA

The primary engagements of the faculty pertain to conducting bio-anthropological research. The faculty members are also engaged in teaching in Anthropology at B.Stat. level. The Unit organizes Workshops, mostly on (i) Research methodologies for biological sciences in general and biological anthropology in particular, and (ii) Workshops/Summer-Winter Schools on SPSS Statistical software packages.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
S.K.Ray	Health and coping strategy of the labourers of closed and running tea gardens of alipurduar district of west Bengal: a comparative study	A. Mallick
	Health related Pain cognition and threshold of the urban and rural Santalsof Howrah and Purba Bardhaman districts of West Bengal.	A. Santra [RS]
S. Mukhopadhyay	Frailty Syndrome and its bio-cultural correlates among the community-dwelling rural elderly in West Bengal.	S. Das [RS]

3. HUMAN GENETICS UNIT (HGU), KOLKATA

The Unit is continuing with its research focus simultaneously on development of novel statistical methodologies as well as innovative experimental/functional strategies for genomic dissection of complex disorders and quantitative phenotypes. Statistical tests involving association of multivariate phenotypes and integration of genetic, expression and methylation data have been explored; while on the experimental aspects, genetic and epigenetic studies on psoriasis as well as oral, pancreatic and gastric cancers have been carried out. The scientists of the Unit have also been involved in multicentric initiative SyMeC for understanding the basis of oral and cervical cancer in terms of providing its expertise on database creation and statistical analyses. The faculty of the Unit have also continued participating in regular teaching of degree courses in the Institute as well as guest faculty of Statistics and Human Genetics modules of masters and Ph.D. level curriculum in Biological Sciences of several Universities. Faculty are also involved in several activities to fight COVID pandemic in different capacities that include publication of scientific papers, setting up of laboratory for testing for COVID, etc.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Indranil Mukhopadhyay	Statistical Genetics and Genomics	Sandip Banerjee, IIT, Rourkee; Stephane Robin, INRA, France; Myetri Gupta, University of Glasgow
Raghunath Chatterjee	Genetics, genomics and epigenetics in Human health and diseases	Dr. Shiv Grewal (NIH, USA) Dr.Gobinda Chatterjee (IPGMER/SSKM Hospital Kolkata) Prof. Soma Banerjee (IPGMER/SSKM Hospital Kolkata) Dr. Roopa Biswas (USUHS, USA) Dr. Soumen K Manna (SINP Kolkata) Dr. Pritam Sukul (Rostock University Medical Center, Germany)
Saurabh Ghosh	Statistical Genetics, Genetic Epidemiology	Masao Ueki, University of Nagasaki Sanjeev Jain, NIMHANS Radha Venkatesan, MDRF Sanjit Dey, CU

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Some Statistical Issues In Simultaneous Genetic Analyses Of Multiple Phenotypes	1st April, 2020	31st March, 2023	Saurabh Ghosh
2	The synergistic effect of microRNAs on target genes in Oral Squamous Cell Carcinoma	1st April, 2020	31st March, 2023	Raghunath Chatterjee

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Modelling Transcriptional Dynamics with Gene Expression Data	1st April, 2019	31st March, 2022	Indranil Mukhopadhyay

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	To identify the role of genetic and epigenetic alterations in epidermal keratinocytes in the pathogenesis of Psoriasis	E-157	March 2021	3 years	Raghunath Chatterjee	SERB, Govt. of India	66,75,400/-

COMPUTER AND COMMUNICATION SCIENCES DIVISION (CCSD)

Professor In-Charge	:	BHABATOSH CHANDA, ECSU, Kolkata (1st Apr 2020 – 17th Sep 2020)
Office	:	9th floor, S.N. Bose Bhavan, ISI, Kolkata-700 108
Professor In-Charge	:	KRISHNENDU MUKHOPADHYAYA, ACMU, Kolkata (18th Sep 2020 - 31st Mar 2021)
Office	:	5th floor, Platinum Jubilee Building, ISI, Kolkata-700 108

01

Advanced Computing and Microelectronics Unit (ACMU), Kolkata

Head of Unit	:	SUSMITA SUR-KOLAY
Number of Faculty/ Faculty-equivalent:		Eleven (11)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	Four (4)
Number of Research Scholars	:	Thirty Four (34)
Office	:	5th floor, Platinum Jubilee Building, ISI, Kolkata-700 108

02

Computer Science Unit (CSU), Chennai

Head of Unit	:	SUJATA GHOSH
Number of Faculty/ Faculty-equivalent:		Four (4)
Number of Research Scholars	:	Four (4)
Office	:	110 Nelson Manickam Road, Aminjikarai, ISI, Chennai-600 029

03

Computer Vision and Pattern Recognition Unit (CVPRU), Kolkata

Head of Unit	:	UMAPADA PAL (1st Apr 2020 –31stDec 2020) and SARBANI PALIT (1st Jan, 2021 –31st Mar 2021)
Number of Faculty/ Faculty-equivalent:		Six(6)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	Two (2)
Number of Research Scholars	:	Fifteen (15)
Office	:	8th floor, S.N. Bose Bhavan, ISI, Kolkata-700 108

04

Cryptology and Security Research Unit (CSRU), Kolkata

Head of Unit	:	DEBRUP CHAKRABORTY
Number of Faculty/ Faculty-equivalent:		Five (5)
Number of Research Scholars	:	Ten (10)
Office	:	3rd floor, C.D. Deshmukh Bhavan, ISI, Kolkata-700 108

05

Documentation Research and Training Centre (DRTC), Bangalore

Head of Unit	:	DEVIKA P. MADALLI
Number of Faculty/ Faculty-equivalent:		Three (3)
Number of Non-Scientific Workers	:	One (1)
Number of Research Scholars	:	Eleven (11)
Number of Visiting Scientists	:	Three (3)
Office	:	8th Mile, Mysore Road, ISI, Bangalore- 560 059

06

Electronics and Communication Sciences Unit (ECSU), Kolkata

Head of Unit	:	SWAGATAM DAS
Number of Faculty/ Faculty-equivalent:		Seven (7)
Number of Scientific Workers	:	Two (2)
Number of Non-Scientific Workers	:	Six (6)
Number of Research Scholars	:	Seventeen (17)
Office	:	9th floor, S.N. Bose Bhavan, ISI, Kolkata-700 108

07

Machine Intelligence Unit (MIU), Kolkata

Head of Unit	:	ASHISH GHOSH
Number of Faculty/ Faculty-equivalent:		Ten (10)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	Three (3)
Number of Research Scholars	:	Twenty-Five (25)
Office	:	4th floor, Platinum Jubilee Building, ISI, Kolkata-700 108

08

Systems Science and Informatics Unit (SSIU), Bangalore

Head of Unit	:	SAROJ K. MEHER
Number of Faculty/ Faculty-equivalent:		Four (4)
Number of Non-Scientific Workers	:	One (1)
Number of Research Scholars	:	Two (2)
Office	:	8th Mile, Mysore Road, ISI, Bangalore- 560 059

1. ADVANCED COMPUTING AND MICROELECTRONICS UNIT (ACMU), KOLKATA

RESEARCH

The focus of the faculty members of the ACM Unit (ACMU) is in the core areas of Computer Science and Engineering, broadly spanning topics in Theoretical Computer Science and High Performance Computing Systems.

The research projects are in the areas of streaming algorithms, theory of learning, computational geometry and topology, graph theory, distributed algorithms, 5G mobile and ad hoc networks, cognitive radio, formal verification, cloud computing, privacy and security in hardware and Internet-of-Things, quantum computing, algorithms for design automation, testing and fault tolerant in-memory computing systems with emerging devices such as memristors, hardware accelerators for machine learning, 3D image reconstruction and medical image analysis. The outcomes of these projects have been published in leading international journals and peer-reviewed conference proceedings.

TEACHING AND TRAINING

(a) Degree and Training Courses: During 2020 -2021, all the faculty members of the Unit taught a significant number of courses in the M.Tech (Computer Science) program, along with those in other degree programs such as B. Stat., M. Stat., and M.Tech (Cryptology & Security) of the Institute.

The following courses have been taught by the faculty members of the unit during this year:

- Algorithms for Big Data
- Advanced Algorithms for Graph Theory and Combinatorial Optimization
- Combinatorial Geometry
- Computational Geometry
- Computer Networks
- Computer Organization
- Computing Systems I : Architecture and OS (M.Tech (CrS))
- Data Structures
- Design and Analysis of Algorithms (BStat, M Tech CS, MTech CrS)
- Discrete Mathematics (B Stat, M Tech CS)
- Graph Algorithms
- Information and Coding Theory
- Mobile Computing
- Operating Systems
- Optimization Techniques (M Stat, M Tech CS)
- Parallel Processing: Architectures and Algorithms
- Probability and Stochastic Processes
- Randomized and Approximation Algorithms
- Special Topics on Algorithms (B Stat)
- Topics in Algorithms and Complexity

(b) Summer Training and Projects: Unlike previous years, no students from other Universities/Institutes were supervised for their summer training and project work.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Ansuman Banerjee	Formal Verification	
	Edge Computing	Dr. Arani Bhattacharya, IIIT, Delhi; Dr. Swarup K. Mohalik Ericsson Research; Dr. N. C. Narendra, Ericsson Research
	Microfluidics	Prof. Bhargab B. Bhattacharya, IIT, Kharagpur
Arijit Bishnu	Sub-linear Time and Space Algorithms	Arijit Ghosh, ISI, Kolkata; Gopinath Mishra, ISI, Kolkata
	Graph Theory, Graph Algorithms and Discrete Mathematics	Mathew Francis, ISI Chennai
	Discrete Geometry	Arijit Ghosh, ISI, Kolkata
	Randomized Algorithms	Sandeep Sen, IIT, Delhi
Arjit Ghosh	Theoretical Computer Science	Jean-Daniel Boissonnat, INRIA Sophia Antopolis, France; Arijit Bishnu, ISI, Kolkata; Sourav Chakraborty, ISI, Kolkata; Kunal Dutta, University of Warsaw; André Lieutier, Dassault Systèmes, France; Nabil H. Mustafa, Université Paris-Est, France; Mathijs Wintraecken, IST Austria
Krishnendu Mukhopadhaya	Design and Analysis of Algorithms	

Faculty name	Research topic(s)	Collaborator(s)
Nabanita Das	Cognitive Radio	Prof. A. Das Barman, CU
	Wireless Sensor Networks	Prof. S. Dhar, SJSU, USA
	Social Networks	Prof. G. Chakraborty, Iwate; Prefectural University, Japan
Sandip Das	Graph theory, Computational Geometry, Geometric Optimization	Swami Sarvottamananda, RKMVERI; Sagnik Sen, IIT, Dharwad; Binay Bhattacharya, SFU Canada; Anil Maheswari, Carleton University; Sergio Cabello
Sasthi C. Ghosh	Wireless Networks, Mobile Computing, Device to device communications, 5G cellular networks	Arpan Chattopadhyay, IIT, Delhi; Nabanita Das, ISI, Kolkata
Sasanka Roy	Computational Geometry, Algorithms, Data Structures	Satyabrata Jana, ISI, Kolkata; Binayak Dutta, ISI, Kolkata; Subhas C. Nandy, ISI, Kolkata; J.S.B Mitchell, Stony Brook University, USA ; Anil Maheshwari, Carleton University ; Michiel Smid, Carleton University, Binay Bhattacharya, SFU, Canad ; Minati De, IIT, Delhi; Arindam Karmakar, Tezpur University
Subhas C. Nandy	Computational Geometry and Graph Theory	Anil Maheshwari, Carleton University; Gautam K Das, IIT, Guwahati ; Sasanka Roy, ISI, Kolkata; Ramesh K. Jallu, IIIT, Raichur; Supantha, Pandit, DA-IICT
Susmita Sur-Kolay	Algorithms for Physical Design Automation	Dr. Pritha Banerjee, CSE, CU; Dr. Debajyoti Bhattacharjee, IMEC Belgium
	Hardware IP Security	Dr. Debasri Saha, AKCSIT, CU
	Quantum Computing	Dr. S. Raghunathan, IBM; Prof. A. Chakrabarti, AKCSIT, CU
	3D Image Processing	Prof. Partha Bhowmik, IIT, Kharagpur; Prof. A. Chakrabarti, AKCSIT, CU
Sourav Chakraborty	Streaming Algorithms and Database	Kuldeep Meel, NUS, Singapore; N.V. Vinodchandran, U. Nebraska-Lincoln, USA
	Probabilistic Verification of AI algorithms	Kuldeep Meel, NUS, Singapore; Yash Pote, NUS, Singapore
	Property Testing	Arijit Ghosh, ISI, Kolkata; Sayantan Sen, ISI, Kolkata; Gopinath Mishra, ISI, Kolkata
	Complexity Measures of Boolean Functions	Manaswi Paraashar, ISI, Kolkata; Chandrima Kayal, ISI, Kolkata
	Discrete Geometry	Arijit Ghosh, ISI, Kolkata; Soumi Nandi, ISI, Kolkata
	Fourier Analysis of Boolean Functions	Rajat Mittal, IIT, Kanpur; Swagato Sanyal, IIT, Kharagpur; Tulasi Mohan Mouli, TIFR; Manaswi Paraashar, ISI, Kolkata
	Quantum Computing	Arkadev Chattopadhyay, TIFR; Ronald d'Wolf, CWI, Netherlands; Nikhil Manke , CWI, Netherlands; Manaswi Paraashar, ISI, Kolkata

Projects

Internally-funded Projects
ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Testers for Checking Correctness of Samplers	2019	2022	Sourav Chakraborty
2	Model Centric Algorithms for Graph Theoretic, Clustering and Geometric Problems	2019	2022	Arijit Bishnu
3	Relay Selection in 5G Device to Device Communications under Uncontrolled Interference	2019	2022	Sasthi C. Ghosh
4	Computational Topology and its Applications in Topological Data Analysis	2020	2023	Arijit Ghosh
5	Geometric Shortest Path Problems with Violations	2020	2023	Sasanka Roy

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
6	Distributed Algorithms for Fat Robots	2020	2023	Krishnendu Mukhopadhyaya
7	Center Location Problems on Graphs and Plane	2020	2023	Sandip Das
8	Minimum Discriminating Codes in Geometric Setup	2020	2023	Subhas C. Nandy
9	Machine Learning Based Physical Design Automation for Next Generation ICs	2020	2023	Susmita Sur-Kolay

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Co-operative Channel Sharing in Cognitive Radio Ad Hoc Networks	1st April, 2018	31st March, 2021	Nabanita Das
2	A framework for collaborative application execution for mobile cloud computing	1st April, 2018	31st March,2021	Ansuman Banerjee

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	United Software Defined Architecture for Industrial Internet-of-Things	E133	2019	2022	Subhas C Nandy	SERB	26,68,820/-
2	An Efficient Framework for Ensuring Security of FPGA-Based Environment	E122	13th June, 2019	12th June, 2022	Susmita Sur-Kolay	SERB, New Delhi	26,36,205/-
3	Design for Manufacturability aware Global Routing	251A	2010	Ongoing	Susmita Sur-Kolay	IBM, USA	5,96,649/-
4	Automated Methods for Implementing Robust and Bio-chemical Assays with Micro-fluidic Lab-on-Chips	E095	6th July, 2018	5thJuly, 2021	Ansuman Banerjee	SERB, Govt. of India	18,44,000/-
5	Characterization and Analysis of Interaction Networks	E091	2018	2021	Swati Goswami	DST, New Delhi	14,46,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End Date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	An Assertion Based Verification Framework for Model Driven Design Flows	I056	1st September, 2019	28th February, 2021	Ansuman Banerjee	Research CenterImarat (RCI), DRDO, Government of India	9,78,650/-
2	Ramanujan Fellowship	E030	February 6, 2016	February, 2021	Arijit Ghosh	SERB, New Delhi	89,000,00/-
3	National Post Doctoral Fellowship	E120	2019	2021	Anup Kr. Bhattacharya	SERB, New Delhi	22,36,800/-

2. COMPUTER SCIENCE UNIT (CSU), CHENNAI

Research

The research focus of the faculty members of the Computer Science Unit (CSU) comprise mostly of theoretical and applied topics in Computer Science and allied areas. The faculty members of the CSU teach courses in the PGDSMA program, the only regular teaching program that is being offered at ISI Chennai Centre, as well as in M.Tech.(CS) at ISI, Kolkata. The courses offered in 2020-2021 by the unit members are:

PGDSMA in Chennai

- Calculus
- Numerical Methods

M.Tech. (CS) in Kolkata

- Advanced Graph Algorithms and Combinatorial Optimization
- Elements of Algebraic Structures
- Logic for Computer Science

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Ayineedi Venkateswarlu	Cryptology	Santanu Sarkar, Sumit Kumar Pandey, Abhishek Kesarwani
	Combinatorial Algebra	Samrith Ram, Akansha Arora
Mathew C. Francis	Interval digraphs	Dalu Jacob
	The linear arboricity conjecture	Manu Basavaraju, Arijit Bishnu, Drimit Pattanayak
	The Gyarfas-Sumner conjecture	Manu Basavaraju, L. Sunil Chandran, Karthik M.
	Hadwiger's conjecture and total colouring	Manu Basavaraju, L. Sunil Chandran, Ankur Naskar
Sujata Ghosh	Logic	Spandan Das, Shreyas Gupta, Lei Li, Dazhu Li, Fenrong Liu, R. Ramanujam, Katsuhiko Sano and YaxinTu
	On reasoning tasks performed by individuals with Autism Spectrum Disorder	Torben Braüner, Aishwarya Ghosh
T. Karthick	Structure of graphs and coloring problems	Maria Chudnovsky (USA) Shenwei Huang (China) Peter Maceli (USA) F. Maffrary (France)
	Structural domination and graph coloring	S. A. Choudum (India), Manoj M. Bellavadi (India)

Projects

Internally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Negotiating, one can learn: Developing a serious game	1st April, 2018	31st March, 2021	Sujata Ghosh

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Coloring of some special classes of graphs	N809	12th March, 2019	12th March, 2022	T. Karthick	DST-SERB-MATRICS	6,60,000/-
2	Strategizing with partial information – From game theory, logic and automata theory to experiments and computational models	E801	26th February, 2021	26th February, 2024	Sujata Ghosh	DST-CSRI	35,75,460/-

3. COMPUTER VISION AND PATTERN RECOGNITION UNIT (CVPRU), KOLKATA

Research

The faculty members are currently actively engaged in research activities in various areas of Computer Science and Information Technology, specific areas being Natural Language Processing, Information Retrieval, Robust Deep Learning, Explainable Artificial Intelligence, Medical Image/Signal Processing, keyword spotting, Handwritten script identification, Air writing, Graphology based document analysis, License plate detection, Abnormality Detection in Chest X-Ray, Privacy Preserving Machine Learning, Degraded Document Recognition, Adversarial Machine Learning, Attention-Based Deep Learning, Multi-Task Learning, Spoken Language Recognition, Scene Text Spotting, Pose Estimation of Occluded Pedestrian, Cyclicity detection in geological data records, Image dehazing and applications and Redshift periodicity of astronomical data.

As usual, they have been teaching various courses of the Institute such as Operating Systems, Compiler Construction, Data Structures, Programming Languages, Image Processing, Pattern Recognition, Document Processing, Information Retrieval, Natural Language Processing, Digital Signal Processing etc, through online and subsequently mixed-mode (online and offline) classes. An arrangement for conducting online classes was set up at the CVPR Seminar Room with the help of Dean's Office and CSSC, which was used regularly by faculty members of CVPRU as well as other Units such as SQC.

The faculty and scientific members have continued supervising research scholars, masters dissertations and interns, delivering online keynote/invited lectures/speeches at seminars/academic programs organized by various organizations, collaboration with other national and international institutions, acting as experts of various erudite bodies and government committees, serving in various editorial activities of different journals and serving as a research consultant for renowned industries, research labs. Unfortunately, the ongoing pandemic has resulted in a complete routing of the usual activities of organizing seminars, workshops, and conferences.

An international patent on "Tube Inspection System" has been filed with EPO by Prof. Utpal Garain and his team. It is also worth mentioning that several databases have been created along with their annotations for organization/ participation in various international competitions which are also in popular use by the international research community.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Debapriyo Majumdar	Natural language processing, Information Retrieval, Deep Learning	
Mandar Mitra	Query Performance Prediction	Suchana Datta, Debasis Ganguly, Derek Greene
Sarbani Palit	Cyclicity detection in geological data records	Sarbani Patranobis-Deb
	Image dehazing and applications	Jessica El Khoury, Harsh Bhandari, Soumajit Chowdhury
	Redshift periodicity of astronomical data	Arindam Mal, Sisir Roy
Ujjwal Bhattacharya	Privacy Preserving Machine Learning	Chandan Biswas, Debasis Ganguly, Dwaipayan Roy
	Degraded Document Recognition	Kinjal Dasgupta, Ayan Chaudhury, Partha Sarathi Mukherjee, Sudip Das, Chandan Biswas
	Adversarial Machine Learning	Sudip Das, Kinjal Dasgupta, Subhrajyoti Dasgupta
	Attention-Based Deep Learning	Sudip Das, Kinjal Dasgupta
	Multi-Task Learning	
	Spoken Language Recognition	Jaybrata Chakraborty, Bappaditya Chakraborty
	Scene Text Spotting	Sudip Das, Kinjal Dasgupta
	Pose Estimation of Occluded Pedestrian	Sudip Das, Perla Sai Raj Kishore
Umapada Pal	Forgery document detection	Palaiahnakote Shivakumara
	Scene text detection	
	Keyword spotting	Partha Pratim Roy
	Handwritten script identification	
	Air writing	
	Graphology based document analysis	Palaiahnakote Shivakumara
	License plate detection	
	Abnormality Detection in Chest X-Ray	K. C. Santosh

Faculty name	Research topic(s)	Collaborator(s)
Utpal Garain	Robust Deep Learning	Akshay Chaturvedi, Nicholas Asher, Sujata Ghosh, Omid Mohamad Nezami, Mark Dras, Abhisek Chakrabarty, Masao Utiyama, Eiichiro Sumita
	Explainable AI (XAI)	Akshay Chaturvedi, Shahanshah Salim
	Medical Image Analysis	Anabik Pal, Akshay Chaturvedi, Sounak Ray, Aditi Chandra, Raghunath Chatterjee, Swapan Senapati, Alejandro F. Frangi

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	DAMP: Deep Analysis for Pain Management:	1st April, 2020	3 years	Utpal Garain
2	Recommender System for Citations and Illustrations	1st April, 2020	3 years	Mandar Mitra
3	Air writing Recognition	1st April, 2020	3 years	Umapada Pal
4	DADDI: Deep Analysis of Degraded Document Image	1st April, 2020	3 years	Ujjwal Bhattacharya

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Development of algorithms for cyclicity detection and analysis of geological records for paleoclimate reconstruction.	1st April, 2019	31st March, 2021	Sarbani Palit

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Event detection in videos- A multi-modal zero-short learning approach	F011	September, 2020	1 year	Umapada Pal	Østfold University College, Norway	5,17,500/-
2	Remote Intelligent baby monitoring, Norway	F013	September, 2020	1 year	Umapada Pal	Babysensor, Norway	6,15,250/-

4. CRYPTOLOGY AND SECURITY RESEARCH UNIT (CSRU), KOLKATA

Research

Cryptology and Security Research Unit (CSRU) is a part of the Computer and Communication Sciences Division (CCSD) of Indian Statistical Institute, Kolkata. It is an integral component of R C Bose Centre for Cryptology and Security, a national hub for cryptographic requirements, cutting-edge research activities and indigenous capacity building in all relevant fields of study. The Unit aims at the promotion of interdisciplinary research in Mathematics, Computer Science and Statistics towards furtherance of teaching, research as well as training and development in Cryptology and Cyber Security.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
A. R. Molla	Security in Distributed Computing/ Byzantine Computation	Manish Kumar (CSRU, ISI), Kaustav Bose (R. C. Bose Centre, ISI), John Augustine, Yadu Vasudev (IIT, Madras),Kaushik Mondal(IIT, Ropar), Gopal Pandurangan (UoH, Texas, USA), William K. Moses Jr. (UoH, Texas,USA),
	Mobile Agents/ Robotics	Debasish Pattanayak (LUISS Guido Carli, Rome), Kaushik Mondal(IIT, Ropar), Subhash Bhagat (NISER, Bhubaneswar), SrutiGan Chaudhuri (JU, Kolkata), Ajay D. Kshemkalyani (UI, Chicago, USA), Gokarna Sharma (KSU, USA), William K. Moses Jr. (UoH, Texas,USA)

Faculty name	Research topic(s)	Collaborator(s)
A. R. Molla	Distributed graph algorithms	Prabhat Kumar Chand (CSRU, ISI), Sourav Chakraborty (ACMU, ISI), Amitabh Trehan (UK), Gopal Pandurangan (UoH, Texas, USA), Disha Shur (Purdue University, USA), Keren Censor-Hillel (Technion, Israel)
Debrup Chakraborty	Block Cipher Modes of Operations	Palash Sarkar (ASU), Cuauhtemoc Mancillas Lopez (CINVESTAV IPN, Mexico), Sebati Ghosh (ASU)
	Secure and Efficient Implementations of Cryptographic Schemes	
Goutam Paul	Quantum Information and Security	Atanu Acharyya (ASU), Nayana Das (ASU), Soumya Das (CSRU), Pritam Chattopadhyay (CSRU), Anindya Banerji (NTU Singapore), Ritabrata Sengupta (IISER Berhampur)
	Symmetric Cryptanalysis	Mostafizar Rahman (CSRU), Amit Jana (CSRU), Dhiman Saha (IIT, Bhilai)
	Steganography	Imon Mukherjee (IIIT, Kalyani), Nabanita Ganguly (JU), Sanjay Kumar Saha (JU)
Sabyasachi Karati	Hash-based Signature Scheme	Prof. Rei Safavi-Naini, University of Calgary
	Isogeny-based Cryptography	
Sushmita Ruj	Cloud Security	Shahzaib Tahir (City University, London), Muthukrishnan Rajarajan (City University, London), Srinivasan Narayananmurthy (NetApp Inc), Siddhartha Nandi (NetApp Inc)
	Network Security	Laltu Sardar (CSRU), Sipra Das Bit (IIEST, Shibpur), Tanusree Chatterjee (IIEST, Shibpur), Ranit Chatterjee (IIEST, Shibpur), Jayasree Sengupta (IIEST, Shibpur)
	Blockchains	Prabal Banerjee (CSRU), Ram Govind Singh (CSRU), Subhra Mazumdar (CSRU), Nishant Nikam, Manish Kumar (CSRU), Debendra Nath Das (CSRU)

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Scalable and Secure Byzantine Algorithms in Distributed Networks (E5412)	1st April, 2020	3 years	Anisur Rahaman Molla

Projects done for Govt. of India

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Distributed Computation in Dynamic Networks	E055	1st November, 2016	31th October, 2021	Anisur Rahaman Molla	DST, Govt. of India	19,00,000/-
2	Cryptanalysis of Symmetric Cipher Algorithms	E053	4th January, 2017	31st March, 2021	Goutam Paul	BARC, DAE, India	27,54,000/-
3	Exploration of Suitable Metric for TRNG	E128	18th April, 2019	31st March, 2022	Goutam Paul	DRDO, India	37,52,000/-

5. DOCUMENTATION RESEARCH AND TRAINING CENTRE (DRTC), BANGALORE

Research

The Documentation Research and Training Centre (DRTC) was established as an integral part of the Indian Statistical Institute in 1962. The primary objectives of DRTC are to promote research and training, in the area of Library Science, Documentation and Information Science. the activities of DRTC have been grouped into:

a) Research Programme;

b) Educational and Training programme;

c) Continuing Education etc.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Biswanath Dutta	Semantic Web	Dr. Animesh Dutta (NIT, Durgapur)
	Knowledge Graph	Michael DeBellis
	Network analysis	Dr. Animesh Dutta
	Metadata	Dr. Clement Jonquet (INRAE (MISTEA), & University of Montpellier (LIRMM), France)
	Data Science	
	Electronic Health Information System	
Devika P.Madalli	Knowledge orgnaization, data management, ontology engineering	Anthonu Juenhne, NIH, USA, Ingvill Mochman, GESIS, Germany
M. Krishnamurthy	Information Seeking Behaviour	Prof A Y Asundi, Dr Subhsh Reddy

Projects

Internally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Integrated and Unified Data Model for Publication and Sharing of prolonged pandemic data as FAIR Semantic Data: COVID-19 as a case study	April, 2021	3 Years	Biswanath Dutta

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Covid 19 Universal Resource Gateway	January, 2021	March 2021	Devika P. Madalli

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Global Open access portal	F 501	August, 2020	30th September, 2021	Devika P. Madalli	UNESCO	USD5000

6. ELECTRONICS AND COMMUNICATION SCIENCES UNIT (ECSU), KOLKATA

Research

The faculty and scientific members of this unit are engaged in theoretical and applied research in the broad areas of Artificial Intelligence, Statistical Machine Learning, Computational Intelligence, Image and Video Processing and Analysis, Information Theory and Quantum Information Processing.

Apart from research activities the faculty and scientific members of this unit teach in various academic courses of the Institute, supervise research scholars, present seminars, lectures, teach courses in other learned bodies, edit, review, publish and present research articles and books, organize workshops, seminars and conferences, collaborate with national and international research labs and Universities, and act as experts and members to various learned bodies and government committees.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Bhabatosh Chanda	• Image and Video Processing • Computer Vision • Mathematical Morphology • Machine learning	
Dipti Prasad Mukherjee	• Computer Vision	
Naqueeb Ahmad Warsi	• Multiparty Learning Theory • Classical and Quantum Information Theory	Rahul Jain, Anurag Anshu, Masahito Hayashi, Naresh Goud Boddu
Pinakpani Pal	• Software Engineering	Parthasarathi Ray, Debasis Jana
Partha Pratim Mohanta	• Machine/Deep Learning • Neural Networks • Artificial Intelligence • Image and Video Processing • Computer Vision	Sayed Umer, Aliah University, India, Sanjoy Kumar Saha, Jadavpur University, India, Mrinmoy Ghorai, IIIT, Sri City, India.
Swagatam Das	• Data Clustering Algorithms • Class Imbalanced Learning • Deep Generative Networks • Non-convex and constrained optimization	Dr. Jason Xu, Duke Univ., USA. Dr. Rammohan Mallipeddi, KNU, Korea Prof. Vaclav Snasel, TU Ostrava, Czech Republic Prof. Salvador Garcia, University of Granada, Spain

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Soccer Analytics using Computer Vision	April, 2020	March, 2023	Dipti Prasad Mukherjee

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Investigating Multiple Kernel Approaches for Efficient and Effective Multi-View Clustering	April, 2019	2022	Swagatam Das

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End date	Principal Investigator(s)
1	Multiple Activity Recognition and Captioning in Unconstrained Video	April, 2018	March, 2021	Partha Pratim Mohanta

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Development of Advanced Machine Learning Tools for Multi-modal Image-Assisted Diagnostics of Infectious Respiratory Diseases	E-148	October, 2020	1 Year	Swagatam Das	SERB, DST	10,00,000/-
2	Automated Coal Petrography	I-61	July 2020	July 2021	Dipti Prasad Mukherjee	TATA Steel	16.89 Lakh + GST
3	Expert Advice on Various TCS Project	1058	1st May, 2020	30th April, 2021	Pinakpani Pal, Subhomay Maitra & Samarjit Das	TCS	Rs. 45,00,000/- + 15% Institutional Overhead +18% GST

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Digital Restoration and reconstruction of Indian heritage Artifacts with focus on Murals, Manuscripts and Sculptures with Big data Technology	E118	30th April, 2019	31st March, 2022	Bhabatosh Chanda	DST	36,20,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Information Access from Document Images of Indian languages	E083	13th December, 2017	31st March, 2021	Bhabatosh Chanda	MHRD	30,00,000/-
2	Reviewing CIMS solution being developed by TCS for RBI	1063	1st February, 2020	31st July, 2020	Subhomay Maitra, Samarjit Das & Pinakpani Pal	TCS	10,00,000/- + 15% Institutional Overhead +18% GST

7. MACHINE INTELLIGENCE UNIT (MIU), KOLKATA

Research

The Machine Intelligence Unit (MIU) was established in March 1993. The objective of the unit is to carry out basic research concerning certain aspects of machine intelligence. Machine intelligence signifies the work associated with attempting to make a machine behave like a human being. In other words, it conveys the core concept of pattern recognition and machine learning with the advanced technologies like fuzzy and granular computing, neural and deep learning, evolutionary computing, and rough sets. These tools collectively constitute what is known as soft computing paradigm. They provide efficient theories of flexible information processing, which can be applied in order to tackle real life ambiguous situations in a more efficient manner like human being, and therefore, form the basis of future generation computing systems. However, traditional machine learning techniques may not operate directly on many modern problems involving huge amount of high-throughput data, and as these algorithms require pre-defined features to be extracted from data based on prior knowledge. Thus these problems pose certain challenges including extraction of appropriate features as well as identifying complex patterns embedded in them. Recently, some of the faculty members have been attracted towards these challenges, and have started working in the area of deep learning, under Big Data platform, both from the perspectives of theory and applications. The applications include bioinformatics, personalized medicine, computer vision, medical image processing and network analysis, while the theoretical study will deal with developing novel deep neural network

models with optimized architecture and appropriate learning algorithms for solving certain problems. Keeping, the above mentioned facts in mind, investigations are being carried out in MIU comprise both the development of these technologies individually and in an integrated (hybridized) manner. They demonstrate their effectiveness in solving various problems of pattern recognition, machine learning, bioinformatics, systems biology, image and video analysis, computer vision, data and web mining, social network analysis, among others, related to the design of intelligent systems. Investigations in certain areas of web and social network mining, video image analysis and medical image analysis are also in focus.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Ashish Ghosh	Machine learning, bioinformatics	Dr. Jonathan H. Chan, Associate Professor, King Mongkut's University of Technology Thonburi, Thailand
	Image processing	Dr. T. Veerakumar, Assistant Professor, National Institute of Technology, Goa
	Video analysis	Dr. B. N. Subudhi, Assistant Professor, Indian Institute of Technology, Jammu
	Evolutionary computation	Dr. S. Dehuri, Professor, F. M. University, Balasore, Odisha, India
	Soft computing	Dr. S. B. Cho, Professor, Yonsei University, South Korea
B. Uma Shankar	Machine Learning, Global Terrestrial Gross Primary Productivity (GPP) Mode, Eddy Flux Covariance Data	A. Ghosh, Bikash R. Parida,
	Vision, Image Analysis and Perception	R. Das, T. Chakraborty, K Ghosh
	Coal Petrography	Avinash Kumar Tiwary, Suman Ghosh, Rashmi Singh, Dipti Prasad Mukherjee, Pratik Swarup Dash
Kuntal Ghosh	Machine vision, perception, complex networks, image processing	Ashish Bakshi, Rajdeep Das, Swarup Chattopadhyay, Srutiparna Neogi
Malay Bhattacharyya	Crowdsourcing, Big Data Analysis, Computational Biology	Niranjan Nagarajan, Christopher E. Mason, Emmanuel Dias-Neto, Eran Elhaik, Christelle Desnues, Michael Poulsen
Pradipta Maji	Machine Learning and Data Analysis	Partha Garai (Kalyani Govt. Engg. College), Ankita Mandal (ISI), Aparajita Khan (ISI), Ekta Shah (ISI)
	Multimodal Data Analysis	Ankita Mandal (ISI), Aparajita Khan (ISI)
	Deep Learning	Debamita Kumar (IS)
	Medical Imaging	Ratan K Saha (IIIT, Allahabad), Sumit Banerjee (AIIMS, Jodhpur), Abhirup Banerjee (Oxford University), Shaswati Roy (RCC-IIT, Kolkata), Ashish Phophalia (IIIT, Vadodara)
	Bioinformatics	Sushmita Paul (IIT-Jodhpur), Sudipto Saha (Bose Institute), Ekta Shah (ISI)
Rajat Kumar De	Computational Biology, Computational Systems Biology, Machine Learning	Sushil Mahata (USCD, USA), Abhijit Dasgupta (UCD, Ireland)
Sanghamitra Bandyopadhyay	Evolutionary Optimization	Monalisa Pal (Mathworks), Sriparna Saha (IIT, Patna)
	Multi-Objective Building Energy Management	Stephane Ploix (INP Grenbole), Monalisa Pal (Mathworks)
	Bioinformatics and Computational Biology	Malay Bhattacharyya (MIU, ISI), Sumanta Ray (Aliah University), Ujjwal Maulik (Jadavpur University), Debarka Sengupta (IIIT, Delhi), Abhik Ghosh
	Pattern Recognition	Abhik Ghosh
Shubhra Sankar Ray	Bioinformatics, Computational Biology, Neural Networks, Soft Computing	Jayanta K. Pal, Sampa Misra, and Sudip Ghosh.
Sushmita Mitra	Medical image analytics	Dr. Indranil Mullick, TMC Kolkata Dr. Rajiv Raman, Sankara Nethralaya, Chennai Dr. Ashish Dhara, NIT Durgapur
	Deep and shallow learning	Prof. Lawrence O. Hall, USF Tampa, USA Prof. Marley Vellasco, PUC Rio, Brazil
	COVID19 applications	Dr.Nilanjan Saha, Jamia Hamdard, New Delhi
	Bioinformatics	Dr. Raghunath Chatterjee, HGU, ISI

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Judgment Analysis on Multi-dimensional Crowd Opinions	April, 2020	3 years	Malay Bhattacharyya
2	Habitat imaging for survival prediction in radio genomics	April, 2020	31st March, 2023	Sushmita Mitra
3	Multi-Omics Data Integration for Cancer Subtype Discovery	April, 2020	March, 2023	Pradipta Maji
4	Machine Learning based Global Terrestrial Gross Primary Productivity (GPP) Model Development using Satellite Driven observation and Eddy Flux Covariance Data.	April, 2020	March, 2023	B. Uma Shankar

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Big Data Challenges in Biology: Algorithms for Single Cell Transcriptomic Analysis	1st April, 2019	31st March, 2022	Sanghamitra Bandyopadhyay
2	Three Timescale Modeling of Biochemical Pathways: Integration of Signaling, Gene Regulatory and Metabolic Pathways	1st April, 2019	31st March, 2022	Rajat K. De
3	Identifying various stages of cancer using miRNA Expressions	April, 2019	March, 2022	Shubhra Sankar Ray

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Distributed deep learning for multi-label classification	1st April, 2018	31st March, 2021	Ashish Ghosh
2	Understanding the mechanisms of perceptual filling-in and attention in low-level vision	2018	2021	Kuntal Ghosh
3	Designing Feedback Mechanisms for Crowdsourcing Markets	August, 2019	June,2020	Malay Bhattacharyya

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Technology Innovation Hub on Data Science, Big Data Analytics and Data Curation	E151	August, 2020	5 years	Ashish Ghosh	DST	1,00,00,00,000/-
2	Network Based Prediction of COVID-19 Spread in India under Migration	E-147	July, 2020	1 year	Malay Bhattacharyya	SERB, Department of Science and Technology, Government of India	5,50,000/-
3	Distributed cognitive system for healthcare	E143	April, 2020	March, 2023	Ashish Ghosh	MEITY, New Delhi	1,32,55,000/-
4	Understanding the Efficacy of Existing Drug Molecules on COVID-19 through an Interactive Pathway: A Deep Learning based Predictive Model	E-146	16th July, 2020	15th July, 2021	Rajat K. De	SERB, DST	5,00,000/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Deep Learning for Handling Imbalance in Diabetic Retinopathy	F008	1st December, 2018	30th November, 2021	Sushmita Mitra	Intel, USA	8070 USD
2	Hardware Trojan detection in PCBs using X-ray images		1st October, 2019	3 years	Ashish Ghosh	DRDO	63,38,000/-
3	Cluster project under data science research (a consortium of 23 projects from different Institutes in India	E113	April, 2019	March, 2022	Ashish Ghosh	DST	12,12,19,040/-
4	Machine Learning in Data Science	E112	April, 2019	March, 2022	Ashish Ghosh	DST	83,47,400/-
5	Copula Functions in Analysis of Single Cell Gene Expression Data	E057	February, 2017	February, 2022	Sanghamitra Bandyopadhyay	JC Bose Fellowship Project, DST, Govt. of India	95,00,000/-
6	Multi-dimensional research to enable systems medicine: acceleration using a cluster approach	E065	January, 2017	January, 2022	Sanghamitra Bandyopadhyay	Department of Biotechnology (DBT)	15,08,18,000/-
7	Development of Computational Techniques to Integrate Multimodal, Multiscale Omics and Imaging Data for Cancer Diagnosis and Prognosis	E036	May 2016	April 2021	Pradipta Maji	Ministry of Electronics and Information Technology, Government of India	37,00,000/-

8. SYSTEMS SCIENCE AND INFORMATICS UNIT (SSIU), BANGALORE

SSIU is a mutidisciplinary unit for scientific computation specializing in Informatics and Machine Learning. Currently, our research areas include; Mathematical Morphology, Mathematical Earth Sciences, Spatial Data Science, Neuroinformatics, Computational Neuroscience, Machine Learning, Granular Computing, Domain adaptation, Quantum condensed matter theory, quantum computation, quantum information, Graphene physics. We have plans to offer postgraduate-level courses in Informatics and Machine Learning. We want to consolidate our current areas of research with internal (within ISI) and external collaboration. We brought quite a good amount of external funding and looking forward to getting more. Our research publications are on par with any top notch University across the globe. We are also looking forward to industry collaboration. ISI has eight master's and two bachelor's programs. SSIU faculties have taught or are still teaching in five master's and one bachelor's programs. SIU faculties also guided the dissertation of MSLIS, M.Tech. (CS), MSQMS, M.Math. and B.Math.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
B. S. DayaSagar	Triplet Watershed for Hyperspectral Image Classification	Aditya Challa, Sravan Danda, Laurent Najman
	Digital Elevation Models and Spatial Data Science	Geetika Barman, Lim Sin Liang
	Hyperspectral Image Classification via Mathematical Morphology	Sampriti Soor, Geetika Barman
	Granulometries in Digital Elevation Model Analyses	K. Nagajothi and Ashok Vardhan
	Spatial Social Data Science	H. M. Rajasekhara
P. Chakraborty	Quantum Monte Carlo simulations of strongly correlated systems	R. Narayanan
	Twisted bilayer Graphene	K. Sengupta

Faculty name	Research topic(s)	Collaborator(s)
Saroj K. Meher	Domain adaptation-based classification models	Neeta S. Kothari and Ganapati Panda
	Granular Neural Network with Semisupervised Learning-based classification models	Neeta S. Kothari
	Neural Network with Semisupervised Learning-based classification models	
	Representative learning with deep neural networks	
	Human Sentiment Analysis	S. Sagnik and B.S.P. Mishra

PROJECTS:

Externally funded project:

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Analysis of Optical and Radar Remote Sensing Images for Dynamic Earth Process Monitoring	E511	April, 2019	3 Years	BS DayaSagar, Subhashish Chaudhuri (IIT-B), Arundhathi Misra (ISRO-SAC), Laurent Najman (University of Trento)	DST-ITPAR-IV: Govt. of India	1,36,00,000/-
2	An efficient measure of network synchronizability with applications	E514	21st February, 2020	3 Years	Kaushik Majumdar	DST-SERB	6,60,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Quantitative Morphologic and Scaling Analyses of Lunar Digital Elevation Models (LDEM) Derived from TMC Data of Chandrayaan-1 Mission via Mathematical Morphology and Fractal Geometry	E 505	January, 2017	June, 2020	B.S. DayaSagar	ISRO-Department of Space	28,00,000/-

ISI, Bangalore Centre

PHYSICS AND EARTH SCIENCES DIVISION (PESD)

Professor In-Charge	:	PARTHASARATHI GHOSH, GSU, Kolkata (1st Apr 2020 – 17th Sep 2020)
Office	:	2nd floor, Platinum Jubilee Building, ISI, Kolkata-700 108
Professor In-Charge	:	PREETI PARASHAR, PAMU, Kolkata (18th Sep 2020 - 31st Mar 2021)
Office:		7th floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

01

Geological Studies Unit (GSU), Kolkata

Head of Unit	:	DHURJATI PRASAD SENGUPTA and SARBANI PATRANABIS DEB
Number of Faculty/ Faculty-equivalent:		Nine (9)
Number of Non-Scientific Workers	:	Six (6)
Number of Research Scholars	:	Twelve (12)
Office	:	2nd floor, Platinum Jubilee Building, ISI, Kolkata-700 108

02

Physics and Applied Mathematics Unit (PAMU), Kolkata

Head of Unit	:	GURUPRASAD KAR
Number of Faculty/ Faculty-equivalent:		Ten (10) + Three (3) (Inspire Faculty)
Number of Non-Scientific Workers	:	Three (3)
Number of Research Scholars	:	Twenty-Eight (28)
Number of Visiting Scientists	:	Five (5)
Office	:	7th floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

03

Theoretical and Applied Sciences Unit (TASU), North-East Centre, Tezpur

Head of Unit	:	KUNTAL GHOSH
Number of Faculty/ Faculty-equivalent:		Three (3)
Office	:	Punioni, Solmara, ISI, Tezpur, Assam- 784501

1. GEOLOGICAL STUDIES UNIT (GSU), KOLKATA

Geological Studies Unit (GSU), Indian Statistical Institute, Kolkata teaches basic ideas of Earth System Science to the B.Stat students. Faculties of the unit supervise research students working for their Ph.D. degrees, conduct course work for Ph.D students. Students are also trained to carry out extensive geological field work and techniques of data collection. At the same time, computational techniques are also used for geological modelling by numerical simulation and development of software to suit specific needs of the unit. At present, research works in the Geological Studies Unit are focused on several different aspects of Earth Science. They are as follows-

1) Crustal Geodynamics 2) Evolution of Sedimentary Basins with their sedimentology, paleoclimate and depositional history 3) Phanerozoic Faunal Record as widows to Evolutionary and Developmental Paleobiology 4) Numerical analysis and modelling of geological data and geological systems

GSU maintains a unique museum that housed the oldest mounted skeleton of a herbivore dinosaur named *Barapasaurus*.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Amlan Banerjee	Sedimentology, geochemistry, geochemical modeling	Prof. S. Patranabis Deb; Prof. Dilip Saha; Dr. Tridib Mandal; Dr. M. Słowakiewicz
Debarati Mukherjee	Bone histology and functional attributes of premaxillae of *Hyperodapedontikiensis* from the Upper Triassic Tiki Formation of India	Prof. Sanghamitra Ray, IIT, Kharagpur
	Signature of diagenetic alteration of dicynodont bones from coeveal Permian-Triassic horizons of South Africa and India: palaeoenvironmental implications	Prof. Anusuya Chinsamy-Turan, University of Cape Town, South Africa
	Revision of the basal Archosauromorhs from South Africa	C. Browning, Curator, Karoo Palaeontology, Iziko Museum, Cape Town, South Africa
Dhurjati Prasad Sengupta	Evolution, diversity and taphonomy of Triassic Gondwana Vertebrates, Morphometry, Gondwana stratigraphy (Triassic)	Prof. Saswati Bandyopadhyay; Prof. Susmita Sur-Kolay (ACMU); Somobali Ghoshal SRF, CU; Ms. Sanjukta Chakravorti, SRF and Visiting Sc., GSU, Dr.Saradee Sengupta, Durgapur Govt. College; Geologists of Paleontology Division, CHQ, Geological Survey of India; Dr. Dorota Konietzko-Meier, Depatment of Biosystematics, University Opole, Poland; Elzbieta Teshner, Opole; Prof. Richard Butler University Birmingham; Dr. Martin Ezcura Museo Argentino de Ciencias Naturales
	Taphonomy of Eocene larger benthic foraminifera and coeval macrofaunaof Kutch Basin	Prof. Parthasarathi Ghosh; (GSU); Ms. Sreemoyee Chakravorti SRF, GSU
Dilip Saha	Archean greenstone belts, Proterozoic basins	S. Patranbis-Deb, A. Banerjee
Parthasarathi Ghosh	Sedimentology of the Mesozoic freshwater carbonates	Suprana Goswami
Sarbani Patranabis-Deb	Neoproterozoiccratonic basins in southern India	Prof. Dilip Saha, ISI, Kolkata; Dr. Amlan Banerjee, ISI, Kolkata; Prof. Sarbani Palit, ISI, Kolkata; Prof. Michiel Olivier De Kock, University of Johannesburg, SA; Prof. N. J. Beukes, University of Johannesburg, SA; Prof. M.E. Tucker, University of Bristol, UK.
Saswati Bandyopadhyay	New erythrosuchid from the Middle Triassic Yerrapalli Formation, P-G Basin	Martin Ezcurra
	New Proterosuchid archosauriform from Early Triassic Panchet Formation, Damodar Basin	Martin Ezcurra, Richard Butler
	Azendohsaurids (Archosauromorpha: Allokotosauria) from the Late Triassic of the Western United States and India	Sterling Nesbitt, Martin Ezcurra, Nick Fraser

Faculty name	Research topic(s)	Collaborator(s)
Shiladri Shekhar Das	Whale (Delphinidae) fall fauna from the lower Miocene of Kutch, India	P. Goswami and S. Panja
	The youngest *Talantodiscus* (Gastropoda) from Kutch, western India: systematics and paleobiogeography	S. Saha, and S. Mondal
	Evolution and extinction of *Chartronella* (Gastropoda): A study from the uppermost Jurassic of Kutch, India.	S. Bardhan and S. Saha
	Global paleobiogeographic distributions and migration patterns of the Cenozoicpleurotomariid gastropods (Family: PleurotomariidaeSwaison, 1840)	K. Bose and S. Mondal
	A new giant strombidgastropod*Dilatilabrumgajensis*n. sp. from the Miocene ofWestern India and its paleobiogeographic implications.	K. Bose and S. Saha
	Gastropod drilling predation in the Upper Jurassic of Kutch, India	R. Saha; S. Paul; S. Mondal; S. Bardhan; S. Saha and D. Sarkar
	Ichnology and paleoecology of a Middle Eocene assemblage from Fulra Formation, Matanomadh, Kutch, Gujarat	A Chakraborty; S. Mondal and U. Sarkar
	Systematics, Palaeobiogeography of Palaeogene Gastropoda of Kutch, Gujarat.	A Ghosh
Tapan Chakraborty	Sedimentology and provenance study of Neogene sediments in NE India (Arunachal, Mizoram)	S. Patranabis-Deb Yani Nazman S. Taral A. Debnath
	Automated petrographic analysis of sandstone using image processing technique on photomicrographs	Kuntal Ghosh B. Uma Shankar R. Das
Tridib Kumar Mondal	Structural Geology and Tectonics Fabric analysis Paleostress analysis Structural control on mineralization Vein emplacement and upper crustal fluid flow Mechanical characterization of apparently massive and foliated rocks	Dr. Amlan Banerjee Prof. Manish Mamtani Prof. Thirukumaran V Prof. Sakhawat Hossain Dr. Arnab Sain Dr. Sourav Mondal Prof. Susanta Samanta

Projects

Internally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Micro- and mega- vertebrate and Palynological studies of Panchet formation, Damodar valley basin, india. (Project with GSI through MOU) No separate finding)	24th October, 2019	24th October, 2022	Dhurjati Prasad Sengupta and GSI officers
2	Paleoenvironmental significance of freshwater carbonates in the Upper Gondwanas of India	1st April, 2019	31st March, 2022	P. Ghosh
3	Neoproterozoiccratonic basins in southern India: Palaeoclimatic, palaeoenvironmental and palaeotectonic implications.	1st April, 2019	31st March, 2022	Sarbani Patranabis Deb

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Paleogeography of the Neogene foreland basin of Eastern Himalaya and its relationship with contemporaneous sediments of Mizoram.	2018	2021	T. Chakraborty
2	Gondwana vertebrates of peninsular India; a new perspective from field collection and morphometricdata	1st April, 2018	31st March, 2021	Dhurjati Prasad Sengupta

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Systematics, Palaeobiogeography and change in diversity of Tertiary Gastropoda of Kutch, Gujarat.	E108	12th October, 2018	11th October, 2021	Shiladri Shekhar Das	SERB, DST, Govt. of India	41,40,640/-

2. PHYSICS AND APPLIED MATHEMATICS UNIT (PAMU), KOLKATA

The main areas of research in Physics & Applied Mathematics Unit are Theoretical Physics and various areas in Applied Mathematics. Additionally, some experimental work is also being done in the Fluvial Mechanics Laboratory of this Unit.

In a nutshell, the areas of physics in which Scientists of the Physics & Applied Mathematics Unit (PAMU) have been working, are Astrophysics & Astrophysics related Data Science, Cosmology and Astroparticle Physics, High Energy Physics, Condensed Matter Physics, Mesoscopic Physics and Nano-electronics, Physics of Complex Phenomena, Quantum Field Theory, Quantum Information Theory, Foundation of Quantum Mechanics and Quantum Thermodynamics.

The areas of Applied Mathematics in which Scientists of the Physics & Applied Mathematics Unit (PAMU) have been working, are Nonlinear Dynamical Systems, Temporal Networks, Quantum Coherence as Resource Theory, Study of Quantum Channel and Quantum Cryptography. There is an externally funded new project on Synchronization, clustering and death in Networks of Complex systems (Theories having applications in Biology and Neurophysiology).

The areas in which experiments are performed in Fluvial Mechanics Laboratory of this Unit are Sediment-Fluid Interactions, Flow Visualization and Turbulent Flow in Open Channel.

During last one year, there have been around 63 publications by PAMU that also include some publications by Inspire Faculties and some publications exclusively by research students with their collaborators. The International journals in which papers have been published include Physical Review A, B, E, D, Chaos, Physical Review Letters etc.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Banasri Basu	Theoretical Condensed Matter Physics	Prof. Anirudha Menon, California, USA; Prof. Tanay Nag, SISSA, Trieste, Italy
	Physics of Complex phenomena	Dr. Abhik Ghosh, ISI, Kolkata
Dibakar Ghosh	**Eco-evolutionary dynamics:** Prisoner's dilemma, Social dilemmas, Cyclic dominance, delayed eco-evolutionary dynamics	Prof. Matjaz Perc (University of Maribor, Slovenia)
	Swarmalators: Synchronization, Spatial pattern, Active particles, Flocking birds motion	Prof. Stefano Boccaletti (CNR-Institute of Complex Systems, Florence, Italy)
	Extreme Event: origin of extreme event, statistical analysis, mobile agents, early detection of extreme event	Prof. Tomasz Kapitaniak (Lodz University of Technology, Poland); Prof. Syamal K. Dana (Department of Mathematics, Jadavpur University, Kolkata)
	Temporal networks: synchronization, analytical stability analysis, hypernetwork, multiplex network, amplitude death	Prof. Erik M. Bollt (Clarkson University, Potsdam, NY); Prof. Sudeshna Sinha (IISER Mohali); Prof. Jürgen Kurths (Potsdam Institute for Climate Impact Research, Potsdam, Germany)

Faculty name	Research topic(s)	Collaborator(s)
Guruprasad Kar	Study of Quantum Switch	Dr. Manik Banik, IISER, Thiruvananthapuram; Dr. Arup Roy, ABN Seal College, Coachbehar; Dr. Some Sankar Bhattacharya, Univ. of Hong Kong; Sutapa Saha, ISI, Kolkata; Tamal Guha, ISI, Kolkata
	Dintinguishability of Multi-partite Quantum States	Prof. Sibasish Ghosh, IMSc, Chennai; Dr. Ramij Rahaman, ISI, Kolkata; Dr. Manik Banik, IISER, Thiruvananthapuram; Dr. Some Sankar Bhattacharya, Univ. of Hong Kong
Preeti Parashar	Quantum Thermodynamics	Tamal Guha, ISI, Kolkata; Mir Alimuddin, ISI, Kolkata
Ramij Rahaman	Quantum Cryptography and Quantum Nonlocality	Prof. Guruprasad Kar, ISI, Kolkata
	Quantum Oblivious Transfer	Prof. Sibasish Ghosh, IMSc, Chennai & Prof. M. Zukowski, University of Gdansk, Poland.
	Graph states	Prof. M G. Parker, University of Bergen, Norway
Sankar Sarkar	Turbulent flow in open channel	Prof. Subhasish Dey, IIT, Kharagpur
	Electrokinetic Theory	Dr. Partha P. Gopmandal, NIT Durgapur
Santanu K. Maiti	Thermoelectric study for efficient energy conversion.	S. Chakraborty, ISI, Kolkata; S. Roy, ISI, Kolkata; J. Majhi, ISI, Kolkata
	Spintronics in magnetic helix structures.	S. Sarkar, ISI, Kolkata; A. Koley, ISI, Kolkata; D. Das Gupta, ISI, Kolkata
	Topological states and localization phenomena.	R. Bhattacharya, ISI, Kolkata; Dr. M. Patra (Kwansei Gakuin University), Japan
	Transport properties in presence of light irradiation	Dr. M. Dey (Adamas University); Prof. S. Sil (Visva-Bharati University)
	Transport phenomena in interacting quantum systems.	Prof. J. Silva (Universidad Pedagogica, Colombia); Prof. D. Laroze (Universidad de Tarapaca, Chile)
Swapan Rana	Quantum Coherence, Quantum channels	Prof. Alexander Streltsov
Supratik Pal	Cosmology and Astroparticle Physics	Abhishek Naskar, ISI, Kolkata; Arnab, Paul, ISI, Kolkata; Tony Pinhero, ISI, Kolkata; Debabrata Chandra, ISI, Kolkata; Antara Dey, ISI, Kolkata
	Data Science	Soumendra Kishore Roy, University of New York, USA; Dr. Anish Ghoshal, INFN, Rome; Dr. Ayan Mitra, Nazarbayev Univ. Kazakhastan
Subir Ghosh	Higher derivative gravity	Dr. Sumanta Chakrabarty, IACS, Jadavpur
	Quantum mechanical back flow	Dripto Biswas, NISER, Bhubaneswar
	Anyon physics	Joydeep Majhi, ISI, Kolkata

Projects

Internally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Turbulent flow over a bimodal water-worked sedimentary bed	April, 2019	April, 2022	Sankar Sarkar

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Unravelling the interdisciplinary facets of physics and data sciences in real life socio-economic challenges.	E-135	26th December, 2019	25th December, 2022	Banasri Basu	SERB	21,19,546/-

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
2	Indo-Russian Joint project	E-139	21st January, 2020	20th January, 2022	Dibakar Ghosh	SERB-DST, Government of India and Russian Foundation for Basic Research (RFBR)	16,34,200/-
3	Quantum transort in mesoscale and nanoscale systems: Open problems and challenges	E-103	14th September, 2018	13th September, 2021	Santanu K. Maiti	DST-SERB, India	18,60,980/-

3. THEORETICAL AND APPLIED SCIENCES UNIT (TASU), NORTH-EAST CENTRE, TEZPUR

Research

The Theoretical and Applied Sciences Unit (TASU) at the North-East Centre of the Institute was established in August 2018.The goal of the Unit is to pursue research in basic theoretical sciences and emerging interdisciplinary and multidisciplinary areas. The Unit aims to complement research and development on Sustainable Development Goals, in line with the ongoing work of MoSPI towards monitoring progress on the environmental indicators. The research topics of this Unit include: Crop health and structural change monitoring using satellite imagery in Tezpur, Assam, Change detection around Kaziranga National Park, Effect of Lockdown for COVID-19 on vegetation health and environmental parameters; Lipschitz Geometry, O-minimal Structures; Air quality and exposure assessment, Source apportionment, risk assessment and study of fate of polycyclic aromatic hydrocarbons (PAHs) in the atmosphere, Retrieval of the historical atmospheric levels (~150 years) of black carbon using lake sediments. Six scientific papers were published in journals.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Darpa Saurav Jyethi	Polycyclic aromatic hydrocarbons (PAHs) exposure, source apportionment and risk in the environment.	P. S. Khillare, Jawaharlal Nehru University, New Delhi
Sanjit Maitra	Crop Health Monitoring	Rituraj Gogoi
	Change detection around Kaziranga National Park	Tapan Chakraborty (GSU), Kuntal Ghosh (MIU); Aniruddha Dey (MAKAUT); Srutiparna Neogi (IIIT, Kalyani); Geetanjali Aich, Suchismita Bhattacharya
	Effect of Lockdown for COVID-19 on vegetation health and environmental parameters	
Saurabh Trivedi	Lipschitz Geometry, O-minimal Structures	D. Trotman (Aix-Marseille University, France); N. Nguyen (Basque Center for Applied Mathematics, Spain), M. Ruas(University of Sao Paulo, Brazil)

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Modeling crop growth and detection of stress regions during the growing season in Sonitpur district, Assam	5th June, 2020	31st March, 2023	Sanjit Maitra
2	Assessment of Atmospheric Particulate Matter ($PM_{2.5}$) and associated Elemental Carbon, Organic Carbon and Water Soluble Organic Carbonat Tezpur, Assam	1st April, 2020	31st March, 2023	Darpa Saurav Jyethi

SOCIAL SCIENCES DIVISION (SSD)

Professor In-Charge	:	E. SOMANATHAN, EPU Delhi (1st Apr 2020 – 17th Sep 2020)
Office	:	7, S.J.S. Sansanwal Marg, ISI, New Delhi- 110 016
Professor In-Charge	:	MANIPUSHPAK MITRA, ERU Kolkata (18th Sep 2020 - 31st Mar 2021)
Office	:	6th floor, S.N. Bose Bhavan, ISI, Kolkata-700 108

01

Economic Analysis Unit (EAU), Bangalore

Head of Unit	:	MADHURA SWAMINATHAN
Number of Faculty/ Faculty-equivalent	:	Two (2)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	One (1)
Number of Research Scholars	:	Ten (10)
Number of Visiting Scientists	:	Two (2)
Office	:	8th Mile, Mysore Road, ISI, Bangalore- 560 059

02

Economics and Planning Unit (EPU), Delhi

Head of Unit	:	DEBASIS MISHRA
Number of Faculty/ Faculty-equivalent	:	Eleven (11)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	One (1)
Number of Research Scholars	:	Thirty-Four (34)
Number of Visiting Scientists	:	Five (5)
Number of Research Scholars	:	Thirty-four (34)
Office	:	7, S.J.S. Sansanwal Marg, ISI, New Delhi- 110 016

03

Economic Research Unit (ERU), Kolkata

Head of Unit	:	TARUN KABIRAJ
Number of Faculty/ Faculty-equivalent	:	Twelve (12) [including one contractual faculty member]
Number of Scientific Workers	:	Two (2)
Number of Non-Scientific Workers	:	Four + one part time half (4 & 1 part time)
Number of Research Scholars	:	Eleven (11)
Number of Visiting Scientists	:	Two (2)
Office	:	6th floor, S.N. Bose Bhavan, ISI, Kolkata-700 108

04

Linguistic Research Unit (LRU), Kolkata

Head of Unit	:	NILADRI SEKHAR DASH
Number of Faculty/ Faculty-equivalent	:	One (1)
Number of Non-Scientific Workers	:	Three (3)
Number of Research Scholars	:	One (1)
Office	:	Ground floor, R.A. Fisher Bhavan, ISI, Kolkata-700 108

05

Population Studies Unit (PSU), Kolkata

Head of Unit	:	PRASANTA PATHAK
Number of Faculty/ Faculty-equivalent	:	One (1)
Number of Scientific Workers	:	Two (2)
Number of Non-Scientific Workers	:	Two (2)
Number of Visiting Scientists	:	One (1)
Office	:	5th floor, R.A. Fisher Bhavan, ISI, Kolkata-700 108

06

Psychology Research Unit (PRU), Kolkata

Head of Unit	:	DEBDULAL DUTTA ROY
Number of Faculty/ Faculty-equivalent	:	Two (2)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	Three (3)
Number of Visiting Scientists	:	Two (2)
Office	:	7th floor, Platinum Jubilee Building, ISI, Kolkata-700 108

07

Sampling and Official Statistics Unit (SOSU)

Head of Unit	:	NACHIKETA CHATTOPADHYAY
Number of Faculty/ Faculty-equivalent	:	Four (4)
Number of Non-Scientific Workers	:	3 (Three) full time regular +2 (Two) regular part time + 1 (One) contractual employee
Number of Visiting Scientists	:	One (1)
Office	:	3rd floor, C.D. Deshmukh Bhavan, ISI, Kolkata-700 108

08

Socio-Economic Research Unit (SERU), North-East Centre, Tezpur

Head of Unit	:	GOUTAM MUKHERJEE
Number of Faculty/ Faculty-equivalent	:	Two (2)
Office	:	Punioni, Solmara, ISI, Tezpur, Assam- 784501

09

Sociological Research Unit (SRU), Giridih & Kolkata

Head of Unit	:	TARUN KABIRAJ
Number of Faculty/ Faculty-equivalent	:	One (1)
Number of Scientific Workers	:	Two (2)
Number of Non-Scientific Workers	:	Two (2)
Number of Research Scholars	:	One (1)
Number of Visiting Scientists	:	One (1)
Giridih Office	:	New Barganda, ISI, Giridih, Jharkhand- 815 301
Kolkata Office	:	5th floor, R.A. Fisher Bhavan, ISI, Kolkata-700 108

1. ECONOMIC ANALYSIS UNIT (EAU), BANGALORE

Research

The Unit is actively engaged in quantitative and qualitative research on the rural economy including on issues of food Security and agricultural growth. An area of special interest has been the role of women in the rural work force, including in rice production, in livestock raising and in the tea sector. Growing inequalities by caste, class, gender and region have been documented. We have actively engaged with policy issues be it the price policy for crops or wage policy or the public distribution system or identifying gender gaps in data collection.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
H.M. Rajashekara	Geographical Information Systems, Spatial Social Science, Computational Social Systems	B.S. DayaSagar, Professor, Systems Science and Informatics Unit, ISI, Bangalore K. Nagajothi, Regional Remote Sensing Centre, Indian Space Research Organisation, Bangalore
Madhura Swaminathan	Rural credit market, Women in farming, inequalities in rural India, Food security, Gender gaps in data,	
Molly Chattopadhyay	Gender and labour; Official Statistics regarding Women's Labour in India	

2. ECONOMICS AND PLANNING UNIT (EPU), DELHI

Research

Economics and Planning Unit at Delhi comes under the Social Sciences Division of ISI. We carry out research in the areas of economic theory, applied economics and econometrics, macroeconomics, growth theory, econometric methods, time series analysis and economic statistics. Some specific areas are: welfare economics, industrial economics, game theory and applications, international economics, public economics, financial economics, agricultural economics, development economics, environmental economics, issues on living standards, gender studies and labour economics. While the quantitative and applied work involves extensive application of existing statistical and mathematical tools, substantial contribution is being made in econometric and time series methods in the areas of macro-econometrics, micro-econometrics and financial econometrics.

Economics and Planning Unit has a doctoral program in Economics and a Master's program called Masters in Science in Quantitative Economics (MSQE). We offer courses in Microeconomics, Macroeconomics, Statistics and Econometrics, Mathematics for Economists, Economic Development, Game Theory, Macro Dynamics, International Economics, Finance, Industrial Organization, Dynamic Programming, Applied Econometrics, Time Series Econometrics, Social Choice and Political Economy, Public Economics, Intertemporal Economics, and Environmental Economics, and many more. Details about courses and our Masters and doctoral program can be found under the Academics link.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Abhiroop Mukhopadhyay	Teacher Transfer Policy, Science Choice in High Schools, Macro Returns to Tertiary Education in Rural India, Social Cohesion, Migration, Education and Adverse weather, Political Economy	Soham Sahoo (IIM, Bangalore), Akanksha Agrawal (ISI, Delhi), Amparo Climent (University of Valencia), Ravinder (ISI, Delhi), Prachi Joshi (ISI, Delhi), Latika Chaudhuri (Naval Post Graduate School), Prasad Bhattacharya (Deakin University), Ajay Sharma (IIM, Indore), Sumit Mazumdar (University of York), Papiya Mazumdar (University of York), Rolly Kukreja (ISI, Delhi)
Arunava Sen	Mechanism design, auction theory, decision theory, social choice theory	Ujjwal Kumar, Debasis Mishra, Souvik Roy, Sonal Yadav, Huaxia Zeng, Antonio Nicolo.
Chetan Ghate	Dynamics of Public Debt	Piyali Das
	Redistribution and Monetary Policy	Debdulal Mallick and Ojasvita Bahl
Debasis Mishra	Mechanism design, auction theory, game theory, social choice theory	Sushil Bikhchandani, Arunava Sen, Rajiv Vohra

Faculty name	Research topic(s)	Collaborator(s)
Farzana Afridi	Home Production Technology and Women's Time Allocation in Rural India	Sisir Debnath and Taryn Dinkelman
	The Gendered Effects of Climate Change: Production Shocks and Labor Response in Agriculture	Kanika Mahajan and Nikita Sangwan
	Votebuying	Shabana Mitra and Sujata Visaria
	Electoral Cycles and Public Goods Provision: Evidence from India	Ahana Basistha, Amrita Dhillon and Arka Roy Chaudhuri
	Social Networks, Social Norms and Women's Labor Supply	Amrita Dhillon and Sanchari Roy
	Beliefs, Information and Anti-corruption during Covid-19	Ahana Basistha, Amrita Dhillon and Danila Serra
Kanishka Kacker	Estimating the effect of coal plants on air pollution	E. Somanathan (ISI, Delhi), S. Dey (IIT, Delhi), R. Choudhary (World Bank)
	Transport congestion and air pollution	R. Gupta (South Asian University), S. Ali (IIIT, Delhi)
	Inter-regional competition amongst coal mines	I. Lange (Colorado School of Mines)
	Pensions and Labor Supply	
	Cost and Benefits of COVID containment policies	T. Garg (ISI,Delhi)
	Relational investment and Firm Exit during a Pandemic	C. Ahuja (ISI,Delhl)
Monisankar Bishnu	Pension, Intergenerational transfers, taxes, time inconsistencies, fertility, labor force participation, resource economics	F Afridi (ISI,Delhi), Amol Amol (University Minnesota), J Bhattacharya (Iowa State), S Garg (Harvard), T Garg (MIT), CS Kumru (ANU), K Mahajan (Ashoka University), T Ray (ISI, Delhi)
Mudit Kapoor	Health economics (Prevalence of low birth weight in India, Seasonality in nutritional outcomes)	UNICEF
	Decomposition of neonatal mortality between the rich and poor	UNICEF
	Prediction of early neonatal sepsis	AIIMS
	The association between exposure to open biomass burning and hypertension prevalence in North India	AIIMS
Prabal Roy Chowdhury	Honesty or Talent in Project Implementation	Parimal Bag
	Activists and Politicians	Mayank Mundhra and Jaideep Roy
	MFI Competition in the Presence of Moneylenders: Theory and Evidence	Shyamal Chowdhury
	Regulation of Consumer Data: Privacy and Welfare	Gaurav Jakhu
	Holdup and Gradualism	Kunal Sengupta
	Land Ceiling, Land Acquisition and De-industrialisation - Theory and Evidence from the Indian States	Sarmistha Pal and Zoya Saher
	Spatial Inequality and Economic Development	Namrata Gulati
	Fairness is flexible: A study of competing focal points	Priyanka Kothari and Subrata Banerjee
	Corrupt Principal and Corruptible Agent	Nilesh Jain
E. Somanathan	Electric Stoves as a Solution to Household Air Pollution: Evidence from India	E. Somanathan, Eshita Gupta, Marc Jeuland, Rachit Kamdar, Utkarsh Kumar, T. V. Ninan, Vidisha Chowdhury, Suvir Chandna, Michael H. Bergin, Karoline Barkjohn, Christina Norris, T. Robert Fetter and Subhrendu K. Pattanayak
	A platform for linking community reforestation efforts with global actors and resources	R. Prabhakar and Ruchinilo Kemp

Faculty name	Research topic(s)	Collaborator(s)
	Drilling in the drought? The industrial organization of groundwater	Ujjayant Chakravorty
	Coal plants and Air Pollution	Kanishka Kacker and Rishabh Choudhary
	There is no economic case for new coal plants in India	Shoibal Chakravarty
	The effect of free power for farmers on groundwater	Praveen Kumar and Eshita Gupta
	Drivers of mortality from human-elephant conflict	Nitin Sekar, Meghna Aggarwal, Athisii, Arpit Deomurari, Tanay Raj Bhatt, and Hiten Baishya
	Anti-Depredation Squads and mortality from human-elephant conflict	Nitin Sekar, Poonam Kumari, Hiten Baishya, David Smith, and Athisii
Tridip Ray	Congested Markets: Public vs Private Provision, Inequality and Competition	Arghya Ghosh (University of New South Wales)
	Pension under Endogenous Fertility	Monisankar Bishnu (ISI, Delhi)
	Intergenerational Transfers: Public Education and Pensions with Endogenous Fertility	Monisankar Bishnu (ISI, Delhi)
	Optimal Intergenerational Transfers: Public Education and Pensions	Monisankar Bishnu (ISI, Delhi)
	Changing Structure of the Labour Market in India: Job Polarization and Informalization	Arka Roy Chaudhuri (Shiv Nadar University)
	Caste Peer Effects on Student Performance: Evidence from Indian Schools	Arka Roy Chaudhuri (Shiv Nadar University)
	Gendered Stream Choice in India	Arka Roy Chaudhuri (Shiv Nadar University)

Projects

Internally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Evaluating bids for solar energy production	10th July, 2019	10th December, 2021	Kanishka Kacker
2	Role Model Effects in Stream Choice	April, 2018	3 years	Tridip Ray
3	Changing Structure of the Labour Market in India: Job Polarization and Informalization	April, 2018	3 years	Tridip Ray
4	Education Restriction in Elections-Sarpach elections in Rajasthan	1st April, 2020	31st March, 2021	Abhiroop Mukhopadhyay
5	Transport congestion and air pollution	1st October, 2019	15th December, 2020	Kanishka Kacker

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	Project on guidelines associated data quality in health	I-411	1st January, 2021	6 Months	Mudit Kapoor	Population Council Project	21,77,985/-
2.	Emissions Pricing for Development Program (EPDP)	F-701	1st January, 2021	4 years	E. Somanathan	Environment for Development Initiatives (EfD), Sweden	1,17,89,520/- (for 2021)
3.	Transport congestion and air pollution	MS 578	15th July, 2020	15th December, 2021	Kanishka Kacker	Environment for Development	32,83,376.25/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	IWWAGE	E-706	May, 2018	July, 2021	Farzana Afridi	IWWAGE_IFMR	4,34,68,593/-
2.	Researching Refills: Resources and relationships required for sustaining LPG access in rural India	F-701	1st June, 2019	31st December, 2021	E. Somanathan & Deepti Chatti (Humboldt State University)	Environment for Development Initiatives (EfD), Sweden	14,95,795/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	Analysis for CNNS Data Quality, Seasonality in Nutrition indicators and Trends Analysis based on CNNS and NFHS data	I-408	1st May, 2019	30st November, 2020	Mudit Kapoor	UNICEF	
2.	Impacts of electric stoves on air pollution and women's welfare in rural India	F-701	1st September, 2017	31st December, 2020	E. Somanathan	Environment for Development Initiatives (EfD), Sweden	40,78,358/-
3.	Field study of relation between paddy residue burning and severe air pollution	F-705	11th April, 2018	31st December, 2020	E. Somanathan	The Nature Conservancy, USA	11,62,598/-
4.	A platform for linking community reforestation efforts with global actors and resources	F-701	10th November, 2020	31st December, 2020	E. Somanathan with With R. Prabhakar and Ruchinilo Kemp.	Environment for Development Initiatives (EfD), Sweden	39,76,033/-

Projects done for Govt. of India

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	SERB	N 729	February, 2020	February, 2023	Prabal Roy Chowdhury	DST, Govt. Of India	2,00,000/- / year

3. ECONOMIC RESEARCH UNIT (ERU), KOLKATA

Research

The Unit is actively involved in various academic activities. The scientists of the Unit participate in various teaching programs like B.Stat., M.Stat., MSQE), ISEC and Post-Graduate Diploma programs over the year. ERU faculty members also teach PhD courses and supervise the PhD scholars. Then ERU scientists are actively engaged in both independent and collaborative research. They publish their research works in the well-recognized international journals, conference proceedings and as book chapters. Some scientists also publish books. Their present research areas are: Game Theory and Mechanism Design, Political Economy, Social Choice Theory, Development Economics, Income inequality, Industrial Organization, Conflict Economics, Applied Econometrics, Panel Data and Time Series Analysis, Gender Inequality and Women Violence, Child Education and Healthcare, MGNREGA, Econophysics, General Equilibrium Theory, Trade Policy and Unemployment, Machine Learning, Public Economics, Covid-19 Issues, etc. The scientists also engage in internally and externally funded projects. The Unit organizes lecture series, seminars and workshops, regularly.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Anuj Bhowmik	Social Economics	Arijit Sen
	General Equilibrium and Development	Biung-Ghi Ju and Manipushpak Mitra
	General Equilibrium Theory	Maria Gabriella Graziano, G V A Dharanan, Sandipan Saha, Japneet Kaur
	Matching Theory	Pramit Dutta
	Reputational Cheap Talk	Saptarshi P. Ghosh
	Games with Discontinuous Payoff	Nicholas C. Yannelis
Brati Sankar Chakraborty	Trade policy and unemployment	
Chaiti Sharma Biswas	Women Studies: Women empowerment, Gender violence, Women and child violence, Quality of life of women	
Indraneel Dasgupta	Group conflict	Sarmistha Pal (University of Surrey, UK) Dripto Bakshi (Institute of Economic Growth Delhi)
Manipushpak Mitra	Econophysics, Game Theory, Social Choice Theory, Mechanism Design under incomplete information and Industrial Organization	Suchismita Banerjee, Bikas K. Chakrabarti, Satya R. Chakravarty, Youngsub Chun, Suresh Mutuswami, Rupayan Pal, Arindam Paul and P. M. Saradha,
Priyodorshi Banerjee	Social Influence on individual decisions	Tanmoy Das
	Social prefences	Sujoy Chakravarty
	Deception detection	Sanmitra Ghosh; Sanchaita Hazra
Raju Maiti	Machine Learning, Classification, ROC curve	Bibhas Chakraborty, Li Jialiang, Priyam Das
	Income inequality, Gini coefficient	Manipushkar Mitra, Bikash K. Chakraborty
	Econometrics, Time Series Analysis	Samarjit Das, Atanu Biswas,
	Health Economics	Graves Nicholas
	Sequential Multiple-Assignment Randomized Trials (SMARTs)	Bibhas Chakraborty, Inbal Nahum-Sani, Jamie Yap
Samarjit Das	Econometrics, Time Series Analysis	Atanu Biswas
Saswati Das	Phase-wise impact study of MGNREGA on livelihood security of rural Indian people	
	Multidimensional child disadvantage: India and the world	D. Mukherjee
	South Asian research on childhood and youth studies	H. Goswami and others
Souvik Roy	Game Theory, Mechanism Design, Evolutionary Game Theory, Percolation and Random Graphs, Algebraic Graph Theory, Image Processing	Hans Peters, Arunava Sen, Debasis Mishra, Ton Storcken
Soumyanetra Munshi	Analysis of third party intervention in conflict	
	Analysis of conflict during a pandemic	
	Clientelism or Public Goods: Dilemma in a 'Divided' Democracy	
Tarun Kabiraj	Inter-outfit terrorist cooperation	Aditya Bhan
	Uncertain probability of success and R&D incentives	Rittwik Chatterjee and Srobonti Chattopadhyay
	Free licensing in a differentiated duopoly	Rittwik Chatterjee and Srobonti Chattopadhyay

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Mechanism Design with Interdependent Preferences	April, 2020	March, 2023	Souvik Roy

Externally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Learning and deception detection	E119	February, 2019	August, 2020	Priyodorshi Banerjee	ICSSR	1,50,000/-

4. LINGUISTIC RESEARCH UNIT (LRU), KOLKATA

From April 2020 to March 2021, Linguistic Research Unit has done innovative research in Corpus Linguistics & Language Technology, Computational Lexicography, Language Documentation & Digitization, Language Teaching, Digital Ethnography, Clinical Linguistics, and Descriptive Linguistics. During this phase LRU has completed two major projects (POS Tagged Bangla Text Corpus Generation (2018-2021) and POS Tagging of News Text Corpus of Indian English (2018-2021)). Also, it has started working on some small projects (e.g., generation of lexical database of English-Bangla translational equivalents, digitization of Charyagiti Padavali as a part of digital humanities, bilingual dementia of patients with Broca's Aphasia, digital dictionary for the Sabar speech community: an endangered tribal community of West Bengal, digital dictionary with lexicographic analysis of Bengali consonant clusters, and a digital dictionary of spatio-temporal expressions used in modern Bengali). In this period, LRU has published two chapters in edited volumes, 11 research papers in journals, and 2 papers in conference proceedings. Moreover, it has successfully executed 23 external academic assignments across the world.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Niladri Sekhar Dash	Nature of Bilingual Dementia of Patients with Broca's Aphasia	Dr. Arpita Bose, CeLM, School of Psychology & Clinical Language Sciences, University of Reading, UK
	Sound Imitative Words in World Languages	Prof. Livia Kortvelyessy, Dept. of British and American Studies, Faculty of Arts, P.J. Šafárik University, Kosice, Slovakia
	Automatic Conversion Tool for Public Announcements at Airports and Railway Stations in Indian Sign Language Animations	Prof. Vishal Goyal, Dept. of Computer Science, Punjabi University, Patiala, India
	Dictionary for Sabar Speech community: an endangered tribal community living in West Bengal.	Kheria Sabar Kalyan Samility, Purulia, West Bengal
	Digital dictionary with Lexicographic analysis of Bengali consonant clusters.	
	Digital Dictionary of Spatio-Temporal Expressions used in modern Bengali.	

Projects

Internally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	POS Tagged Bengali Text Corpus Generation	April, 2018	March, 2021	Niladri Sekhar Dash
2	POS Tagged version of News Text Corpus of Indian English (NTCIE)	April, 2018	March, 2021	Niladri Sekhar Dash

5. POPULATION STUDIES UNIT (PSU), KOLKATA

Research

The unit is extensively involved in various researches, teaching and training activities. This unit is also participating in teaching in ISEC Courses in regular as well as specialization in Demography. Currently, the research activities of the Unit include statistical trend analyses, multivariate statistical analyses, statistical surveys, categorical data analyses, parametric and non-parametric statistical inference, time-series analyses, mathematical and statistical modeling, epidemiological analyses, spatial analyses, micro-level demographic research on fertility, studies on mortality and migration characteristics, studies on actuarial statistics and health insurance, analyses of population dynamism and ageing. It has also worked on population projection, application of survival analysis in health care perspective, measuring economic efficiency using input-output models in different health care institutions, use of inequality models to judge the performance of various population parameters, indirect estimation of illegal migrants in border and hill areas, epidemiological studies with current Pandemic situation etc.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Partha De	Inequality in maternal and child health care utilization in the major states of India using National Family Health Survey data of 2015-16 (NFHS-4).	
	Efficiency of Health Care system in Major States of India and their effectiveness under present pandemic situation related with Covid-19 in India	
	Multivariate relationship between different characteristics variables and determinants of under-five mortality components in India using NFHS-4 data	
	Attitude of Family Members toward their children with developmental challenges in a backward district of West Bengal, India	
Prasanta Pathak	Population Dynamism and Ageing	
	Variation in Contraceptive Behaviour among Advanced, not so Advanced, less Advanced and Poor States by age, sex and various Socio-cultural Factos	
	Statistical Identification of Dimensions of Managerial Role Contributing to Competitive Advantage in the Indian Health Insurance Industry	Biswajit Nayak, NMIMS University, Mumbai
Subhash Barman	Determinants of contraceptive usage in Indian states: Role of female education and autonomy	
	Unmet need for family planning in India and its consequences in the context of COVID 19 pandemic	
	Inequality in Childhood Immunization among the social groups in Indian states	

6. PSYCHOLOGY RESEARCH UNIT (PRU), KOLKATA

Research

Faculty members and research fellows of the Psychology Research Unit are engaged in teaching, research, training and consultancy. 2 research fellows have successfully completed Ph.D. Viva and received provisional certificates. 16 students are regularly trained by the unit for research internship. Unit faculty trains students of other Universities and Engineering Institutes on Exploratory data analysis, Data Discretization, Categorical data structuring, Psychometric counselling through short term courses. Besides the unit has organized Research internship in order to overcome covid-19 stress. Focused areas of research in research internship are Hierarchical clustering in dimension reduction and farmer self-efficacy data analysis.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Debdulal Dutta Roy	Clustering items of Pro-environmental attitude questionnaire	

Projects

Internally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Pro-environmental attitude survey	2019	2022	Debdulal Dutta Roy

7. SAMPLING AND OFFICIAL STATISTICS UNIT (SOSU), KOLKATA

Research

Emphasis on interdisciplinary collaboration in Research Projects and Training programs: Statisticians, Economists, Computer Scientists, Official Statisticians from the Govt are involved.

Research Projects and Training Programs are Demand Driven. Research projects, being demand driven, involve real-life problems involving statistical challenges in addressing them.

Individual research works undertaken in diverse fields with international collaborators in spite of undertaking so many projects and training programs with a small manpower. Futuristic vision in development of courses in digital mode, research based training. Aspiration to involve official statisticians in research and development in Indian official statistical system, with support from the administration.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Diganta Mukherjee	Marhematical Finance	Mrinal K. Ghosh, Gopal K. Basak, Indranil Sengupta, Subhojit Biswas
Kajal Dihidar	Bayesian analysis for sensitive population characteristics	
Nachiketa Chattopadhyay	Combining multiple datasets; Ordinal measures of pro-poorness, Mobility	Debasis Sengupta, Satya R Chakravarty
Sandip Mitra	Decentralized Targeting of Agricultural Credit Programs: Private versus Political Intermediaries	Dilip Mookherjee (Boston University), Pushkar Maitra (Monash University), Sujata Visaria (Hong Kong University of Science and Technology)
	Evaluating the Distributive Effects of a Development Intervention*	
	Clientelism and Ideology : Analysing West Bengal elections from 1977-2019 based on panel survey	
	What Motivates Politicians? Evidence from a Lab-in-the-Field Experiment in India	Prasenjit Banerjee, Kunal Sen(University of Manchester), Antonio Nicolò (University of Padova), Vegard Iversen University of Greenwich
	Politicians, Promises and Citizen Welfare: Evidence from a Lab-in-the-Field Experiment in India	
	Transparency in Primary Commodity Procurement-Study in collaboration with Lal Bahadur Sashtri National Academy of Administration and IRMA	Debasish Sengupta, Nachiketa Chattopadhyay
	Gender differences in Mental Load of Domestic responsibilities and its impact on workplace productivity	Anandi Mani, University of Oxford

Projects

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Formulation of a perspective plan for holistic and sustainable development in the low lying areas of Bilkanda I & II Gram Panchayats under Barrackpur – II Development Block in the District of North 24 Parganas	E 101	September 2018	Ongoing	Nachiketa Chattopadhyay	Finance Department (Revenue) Government of West Bengal	10,72,030/-

Projects done for Govt. of India

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Reviewing the existing system of compilation of trade indices	T027	August, 2013	Ongoing	Nachiketa Chattopadhyay	DGCI & S, Govt. of India	5,00,000/-
2	Design and Conc. Evaluation of Foreign Trade Policy	E050	January, 2017	Ongoing			7,00,000/-
3	Statistics and its applications for RBI Officers	T025	November, 2015	Ongoing		Reserve Bank Of India	4,56,000/-
4	Development of Browser-based Application of CAPI for NSSO 77th Round Schedule (Phase I, II & III)	E100	October, 2018	Ongoing		NSSO (FOD) M.O.S.&P.I., Government of India	13,96,350/-
5	Developing of a demonstration module of e-learning on "Basic Official Statistics"	E110	October, 2018	Ongoing		NSSTA, M.O.S.&P.I., Government of India	5,00,000/-

8. SOCIO-ECONOMIC RESEARCH UNIT (SERU), NORTH-EAST CENTRE, TEZPUR

Research

Currently the research areas of the socio-economic research unit are microeconomic theory, and applied time series. Faculty members of the unit participate in the teaching activities at the centre by offering various core courses to students enrolled in PGDSMA. Also the faculty members of the unit have been actively involved in organizing various training programs and workshops.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Kushal Banik Chowdhury	Testing stability in the oil price - exchange rate nexus: evidence from net-oil importing countries	Bhavesh Garg
	Relationship between ambient particulate matter and leaf area index: A panel data study in Delhi, India	Darpa S Jyethi, Sanjit Maitra
	Real and nominal Uncertainty: Effect of the state of the economy	
	Structural break in the relationships between inflation, growth and uncertainty	

9. SOCIOLOGICAL RESEARCH UNIT (SRU), GIRIDIH & KOLKATA

Research

The Scientific workers (both faculty & non-faculty) of the Unit have performed various research activities during April 2020 – March 2021. These cover various sociological research themes, like land and its utilization pattern, contract farming, nutritional status, overweight and obesity of school going children, gender, wage labour in unorganised sector, unpaid family labour, Farm sector labour force, social network analysis approach for studying inter-state relation through migration & trade. They are also involved in teaching and supervising Ph.D. students.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Hari Charan Behera	Land leasing arrangements and functions in eastern India	
	Contract farming: participation, partnership and socioeconomic development in eastern India	

Faculty name	Research topic(s)	Collaborator(s)
Rabindranath Jana	Indian Inter-state Relation on Trade	P. Vdhyarani, Sri Parasakthi College for Women, Tamilnadu, India; R. Maruthakutti, M. S. University, Tamilnadu, India
	Cohesiveness on Indian Inter-State migration	Hari Charan Behera, ISI; Rupak Goswami, RKVU, Narendrapur, W.B.
Sonali Chakraborty	Gender, wage labour in unorganised sector, unpaid family labour, Farm sector labour force	
Susmita Bharati	Overweight and obesity of school going children	Manoranjan Pal, former Professor, ISI; Premananda Bharati, Former Professor, ISI

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Land leasing arrangements and functions in eastern India	April, 2020	2 years	H.C. Behera

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	End Date	Principal Investigator(s)
1	Contract farming: participation, partnership and socioeconomic development in eastern India	April, 2018	31st December, 2021	H.C. Behera

Externally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Strengthening livelihood opportunities among forest dwellers in Jharkhand and Odisha	E-951	April, 2018	February 2021	H. C. Behera	Ministry of Tribal Affairs	8,92,500/-
2	Baseline survey of beneficiaries of horticulture development in Paschimanchal District in West Bengal.	I038	April, 2018	June 2020	H.C. Behera	Government of West Bengal	8,33,000/-

ISI, Giridih Branch

STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH DIVISION (SQC&OR)

Head	:	ASHIS KR. CHAKRABORTY, SQC & OR Kolkata (From 1st Apr 2020 – 17th Sep, 2020)
Head	:	ARUP RANJAN MUKHOPADHYAY, SQC & OR Kolkata (18th Sep, 2020 - 31st Mar, 2021)
Office	:	6th floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

01

Statistical Quality Control & Operations Research Unit (SQC&OR), Bangalore

Head of Unit	:	BOBY JOHN
Number of Faculty/ Faculty-equivalent	:	Five (5)
Number of Non-scientific Workers	:	Two (2)
Number of Visiting Scientists	:	One (1)
Office	:	8th Mile, Mysore Road, ISI, Bangalore- 560 059

02

Statistical Quality Control & Operations Research Unit (SQC&OR), Chennai

Head of Unit	:	G. RAVINDRAN
Number of Faculty/ Faculty-equivalent	:	Four (4)
Number of Non-scientific Workers	:	One (1)
Number of Research Scholars	:	One (1)
Office	:	37 Nelson Manickam Road, Aminjikarai, ISI, Chennai-600 029

03

Statistical Quality Control & Operations Research Unit (SQC&OR), Coimbatore

Head of Unit	:	D. SAMPANGI RAMAN
Number of Faculty/ Faculty-equivalent	:	One (1)
Number of Non-scientific Workers	:	One (1)
Office	:	1st Floor 514, Mettupalayam Road, North Coimbatore, Coimbatore - 641 043

04

Statistical Quality Control & Operations Research Unit (SQC&OR), Delhi

Head of Unit	:	RINA CHAKRAVORTY
Number of Faculty/ Faculty-equivalent	:	Two (2)
Number of Non-scientific Workers	:	One (1)
Number of Post-doctoral	:	Two (2) [Post-doctoral fellow]
Office	:	7, S.J.S. Sansanwalmarg, New Delhi -110016

05

Statistical Quality Control & Operations Research Unit (SQC&OR), Hyderabad

Head of Unit	:	S. M. SUBHANI
Number of Faculty/ Faculty-equivalent	:	Four (4)
Number of Non-scientific Workers	:	Four (4)
Office	:	Street Number 8, Habsiguda, Hyderabad, Telangana 500007

06

Statistical Quality Control & Operations Research Unit (SQC&OR), Kolkata

Head of Unit	:	NANDINI DAS
Number of Faculty/ Faculty-equivalent	:	Fifteen (15)
Number of Non-scientific Workers	:	Five (5)
Number of Research Scholars	:	Nine (9)
Number of Visiting Scientists	:	Three (3)
Office	:	6th floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

07

Statistical Quality Control & Operations Research Unit (SQC&OR), Mumbai

Head of Unit	:	SAGAR SIKDER
Number of Faculty/ Faculty-equivalent	:	Two (2)
Number of Non-scientific Workers	:	One (1)
Office	:	Prathista Bhavan, 3rd Floor, 101, Maharshi Karve Road, ISI, Mumbai - 400 020

08

Statistical Quality Control & Operations Research Unit (SQC&OR), Pune

Head of Unit	:	SUBRATA RATH
Number of Faculty/ Faculty-equivalent	:	One (1)
Number of Non-scientific Workers	:	Two (2)
Office	:	B-Wing, 3rd Floor, Anandvan Housing Society, Near Gandhi Bhavan, 36, Kothrud, ISI, Pune - 411 038

1. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, BANGALORE

Research

The major activities of the unit are the academic programs, research, industrial training & consultancy services, and organizing short-term training programs and symposia. Currently, the unit is handling two academic courses namely Master of Science in Quality Management Sciences (MS-QMS) and Part-Time Diploma in Statistical Quality Control. The first semester of 7th batch of MS-QMS course completed during 2020-21. The 100th batch of Part-Time Course has been started with 26 students during February 2020. As part of research activities, the faculties have published 10 papers in Scopus indexed journals during 2020-21. The unit has undertaken 9 consultancy and training assignments and generated more than Rs.40,00,000/- as training and consultancy fee during 2020-21. The unit also organized an international event titled "Chowdhury Lecture Series" during 22 - 25 February 2021. Eminent personalities from Memorial University of Newfoundland, University of Florida, Rutgers University and City University of Hong Kong delivered invited talks.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
E V Gijo	Reliability estimation of progressive interval censoring scheme	
	Process capability evaluation of life data	
	Assessing the impact of DFSS on Sustainable Performance for the Product/Service Industry.	J. Antony, S. Bhat
Boby John	Supply Chain Optimization : Pre and Post Pandemic Scenario	Anirban Kundu
	Development of Six Sigma methodology to improve insurance claim processing process	Pragati Parikh
	Development of Six Sigma methodology for improving the resolution time performance of an application support process	R S Kadadevaramath
	Development of a service level agreement baselining methodology for non-normal characteristics using the Pearson distribution	S M Subhani

Projects

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Training & guidance on business forecasting	S155	20th March, 2021	30th June, 2021	Boby John	Hewlett Packard Inc	1,50,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Training & Consultancy on Six Sigma BB, DFSS & Data Analytics	1309	1st July, 2020	31st March, 2021	U H Acharya K K Chowdhury Boby John	Bharat Electronics, Bangalore	12,87,000/-
2	Six Sigma Black Belt Certification Program (online)	1316	21st September, 2020	31st March, 2021	Somnath Ray E V Gijo A R Chowdhury	HAL Management Academy	6,00,000/-
3	Training and guidance on Data Science	1310	1st April, 2020	31st March, 2021	Boby John	Larsen & Toubro Ltd	2,00,000/-
4	Training and guidance on Predictive Modeling	1311	1st April, 2020	31st March, 2021	Boby John	Caterpillar India	4,00,000/-
5	Training and guidance on Analytics, Forecasting, Optimization and Deep Learning	1308	1st April, 2020	31st March, 2021	Boby John	Hewlett Packard Inc	4,00,000/-

2. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, CHENNAI

Current Areas of Research

Faculty name	Research topic(s)
G. Ravindran	Stochastic Games and Linear Complementarity Problem
Amit K. Biswas	Classification of terrestrial vegetation species using spectral reactance – joint work

3. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, DELHI

Research

The SQC & OR unit, ISI, Delhi has been conducting short term training programs online during the pandemic also. Besides this two post doctoral fellows also were nurtured. Two workshops were conducted which was funded by Central Pollution Control Board, Ministry of environment, forest and climate change, govt. of India. One online International Symposium on Computational Operations Research and Algorithmic game theory was organised during Mar 29-31, 2021.

Current Areas of Research

Faculty name	Research topic(s)
Rina Chakravorty	Design of Experiments – Static Characteristics, Dynamic Characteristics and Categorical Characteristics in a multi response processes
S.K. Neogy	Mathematical Programming, Linear Complementarity Problem(LCP) and its generalizations, Optimization problem in graph theory, Matrix Theory (Study of Matrix Classes useful in Complementarity, Optimization and Game Theory), Non-cooperative games, Algorithms for Stochastic Games.

4. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, HYDERABAD

All the four faculty of this unit are actively involved in the Teaching programme for MSQMS Semester III (Batch: 2019-2021). The teaching was in on-line mode - ALN Murthy taught 'Applied Regression Analysis', GSR Murthy - 'Nonlinear Programming', G Murali Rao - 'Six Sigma for Business Excellence' and SM Subhani - 'Industrial Experimentation'. S M Subhani is the I/c Students' Academic Affairs for the Semester-III of the batches 2018-19 and 2019-20 at Hyderabad. The faculty also guide MSQE students in their project and dissertation work.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
A L N Murthy	Statistical Modelling	
	Medical Statistics	
	Six Sigma	
G M Rao	Data Science - Cluster Analysis	
	NLP – Text Mining/Sentiment Analysis	
G S R Murthy	Modelling Resource Scheduling Problems using mathematical programming problems and finding efficient solutions	Dr. T R Lalia
	Study of assessment of Chennai airspace utilization using stochastic optimization models	Shri Penchal Rao, GM, R&D Tech Center, AAI, Hyderabad; Shri Rajender Kumar, AAi, and Dr T R Lalita
S M Subhani	Fixed Point Theorems in Fuzzy Metric Spaces	

Projects

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Six Sigma Training and Guidance (Wave III) for Business Excellence	1678	November, 2019	August, 2021	A L N Murthy	ITC Limited, Paper Boards and Specialty Papers Division, Hyderabad	39,60,000/- (exclusive of GST)

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	In-house Training on Statistical Process Control (10 Half-days) for Senior Engineers	E 904	3rd September, 2020	6th January, 2021	S M Subhani	M/s. Keerthi Industries	90,000/- (exclusive of GST)

5. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, KOLKATA

The faculty members of SQC&OR unit , Kolkata are engaged in teaching in MTech (QROR), BSTAT, MS (QE) and PGDBA, research in various topics of quality, reliability and operations research and providing consultancy in different industries in India and overseas. During april '20-March '21 there are 18 journal publications and 2 publications in conference proceedings. The research topics include Linear Complementarity Problem, software and hardware reliability, statistical process control, process capability analysis, supply chain management, survival analysis, reverse logistic etc. During this period 2 new and 1 ongoing internally funded projects have been carried out by the faculty members. There are 3 new, 5 ongoing and 5 complete externally funded projects done by the faculty members. The list of externally funding agencies include QCI, Tata steal, ISRO, NAI, Ordinance factory, M.A.H.Y Khoory, Dubai etc.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Arup K Das	On Column Competent Matrices and Linear Complementarity Problem	A. Dutta and R. Jana
	Two-warehouse inventory model under preservation technology with stochastic demand	Vandana
	Iterative Descent Method for Generalized Leontief Model	R. Jana and Vishnu Narayan Mishra
	Modeling Multi objective Transportation Problem Using Fuzzy Set Theory	Firoz Ahmad
Abhijit Gupta	Linear Complementarity Problem,Mean Payoff Games	S. K. Neogy, ISI,Delhi
Ashis Kumar Chakraborty	Software Reliability	Dr. Soumen De, Ms. Pallabi Dutta
	Hardware Reliability	Mr. Subrata Rath, Ms. Retuparna Dutta
	Sarcopanea	Dr. Shabnam Agarwal, Ms. Ritwika Bhattacharya
	Covid-19	Dr. Shabnam Agarwal
	Operations Research	Ms. Ritwika Bhattacharya
	Education	Dr. Moutushi Chatterjee
Arup Ranjan Mukhopadhyay	Sustainable Development and Supply Chain Management	Prof. Sadhan Kumar Ghosh, Mechanical Engineering Department, Jadavpur University
	Sustainable Development and Waste Management	Prof. Sadhan Kumar Ghosh, Mechanical Engineering Department, Jadavpur University
	Statistical Process Control	

Faculty name	Research topic(s)	Collaborator(s)
Biswabrata Pradhan	Survival extropy of coherent and mixed systems	Siddhartha Chakraborty
	Quantile based analysis of survival and failure extropy measures	Siddhartha Chakraborty
	Nonparametric test for harmonic mean residual life order in the two-sample problem	Arindam Panja, Ruhul Ali Khan and Dhrubasish Bhattacharyya
	Stochastic comparisons of largest claim and aggregate claim amounts	Arindam Panja, Nilkamal Hazra and Pradip Kundu
	Analysis of progressive Type-I censored data for log-location-scale family of distributions under competing risks	Soumya Roy
M Z Anis	Process Capability Indices	K. Bera
Prasun Das	Geospatial data analytics and planning for disaster resilience	Sanjay Goswami (VS)
	Improvement of customer experience in retail Banking	Professor I. Mukherjee, MAKAUT, W.B. (Faculty)
	An evolutionary approach for optimizing reverse logistics network for third party logistics under uncertainty	Ramakrushna Mishra (PLP)
	Designing and optimization 3PL network for RL under uncertainty for electronic products	Ramakrushna Mishra (PLP)
	A classical and simulated approach of cost optimization in reverse logistic path of e-commerce business	Ramakrushna Mishra (PLP)
	Multi-Stage Optimization under Uncertainty in Reverse Logistics Operations	Sayantan Ghosh (Student)
Susanta Kumar Gauri	Process capability analysis of discrete-valued characteristic	Surajit Pal, SQC &OR Unit, Chennai
	Process capability analysis of zero inflated processes	
	Process monitoring of zero inflated processes	
Nandini Das	Multivariate control chart for controlling process dispersion	
P. Mandal	Small sample estimation of process variance	

Projects

Internally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	Starting Date	Duration	Principal Investigator(s)
1	Development of Dashboard to Facilitate Compilation and Analyses of Crime Data (NCRB)Available in Public Domain	January, 2021	One Year	Amitava Bandyopadhyay
2	Development of Dashboard to Facilitate Compilation and Analyses of Road Accident Data (MORTH)Available in Public Domain	January, 2021	One Year	Amitava Bandyopadhyay

ONGOING PROJECTS

Sl. No	Name of the project	Starting Date	Eed Date	Principal Investigator(s)
1	Data Analytic Approach towards Modeling of Reverse Logistics	September, 2019	March, 2022	Prasun Das

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Training on Sampling Inspection, MSA and Statistical tolerance plus hands-on data analysis	I071	18th February, 2021	6 months	Prasun Das	NAI, Gun & Shell Factory, Cossipore, Kolkata	5,00,000/-
2	Support to Carry Out Large Scale Government Projects	I070	1st August, 2020	1 Year	Amitava Bandyopadhyay	QCI	12,00,000/-
3	Talent Development and Support for Analytics Projects	I069	1st August, 2020	1 Year	Amitava Bandyopadhyay	Tata Steel	20,00,000/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Normalization of Marks	I064	September, 2019	March, 2024	Ashis Kumar Chakraborty	Admission Committee for Professional Courses, Gujrat	31,05,000/-
2	Development of a Statistical Model for Reliability Estimation of the flight software of Launch Vehicles of ISRO	E129	December, 2019	June, 2021	Ashis Kumar Chakraborty	ISRO, Thiruvananthapuram	21,49,000/-
3	Training Program at 3 propellants OFs	I055	1st May, 2019	Ongoing	Ranjan Sett	Ordnance Factory, MoD	75,00,000/-
4	Six Sigma Green Belt Training and project Guidance	T154	March, 2020	September, 2021	P. Mandal	M.A.H.Y Khoory, Dubai	6,00,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Six Sigma Green Belt Certification Programme	I066	8th December, 2020	17th December, 2020	Prasun Das	NAI, Gun & Shell Factory, Cossipore, Kolkata	2,25,000/-
2	Development of Cleanliness Index		1st June, 2016	30th June, 2020	Amitava Bandyopadhyay	Govt. of Tamil Nadu	
3	Development of Sampling Plan and Protocol	I047	1st April, 2018	30th June, 2020	Ranjan Sett	ITC Limited	5,00,000/-
4	Comprehensive Training Program at 5OFs	I035	1st September, 2017	31st August, 2020	Amitava Bandyopadhyay	Ordnance Factory, MoD	80,00,000/-
5	Training Program at 4 Small Arms OFs	I054	1st May, 2019	31st March, 2021	Amitava Bandyopadhyay	Ordnance Factory, MoD	60,00,000/-
6	Training on Data Analytics	I067	January, 2021	March, 2021	Ashis Kumar Chakraborty	Coal India Limited, Kolkata	10,35,000/-

6. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, MUMBAI

SQC & OR Unit, ISI, Mumbai commenced its operations from 1965. It has served a wide variety of organizations, both Manufacturing and Service, across the country through training and consultancy in the fields of Statistics and Operations Research.

The unit activities can be described in the following categories: Consultancy, project assignments and general Training

Projects

Externally-funded Projects

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Black Belt TRAINING (online)	S-593	13th July, 2020.	18th July, 2020.	Ashok Sarkar	L & T - MADH	1,77,000/-
2	Training Program on Statistical Process Control	I-913	August, 2020	August, 2020	Ashok Sarkar	UPL Ltd. Ankleshwar	4,77,900/-
3	Analytical Techniques for Process Modelling	I-908	September, 2020	November, 2020	Ashok Sarkar	Adani Power Maharashtra	2,47,800/-
4	Consultancy on FMEA and Project review.	S-594	11th November, 2020	12th November, 2020	Ashok Sarkar	Schneider Electric India Pvt. Ltd.	29,500/-
5	Certification Program on Business Analytics & Data Mining	I-911	4th December, 2020	7th February, 2021	Ashok Sarkar	External Participants	16,77,490/-
6	Master Black Belt Program	I-912	8th February, 2021	6th March, 2021	Ashok Sarkar	External Participants	6,96,200/-
7	Statistics with MINITAB - C-TEA Program	I-915	February, 2021	February, 2021	Ashok Sarkar	L&T Mysore	2,25,000/-
8	Data Analytics Program	I-917	16th February, 2021	25th March, 2021	Ashok Sarkar	Adani Power Mundra Ltd.	2,97,360/-
9	Sigma Green Belt Training & Certification & Project Review	I-898	17th February, 2021	18th February, 2021	Ashok Sarkar	Kalpataru Power Transmission Ltd.	74,340/-
10	Six Sigma Green Belt Training & Certification (online)	S-595	5th September, 2020	20th September, 2020	Sagar Sikder	External Participants	2,95,000/-
11	Six Sigma BLACK BELT Training & Certification	I-909	Ocober, 2020	December, 2020	Sagar Sikder	External Participants	8,02,100/-
12	Six sigma Green Belt Training & Certification	I-910	28th November, 2020	13th December, 2020	Sagar Sikder	External Participants	4,72,000/-
13	Six sigma Green Belt Training & Certification	I-914	6th March, 2021	21st March, 2021	Sagar Sikder	External Participants	6,37,200/-

7. STATISTICAL QUALITY CONTROL & OPERATIONS RESEARCH UNIT, PUNE

The unit has focused on application of statistics to industries and societies at large under primarily five platforms- Six Sigma, Lean Six Sigma, Design for Six Sigma, Data Science and Reliability. Industrial consulting, project linked training in the industries, public programmes, research work in the areas of reliability, Six Sigma and Data analytics have been noteworthy and will be carried forward. The programme of statistics for researchers has reached out the varieties of domain viz. dance, health-care, BPO/IT, education, manufacturing. No less than 150 students have completed their professional certification programme in the field of Six Sigma, Data Science and Statistics for Researchers.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
S. Rath	Reliability Improvement	Dr. Ashis K. Chakraborty & Dr. Subhashis Chatterjee
	Modelling Review & Non-Review Class Hotel	Dinesh Chaurasya
	Six Sigma for Telecom Sector	Dr. Ramkrishna Padhy, Dr. Ratri Parida

Projects

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Productivity Improvement	I835	25th August, 2020	1 year	Subrata Rath	LRQA, Mumbai	3,52,000/-
2	Six Sigma & Data Science programme – 2nd Wave	I836	1st October, 2020	6 months	Subrata Rath	Eduplusnow, VIT, Pune	12,00,000/-
3	Six Sigma	I839	10th November, 2020	5 months	Subrata Rath	Associated Capsules, Pune	5,76,000/-
4	Data Analytics	I840	1st February, 2021	4 months	Subrata Rath	Marico Ltd, Mumbai	5,76,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Data Analytics	I829	30th March, 2020	30th May, 2020	Subrata Rath	Eaton Technologies, Pune	7,80,000/-
2	Six Sigma & Data Science Programme	I834	25th June, 2020	4 months	Subrata Rath	Eduplusnow, VIT, Pune	6,00,000/-
3	Statistics with Special Focus on Sampling	S448	3rd August, 2020	30th September, 2020	Subrata Rath	Basamati Exports Dev. Foundation, Noida	64,000/-
4	Six Sigma Champion & SSBB	S450	4th September, 2020	31st March, 2020	Subrata Rath	Associated Capsules, Pune	6,72,000/-
5	Six Sigma Green-Belt	I837	13th October, 2020	4 months	Subrata Rath	TACO, IPD, Pune	1,80,000/-
6	DFSS Green-Belt	I838	3rd November, 2020	3 months	Subrata Rath	Tata Toyo, Pune	2,16,000/-
7	Statistics with Special Focus on Sampling	S449	3rd November, 2020	31st December, 2020	Subrata Rath	Serum Institute, Pune	1,13,280/-

THEORETICAL STATISTICS AND MATHEMATICS DIVISION (TSMD)

Professor In-Charge	:	B.V. RAJARAMA BHAT, SMU, Bangalore (1st Apr 2020 – 17th Sep 2020)
Office	:	8th Mile, Mysore Road, ISI, Bangalore - 560 059
Professor In-Charge	:	ANTAR BANDYOPADHYAY, SMU, Delhi (18th Sep 2020 - 31st Mar 2021)
Office	:	7, S.J.S. Sansanwal Marg, ISI, New Delhi- 110 016

01

Stat-Math Unit (SMU), Bangalore

Head of Unit	:	JAYDEB SARKAR
Number of Faculty/ Faculty-equivalent:		Twenty (20)
Number of Non-Scientific Workers	:	One (1)
Number of Research Scholars	:	Eighteen (18)
Number of Visiting Scientists	:	Thirty-Two (32)
Office	:	8th Mile, Mysore Road, ISI, Bangalore - 560 059

02

Stat-Math Unit (SMU), Delhi

Head of Unit	:	ARUP KUMAR PAL
Number of Faculty/ Faculty-equivalent:		Twelve (12)
Number of Non-Scientific Workers	:	Two (2)
Number of Research Scholars	:	Ten (10)
Number of Visiting Scientists	:	Seven (7)
Office	:	7, S.J.S. Sansanwal Marg, ISI, New Delhi- 110 016

03

Stat-Math Unit (SMU), Kolkata

Head of Unit	:	RITABRATA MUNSHI
Number of Faculty/ Faculty-equivalent:		Twenty-Seven (27)
Number of Scientific Workers	:	One (1)
Number of Non-Scientific Workers	:	Six (6)
Number of Research Scholars	:	Twenty-Nine (29)
Office	:	2nd floor, A.N. Kolmogorov Bhavan, ISI, Kolkata-700 108

1. STAT-MATH UNIT (SMU), BANGALORE

Research

During 2020-21, due to the pandemic, the Stat-Math Unit conducted all courses online. The faculty interacted with students, research scholars and post-docs online. They also participated in various national and international seminars, conferences and workshops.

The Unit is also involved in conducting ISI admission test, Olympiad camps and Madhava competition. The Unit was active in research in various fields of Mathematics such as Algebraic Geometry, Number Theory, Operator Theory, Operator Algebras, Quantum Probability and different fields in Probability and Statistics, Stochastic geometry, Random topology, Random graphs, Bayesian Statistical Inference, Statistical Ecology, Group actions.

In terms of COVID-19 response, the unit is also actively engaged with the Government of Karnataka on vaccination Strategies, optimal testing design, and sero-surveillance.

Prof. V R Padmawar retired in Nov. 2020 after several decades of dedicated and exemplary service to the Institute. He was a very popular teacher. With his retirement we have lost one more Statistician.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Anita Naolekar	Leavitt Path algebras	Abdenacer Makhlouf (Haute-Alsace); Ashis Mandal (IIT, Kanpur); Rabeya Basu (IISER Pune)
	Categories, Operads	Abhishek Banerjee (IISc)
Aniruddha C Naolekar	Algebraic topology	B Subash (IISER Tirupati); Ajay Singh Thakur (IIT, Kanpur)
B. Sury	Packing Polynomials for irrational sectors	Maxim Vsemirnov
	Quasi-permutation Representations of Holomorphs of cyclic p-groups	Soham Pradhan; Eshita Mazumdar
	Schur index of Metabelian Monolithic groups	
	Davenport constants of some nonabelian groups	
B V Rajarama Bhat	Local completely positive maps and Stinespring's theorem	Anindya Ghatak and Santosh Kumar
	C* -extreme points of CP maps. Nest algebra and logmodular algebras	Manish Kumar
	Dilation theory, Non-commutative Poisson boundary of completely positive maps	Narayan Rakshit and Sandipan De
	Products of symmetries of von Neumann algebras	Soumyashant Nayak and P. Shankar
C R E Raja	Group action and power maps	A Mandal
D. Yogeshwaran	Stochastic geometry, Random topology, Random graphs	Guenter Last, Michael Klatt; Giovanni Peccatti; Omer Bobrowski; Matthias Schulte; Primoz Skraba; Purvi Gupta; Siva Athreya; Manjunath Krishnapur; Akshay Goel; Frank den Hollander; Roman Kotecky
Jaydeb Sarkar	Operator theory and operator algebras	Maneesh, S; Gorai, B; Krishna Das; D Pradhan, D; Timotin; Deekap KD; S Barik
Mathew Joseph	Stochastic PDEs, Interacting Particle Systems	Siva Athreya, Mohammud Foondun; Kunwoo Kim, Carl Mueller
Manish Kumar	Bertini theorem, orbifold bundles	A. J. Parameswaran (TIFR), I. Biswas (TIFR)
Maneesh Thakur	Strongly self-isotopic Jordan algebras	Holger Petersson
	R-triviality for F4	
Siva Athreya	Random Polytopes	D. Yogeshwaran and P. Gupta
	Vaccination Strategies	Madhav Marathe, Rajesh Sundaresan
	Optimal Testing Design	Rajesh Sundaresan

Faculty name	Research topic(s)	Collaborator(s)
Soumyashant Nayak	Extensions of positive linear mappings	
	Subharmonic functions with values in an ordered vector space	
	On the category of finite von Neumann algebras	
	Geometric approaches to variable selection	Shariq Mohammed

Projects

Externally-funded Projects

NEW PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	Limit theorems in Random Geometry and Topology.	E516	18th December, 2020	3 Years	D. Yogeshwaran	SERB	6,00,000/-
2.	The Stochastic Heat Equation	E518	19th February, 2021	3 years	Mathew Joseph	SERB	6,00,000/-
3.	CEFIPRA	N564	9th November, 2020	8th November, 2023	Anita Naolekar and Abdenacer Makhlouf	DST, India and Ministry of Europe and foreign affairs, France	24,35,706/-
4.	Factorizations of bounded analytic functions and kernels	E512	25th June, 2020	3 years	Jaydeb Sarkar	DST	28,90,888/-

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	Indo-French Centre for Applied Mathematics joint project	joint project of Dr. Yogeshwaran amount is released only for travel and food expenses, no account number for this project.	1st July, 2018	30th June,2021	Yogeshwaran Dhandapani; Bartlomiej Blaszczyszyn	Indo-French Centre for Applied Mathematics	
2.	JC Bose Fellowship project	N528	1st March, 2017	28th Febraury, 2022	B V Rajarama Bhat	SERB	95,00,000/-
3.	n-tuples of commuting isometries	E508	28th May, 2018	3 years	Jaydeb Sarkar	DST	6,00,000/-
4.	Stochastic Analysis and Its Applications	E507	28th May, 2018	3 years	Siva Athreya	DST	6,00,000/-
5.	Stochastic Partial Differential Equations	E506	28th May, 2018	3 years	B. Rajeev	DST	6,00,000/-
6.	Coupled Stochastic Partial Differential Equations (SPDE's)	E513	16th January, 2020	3 years	B. Rajeev	DST	27,68,788/-
7.	Probabilistic and Statistical Aspects of Branching Random Walks	E509	18th May, 2018	3 years	Parthanil Roy	DST	6,00,000/-
8.	Swarnajayanthi Fellowship	E510	25th June, 2019	5 years	Parthanil Roy	DST	51,83,080/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	DST INSPIRE Faculty Award	N505	14th August, 2014	13th August, 2020	Yogeshwaran Dhandapani	Department of Science and Technology	35,00,000/-

Projects done for Govt. of India

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	Second Round Sero-Survellaince committee		25th January, 2021	Ongoing	Giridhara Babu and Siva Athreya	Government of Karnataka	No amount is sanctioned

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	Duration	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1.	First Round Sero-Survellaince committee		2nd September, 2020	16th September, 2020	Giridhara Babu and Siva Athreya	Government of Karnataka	No amount is sanctioned

2. STAT-MATH UNIT (SMU), DELHI

Research

The Unit currently has 4 Statisticians and 8 Mathematicians. They continued to work in their respective areas. Many of them were involved in external projects funded by various agencies.

Despite the difficult situation due to the pandemic, the members resumed teaching activities online soon after the nationwide lockdown was put in place in 2020, thus allowing the teaching activities to continue without too much disruption.

The Unit also resumed its weekly seminar program in online mode, and it attracted a much larger audience due to the extended reach of the online platform.

Prof Rahul Roy was selected a Fellow of the Indian National Science Academy, and Prof Antar Bandopadhyay was elected a member of the International Statistical Institute.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Abhay G. Bhatt	Martingale Problems and Markov Processes	
Antar Bandyopadhyay	Branching Random Walk	Mr. Pratha Pratim Ghosh, SRF, ISI, Delhi
	Interacting Urn Models	Dr. Shuei Mano, ISM, Japan; Dr. Gursharn Kaur, NUS, Singapore; and Dr. Neeraja Sahasrabudhe, IISER, Mohali.
Anish Sarkar	Probability Theory, Brownian Web, Interacting Particle Systems	Rahul Roy, Kumarjit Saha, David Coupier, Chi Tran
Arup K. Pal	Quantum groups and Noncommutative Geometry	Partha Sarathi Chakraborty (ISI, Kolkata)
Deepayan Sarkar	Reconstruction of degraded photographic images	Kaustav Nandy
	Statistical analysis of data from high-through put biological experiments	
Issan Patri	Von Neumann Algebras	Kunal Mukherjee, Pierre Fima, Francois le Maitre
	Understanding the dynamics of bacterial cell wall	Garima Rani
Rahul Roy	Brownian web	Azadeh Parvaneh
	Brownian web	Kumarjit Saha, Anish Sarkar
	Confetti percolation	Partha Pratim Ghosh

Faculty name	Research topic(s)	Collaborator(s)
Shanta Laishram	Arithmetic Dynamics	Prabhakar Yadav (JRF, ISI Delhi); Ritumoni Sarma, Himanshu Sharma, Jyotsna Sharma (IIT, Delhi)
	Irreducibility and Galois groups of Laguerre polynomials	Ankita Jindal (ISI Delhi)
	Rational points on Erdos-Selfridge superelliptic Curve	Pranabesh Das (Univ. of Waterloo), N. Saradha (CEBS Mumbai), Divyum Sharma (BITS Pilani)
Swagata Nandi	Statistical Signal Processing, Nonlinear Regression	
Tanvi Jain	symplectic eigenvalues of positive definite matrices Hadamard powers of positive matrices	Rajendra Bhatia, Hemant Kumar Mishra, Ritabrata Sengupta

Projects

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Identify the reasons for delay in disposal of cases and evaluate capacity gap to manage the pendency of cases in district and sub-ordinate courts	I-409	July, 2019	Ongoing	Abhay G. Bhatt and Deepayan Sarkar	Delhi Judicial Academy	5,00,000/-
2	Interacting Urn Schemes	N726	19th March, 2019	18th March, 2022	Antar Bandyopadhyay	SERB, DST, Govt. of India	2,20,000/- per year
3	Statistical methods of high – dimensional binary regression models in Presence of response misclassification	N-715	11th May, 2018	11th May, 2021	Arindam Chatterjee	SERB, DST, Govt. of India	2,20,000/- per year
4	Scaling limits in directed random trees-applications in models of drainage	N-719	24th May, 2018	24th May, 2021	Anish Sarkar	SERB,DST, Govt. of India	6,00,000/-
5	Structure and representations of the C^* algebra of continuous functions on type A_{n} quantum groups	N-722	12th July, 2018	11th July, 2021	Arup K. Pal	SERB,DST, Govt. of India	6,00,000/-
6	Ineference problem in reliability	N731	6th february, 2019	5th February, 2022	Isha Dewan	SERB,DST, Govt. of India	6,00,000/-
7	DST INSPIRE	N-732	3rd April, 2017	03rd April, 2022	Issan Patri	DST, Govt. of India	35,00,000/-
8	Confett percolation and covered area fraction	N-717	19th May, 2018	18th May, 2022	Rahul Roy	SERB,DST, Govt. of India	6,00,000/-
9	Irreducibility and Galois groups of Polynomials	N-716	13th June, 2018	13th June, 2021	Shanta Laishram	SERB,DST, Govt. of India	2,20,000/- per year
10	Geometry on the space of matrices and positivity properties	N725	11th March, 2019	10th March, 2022	Tanvi Jain	SERB,DST, Govt. of India	6,60,000/-

Projects done for Govt. of India

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	BOBASIO Region Airspace Safety Assessment Study	I402	January, 2011	Ongoing	Antar Bandyopadhyay	Airports Authority of India (AAI)	9,50,000/- per year

3. STAT-MATH UNIT (SMU), KOLKATA

Research

SMUK focuses on research in Mathematics, Probability and Theoretical Statistics. The unit currently has 27 faculty members, 5 of them are Bhatnagar awardee. In Statistics the main focus are in: Statistical Study of Agreement, Statistical Inference, Statistical Study of Surveillance, Statistical Study of Apportionment Index, Statistical Modeling of Dyadic Interactions, Parametric and non-parametric classification, Study of Robust Estimators. Non-parametric statistics, Rates of convergence in Central Limit Theorem (CLT), Law of iterated logarithms (LIL) and Characterization theorems, High dimensional time series. In Probability Theory the main focus of research are: Stochastic Processes, Limit Theorems, Rates of Convergence and Expansions, Stochastic Integrals, Stochastic Differential Equations, Stability of stochastic dynamical systems, Random Walks, Martingale Theory and Stochastic Calculus, Stochastic approximation, Markov Chain Simulation, Random Continued Fractions, Bernoulli Convolutions and Iterated Function Systems, Large-dimensional Random Matrices, Record values, Extreme values, Moral hazard problems in economics, Resampling plans, Time series. and Kernel density estimates, Urn Model Asymptotics, free probability analogue of sub exponential distribution, Asymptotics of Randomly weighted sum, Non-commutative probability, Diffusion approximations, Inference in panel data under cross-sectional dependence, Stochastic modelling of political business cycle Stochastic Modelling of financial crisis through trade and capital inflow, High dimensional random matrices and its applications, Free probability. In mathematics the main topics of research are: Noncommutative geometry: Levi civita connections, Hopf algebroid and their actions on noncommutative spaces, quantum symmetry, Commutative Algebra, Affine Algebraic Geometry, History of Mathematics, Analytic Number Theory, Circle method, Analytic theory of L-functions, Differential Geometry, non holonimic distributions of co-rank greater than 1, Harmonic analysis on harmonic manifolds, Riemann surfaces, Rigidity problems for negatively curved manifolds, Motivic Homotopy Theory.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Arup Bose	Cross-covariance matrices	Monika Bhattacharjee (IIT, Mumbai); Apratim Dey (Stanford University)
	Asymptotic freeness via embedding	Monika Bhattacharjee (IIT, Mumbai)
	Block random matrices and asymptotic freeness	Steven Miller (Williams College)
	Time dependent linear spectral statistics	Koushik Saha (IIT, Mumbai); Sambhunath Maurya (IIT, Mumbai)
	Freeness via free cumulants	Soumendu Sundar Mukherjee (ISRU)
	Extensions of the Wigner matrix	Arusharka Sen (Concordia University); Koushik Saha (IIT, Mumbai)
Amarty Kumar Dutta	Algebraic Insights in Ancient Indian Algorithms	
Biswaranjan Behera	Maximal operators associated with general sets	Md. Nurul Molla
	Wavelets on local fields	
Debashish Goswami	Noncommutative Geometry, quantum groups	Jyotishman Bhowmick (ISI. Kolkata); Suvrajit Bhattacharjjee (ISI. Kolkata); Indranil Biswas (TIFR); Gioavanni Landi (Univ Trieste, Italy); Alex Chisvasitu (SUNY Buffalo, USA)
Kingshook Biswas	Holomorphic dynamics	Ricardo Perez-Marco
	Riemann surfaces	Ricardo Perez-Marco, Indranil Biswas
	Rigidity problems and geodesic flow of negatively curved manifolds	
	Harmonic analysis on harmonic manifolds	Rudra Prasad Sarkar
Ritabrata Munshi	Subconvexity for L-functions	Saurabh Singh; Mallesham Kummari; Roman Holowinsky; Zhi Qi; Keshav Aggarwal; Joseph Leung
Swagato Kumar Ray	Boundary behaviour of eigenfunctions of the Laplace-Beltrami operator and Fatou type theorems. Large time behaviour of the heat propagator. Study of quasianalytic functions on Lie groups.	Rudra P. Sarkar (ISI); Jayanta Sarkar (ISI); Mithun Bhowmik (IISc); Sanjoy Pusti (IITB)
Utsav Choudhury	Motives of stacks, Riemann Roch for stacks	Amit Hogadi; Neeraj Desh mukh
	Connected component sheaf in motivic homotopy theory, invaraints in unstable motivic homotopy theory	Amit Hogadi; Biman Roy

Projects

Externally-funded Projects

ONGOING PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	J. C. Bose Fellowship	264	September, 2008	August, 2023	Arup Bose	DST, SERB	1,39,00,000/-
2	J. C. Bose Fellowship	E-043	September, 2016	August, 2021	Debashish Goswami	DST, SERB	68,00,000/-

COMPLETED PROJECTS

Sl. No	Name of the project	A/c No.	Starting Date	End date	Principal Investigator(s)	Funding agency	Sanctioned amount (₹)
1	Swarna Jayanti Fellowship	E-029	2015	February, 2021	Neena Gupta	DST, SERB	27,00,000/-

A.N. Kolmogorov Bhavan, ISI, Kolkata

LIBRARY, DOCUMENTATION AND INFORMATION SCIENCE DIVISION (LDISD)

Divisional Head : KISHOR CHANDRA SATPATHY

01

Library, Bangalore Centre

Name of the Primary Contact : JISHNU BISWAS (Library in Charge),
Address for Postal Communication : 8th Mile, Mysore Road, ISI, Bangalore 560059
Year of Establishment : 1960

02

Library, Chennai Centre

Name of the Primary Contact : KALPANA.T.M.,
Address for Postal Communication : 110, Nelson Manicakm Road, Aminjikarai, Chennai 600049
Year of Establishment : 2010

03

Library, Delhi Centre

Name of the Primary Contact : UDAYA BHANU KANDHA,
Address for Postal Communication : 7, S. J. S. Sansanwal Marg, ISI, New Delhi 110 016
Year of Establishment : 1974

04

Library, North-East Centre, Tezpur

Name of the Primary Contact : KAKOLI GAGOI
Address for Postal Communication : Punioni, Solmara, Tezpur-784028
Year of Establishment : 2011

05

Central Library, Kolkata

Name of the Primary Contact : K. C. SATPATHY
Address for Postal Communication : 1st floor, S.N. Bose Bhawan, ISI, Kolkata 700108
Year of Establishment : 1933

1. LIBRARY, BANGALORE CENTRE

The Bangalore Center of the Indian Statistical Institute was conceived by Prof. P. C. Mahalanobis during 1960s, even when the city was emerging as a center of science. It is a tribute to his foresight that the Institute is now well established in one of the most vibrant scientific communities in India.

Indian Statistical Institute Bangalore Centre Library is aiming to be identified as a model library in the Indian academic scenario. ISI Bangalore Centre Library has also initiated interactive applications for its users. The library has developed a very distinguished collection in different knowledge domains such as Mathematics, Statistics, Systems Science, Information Science, Economics, Quality Management & Operations Research, Library & Information Science, Computation & Artificial Intelligence and so on. Various services are designed to meet the information needs of the faculty members, students, research scholars and visiting scientists. Walk-in users from the other institutions are also permitted to use the library. Major activities of the Library are given below.

COLLECTION DEVELOPMENT:

The library procures journals, books and other reading materials for users. The library subscribes to all major reputed journals in print and electronic form both foreign as well as Indian in the said fields. It has also a good collection of reference documents, govt. statistical reports and books on general interests. Currently, the total collection of the library is 30,971 books and 20,335 bound volumes.

MEMBERSHIP:

More than 285 members registered and facilities were extended to around 384 walk-in users during this period. Consequent to Corona Pandemic, no students/ members are visiting Library.

CURRENT CONTENT SERVICE:

Content pages of around 3020 journals have been scanned.

CIRCULATION SERVICE:

Consequent to Corona Pandemic, no students/ members are visiting to Library.

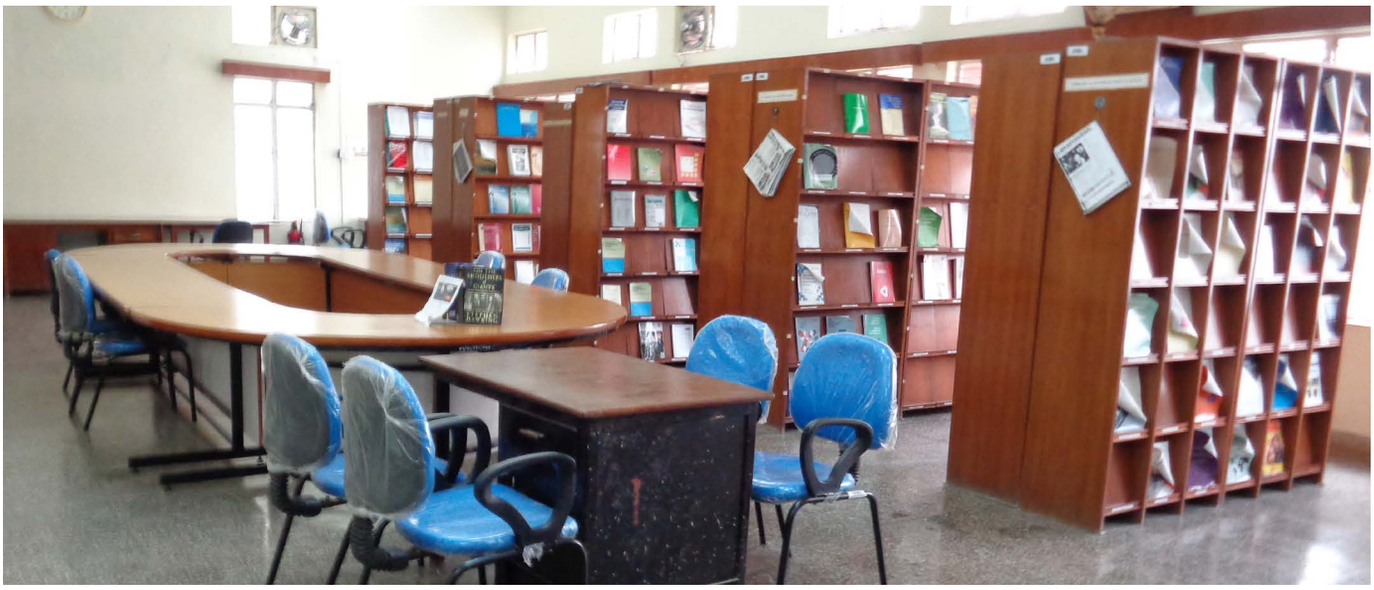
SERVICE ADDED:

The Bangalore Center of the Indian Statistical Institute was conceived by Prof. P. C. Mahalanobis during 1960s, even when the city was emerging as a center of science. It is a tribute to his foresight that the Institute is now well established in one of the most vibrant scientific communities in India. Library members can remotely access to all the important resources subscribed by the Kolkata library (e-books, e-journals) online. Other services are like lending, Inter-Library Loan, content search service, reading room service, reference service, reprography service, and electronic document delivery service etc.

The library provides RemoteXs facility to its users for accessing e-resources remotely. The library is also providing a plagiarism checkingfacility through iThenticate/URKUND to teachers and research scholars of the Institute.

DETAILS ABOUT THE CURRENT STATUS OF THE LIBRARY

Members	Personnel	Books	E-Books	CDs
285	2 Prof + 2 Non Prof.	30971	39	600



2. LIBRARY, CHENNAI CENTRE

ISI Chennai Centre library started in 2010. SQC & OR unit library was established in 1959 and ISI Chennai Centre Hostel Library in 2010. These libraries merged with the Central Library in 2013. Chennai Centre library is fully automated with Koha (Library Automation software), Biometric patron recognition, Fully RFID enabled with ISO standards. Database entries in Koha were updated (in Z39.50 Standard bibliographic format) for all the books. Web OPAC and user self-management systems incorporated with Koha. Books are classified under UDC and arranged accordingly with shelf guides etc. This evolving library aims to a vibrant collection in the fields of Statistics, Applied Statistics, Mathematics, Computer Science, Statistical Quality Control and Operation Research making it prototypical in functioning, administration and unique in the collection.

Library Collection:

The Library maintains an excellent collection of books, journals, magazines, question papers, multimedia resources etc. The library has a total collection of around 5925 books and reading materials. Institutional membership with the Indian Institute of Technology, Madras was renewed regularly for extending the collection. Books from the Chennai center were referred by faculties from ISI Bangalore through interlibrary loan. A total of Rs. 18193 was spent from the annual budget on books and one magazine. Total Rs. 75000 was spent on Computer.

Library services:

Library members can remotely access all the important resources subscribed by the Kolkata library (e-books, e-journals) online. Other services are like lending, Inter-Library Loan, content search service, reprography service and document delivery service etc. ISI Chennai Library website focuses to provide access to relevant information services, bibliographic and full text digital and printed resources to support the Scholarly Community of the Institute. It also shares a platform with ISI group institutions in Resource sharing to broaden resource availability. The library is also open for reference to academic users of other educational and scientific institutions and their neighboring regions. The library provides a RemoteXs facility to its users for accessing e-resources remotely. The library is also providing a plagiarism checking facility through URKUND to teachers and research scholars of the Institute. Library regularly organizes user orientation programme. The total number of documents circulated this year was 225. The number of Requests for Inter-Library Loan was 4.

DETAILS ABOUT THE CURRENT STATUS OF THE LIBRARY

Members	Personnel	Books	E-Books
25	1	5925	6

DESCRIPTION OF THE FACILITIES OR SERVICES PROVIDED

Number of Circulations held in the Year : 150 approximately

COLLECTION DEVELOPMENT

Books	:	20
Access to online / Journals databases	:	Through Remotex
E-books	:	Through Remotex
Bibliographic Records Added to the ILM & DAM Systems	:	41

3. LIBRARY, DELHI CENTRE

The Indian Statistical Institute, Delhi Centre, maintains an academic library, which aims to be a leading library in the fields of Economics, Mathematics, Statistics, Operations Research and Statistical Quality Control.

The library caters mainly to the needs of students, scholars and staff of the Institute. However, it is also open for reference to academic and research users of other educational and scientific institutions of the city and its neighboring regions.

It is one of the modern libraries with an extensive collection of books, journals, CDs, reports, government publications and other documents in print and electronic formats. The ISI Delhi Centre library also acts as one of the NBHM regional libraries of northern India and provides information resources to support academic and research activities in the areas of Mathematics, and allied subject areas.

Library services:

Koha, library management software became fully operational on 24 February 2019 using the library local server. The database of books and journals available is updated regularly and a Web-OPAC facility has been provided for students and teachers to search for documents.

Library members can remotely access to all the important resources subscribed by the Kolkata library (e-books, e-journals) online. Other services are like lending, Inter-Library Loan, content search service, reading room service, reference service, reprography service, Current Awareness Service, Web-OPAC Facility and electronic document delivery service etc. More than 1500 publications have been circulated among the members, 200+ documents delivered electronically. The number of Requests for Inter-Library Loan was 10 and a total of 50+ requests were received for repro photo services.

The library provides RemoteXs facility to its users for accessing e-resources remotely. A total of 600+ documents were downloaded and 1000 hits were received through RemoteXs. The library is also providing a plagiarism checking facility through iThenticate/URKUND to teachers and research scholars of the Institute.

Library organized regular user orientation programme for users, Koha training for library staff, followed Coordination Committee guidelines under the supervision of Chief Librarian, ISI, Kolkata on procurement of e-resources and other reading materials. Library has started new "Alert Services" for the users. Library is open for extended hours (5.30 p.m. to p.m., Monday to Friday and 10.00 a.m. to 2.00 p.m. on Saturday).

DETAILS ABOUT THE CURRENT STATUS OF THE LIBRARY

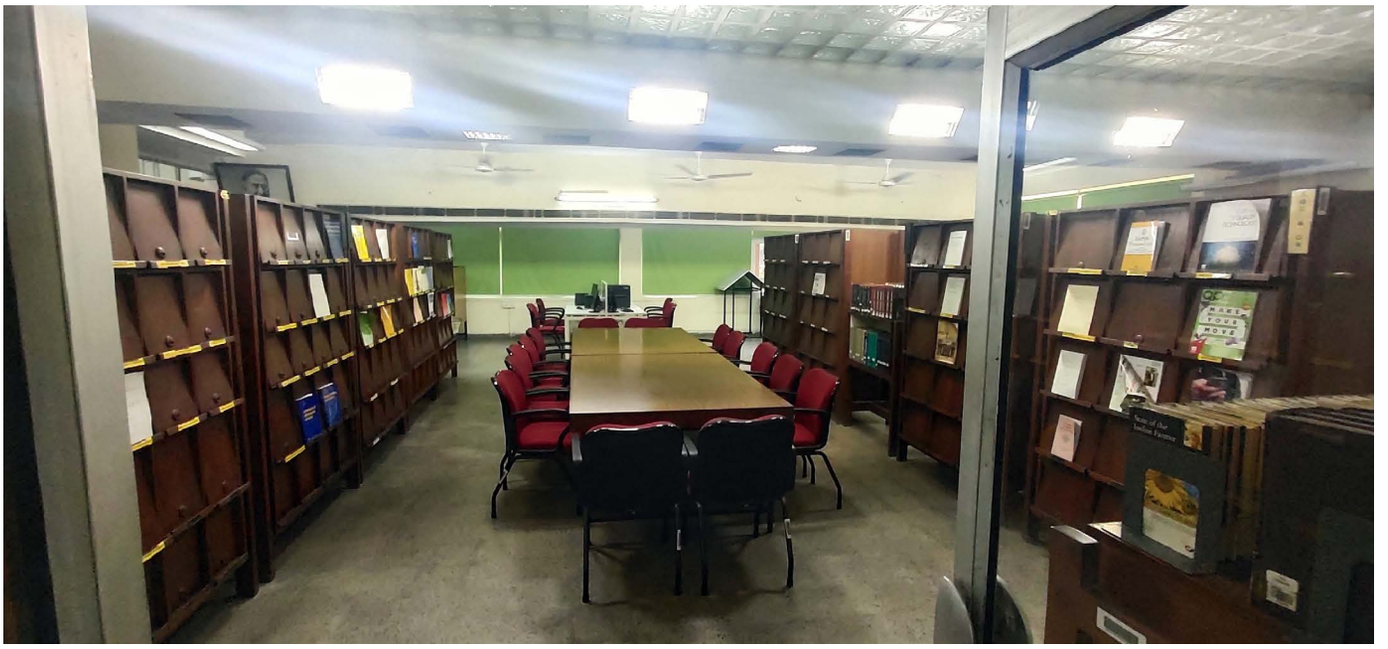
Members	Personnel	Books	Journals	E-Journals	CD/DVDs
165	2	33962	18638	11	700

DESCRIPTION OF THE FACILITIES OR SERVICES PROVIDED

Items Delivered in Electronic Format / ILL	:	50
Data Downloads/ Hits via RemoteXs	:	2652 MB
Number of Circulations held in the Year	:	909
Usage Statistics of Plagiarism Software	:	6
Requests Received for Repro-photo Services	:	10
Details about Web-based Services Provided	:	Library Collection Information, E-resources A-Z list, Library Services, Library Timings, Web-OPAC, Plagiarism Check, RemoteXs service etc.
Promotional Activities Performed in Library	:	Email notice on Library services, RemoteXs collection circulated to users
New Services Undertaken by the Library	:	Alert Services on new additions
Other Relevant Information (please specify)	:	Implemented koha, Library management software
Bibliographic Records Added to the ILM & DAM Systems	:	15

COLLECTION DEVELOPMENT

Books	:	11 books procured from ISI grant and 3 books received as a gift
Journals	:	32 Journals subscribed/renewed for the year 2021
Access to online databases	:	*Getting E-resource access of all necessary books, journals and databases from the Head Quarter Library via RemoteXs platform
E-books	:	*Getting E-books access from the Head Quarter Library via RemoteXs platform
CDs	:	5



4. LIBRARY, NORTH-EAST CENTRE, TEZPUR

ISI North East Centre Library has an excellent collection of books and journals. To cater to the requirements of the user, the Library accessioned a total number of 2994 books, 764 journals, 4 Newspapers and 2 magazines. The library has other special materials like 53 student project reports, 4 summer internship reports, 4 technical reports, 58 CDs, 29 NRSC Satellite Data Product and books as a gift. The Library subscribed to a good quality of electronic as well as print journals to fulfill the needs of the user community.

A total of 40 bibliographic records were processed. A total of Rs. 432853.00 was spent from the annual budget on books and other materials.

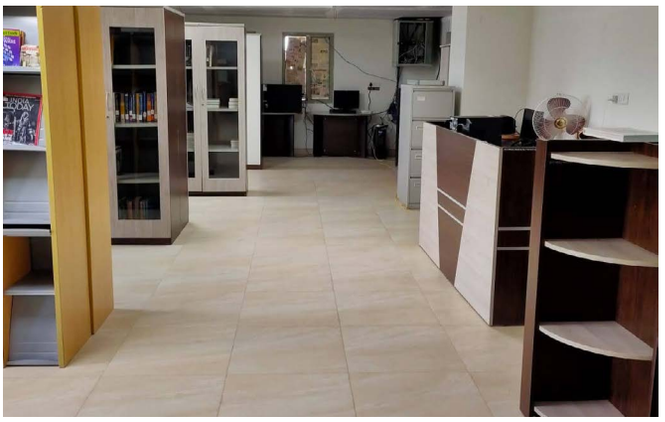
Library services:

Library uses Koha, library management software. The database of books and journals available is updated regularly and a Web-OPAC facility is available for students and teachers to search the library collection.

Library members can remotely access to all the important resources subscribed by the Kolkata library (e-books, e-journals) online. The library provides RemoteXs facility to its users for accessing e-resources remotely. The library is also providing a plagiarism checking facility through URKUND to teachers and research scholars of the Institute. Other Library Services are: Circulation Service, Reading Room Service, Inter-Library Loan Service, Reference Service, Photocopy service, Electronic document delivery service, Current awareness service, Web-OPAC Facility, Web Enable Library Services (Access to online resources). More than 850 publications have been circulated among the members this year. A total of 170 requests were received for repro photo services. The library website has a total number of 993 (348010-347017) hits.

DETAILS ABOUT THE CURRENT STATUS OF THE LIBRARY

Members	Personnel	Books	Journals	E-Journals
36	1	2994	764	1



Special Materials : Student Project Report (53), Summer Internship Report (4) Technical Report (4), Gift Item (Book-8), Gift Item (Magazine-11)

Bibliographic Records Added to the ILM & DAM Systems : 40

DESCRIPTION OF THE FACILITIES OR SERVICES PROVIDED

Data Downloads/ Hits via RemoteXs	:	720.73 MB
Number of Circulations held in the Year	:	200
Usage Statistics of Plagiarism Software	:	10
Number of Hits counted in the Lib Website	:	993

COLLECTION DEVELOPMENT IN 2020-21

Books	:	40
Journals	:	1

5. CENTRAL LIBRARY, KOLKATA

The Central Library occupies a unique place in the academic and research activities of the Institute. The Central Library moved to its present location in 1978, and it occupies 5 floors (60000sq.ft) of a ten-storied building at Kolkata. The Central Library seeks to:

- Meet the informational, educational, recreational, and cultural interests and needs of the user community by providing timely access to print and non-print resources appropriate to those needs.
- Encourage and facilitate reading, literacy and lifelong learning by supplying resources in a variety of formats designed to interest, inform, and enlighten.
- Protect the public's right to know by providing equal access to information needed for informed and effective daily living, decision making, problem solving and thoughtful participation in civic/community affairs.
- Provide the highest quality service and organize and display the collection for easy, open access by all.
- Maintain publication exchange program of the Institute with regional, international, national and foreign institutions and organizations.
- Continue to function as the Eastern Regional Library of the National Board of Higher Mathematics [NBHM], Department of Atomic Energy, and Government of India since 1989.

DETAILS ABOUT THE CURRENT STATUS OF THE LIBRARY

Members 2477	**Personnel** 31	**Books** 138515	**E-Books** 7200	**Journals** 100
E-Journals 20000	**Annual Budget** ₹ 11 crore	**Total Storage Digital Contents** 35 GB	**Bibliographic Records Added to the ILM & DAM Systems :** In IR total 6978 full text records are found in Dspace and 105 records (16 dissertations, 55 thesis, 17 question Papers, 15 ISI Scientist Pub., 2 Annual Reports) updated in the last year consisting about 5000 Pages	

DESCRIPTION OF THE FACILITIES OR SERVICES PROVIDED

Number of Circulations held in the Year	:	13,509 (Checkout-3085, Checkin-3528,Renewal-1910,Local Use-275,CD-Rom-21, References-2380, Dean's Library Circulation 1200)
Number of Requests for Inter Library Loan & checking of Plagiarism Software	:	2 Inter Library Loan books have been issued & 60 articles were sent on ILL. 30 outside member used the plagiarisim software services
Requests Received for Repro-photo Services	:	10 Books have sent for Photocopy at the Reprography unit

Services of the Library, ISI, Kolkata

Over the years, the ISI Central Library has attained the distinction of being one of the richest libraries in India in the areas of mathematics, statistics, economics, theoretical computer science and related areas. To achieve the goals of the Library, the following activities were undertaken during the year under report.

Collection Development:

The Library maintains an excellent collection of books, journals, reports, rare and special collections, government publications, data-books, theses and other documents/ materials in print and electronic formats.

During the year under report, the library accessioned 375 printed books and added SAGE e-Books Collection, Cambridge e-Books Collection while renewed approximately 3200+ e-books from Springer amd AMS eBook subject Collection (Mathematics and Statistics) which is accessible across the centers through IP ranges. The Library has accessioned more than 1718 bound volumes of journals (the total number of bound volumes of journal is 79860) and subscribed to 100 scholarly journal titles in print. Apart from this several journal titles were received

as complimentary and in exchange with Sankhya. The library received and processed more than 537 loose issues of journals. Besides this, the library has added a collection of 34 English books and 14 Bengali books on literature, humanities, travel, health and recreation and 22 Daily Newspapers & Magazines in its Workers' Circulating Library.

The library has a good collection of electronic resources on different media and has access to several online journals/ databases. The library has provided online access to about 20000+ full-text journals and renewed all major online databases like MathSciNet, AMS, IMS journals, IEL online of the IEEE/IEE publications, Econlit with full text, Science Direct, Springer, Taylor & Francis, Wiley, OUP, CUP, Duke Mathematical Society Journals, Euclid Prime, ACM Digital Library, JSTOR, Project Muse, SAGE along with SCOPUS and ProQuest databases.

This year Wall Street Journal, EPWRF Indian Time Series, Proceedings of the Royal Society A & B, J-Gate and J-Gate datatype, World Scientific (WSP)-Computer Sc. and Mathematics Collection, Geological Society of American & Geology journals. The Marking of the Modern World: All parts (Part I to III) with the Economist Historical Archive update 2004-2015 were added to the collection. The library has also subscribed to Census data and acquired online report databases (IP &/or Password based) for providing data services to the potential users. Subscribed online databases are namely – Economic Outlook (CMIE), States of India (CMIE), IndiaStat (Socio-economic Statistical Information & facts on India), DistrictsofIndia (only West Bengal Districts), CEIC Databases (Global DB + Daily DB + Indian Premium DB).

Library has Institutional tie-ups with several professional bodies like ILA,IASLIC, BLA, DELNET, British Council etc. Library renders electronic document delivery services bases on online / offline databases in India and abroad. Library also provides data download services with high-end computing facilities as well as photo-copying, data-copying, and printing etc.

Services:

The ISI-Library, since its inception has been providing a variety of library and information services to its users. The services presently being provided include:

Web-OPAC: Members use this facility to browse and search the database to see the status of a document including their own transactions.

Lending/Document Delivery Service: During this period 17037 books and other documents were issued to the user on loan and reference. Publications from the Government of India and other international organizations and data CDs, were issued to users for reference purposes. It provided document delivery services of 700–It provided email-based reminder services like 7-day advance alert, long overdue notice and check-in information.

Inter-library loan: 02 Books were borrowed from other libraries, while 10 books were lent to other libraries.

Current Awareness Service: 3 monthly lists of current additions to the library were made available online.

Self-Photocopying Service: The library provided the Self-photocopying service in its periodical section, which was available every day throughout the library hours. During this period 606 pages were photocopied from the journals and 35 nos. of books were sent for photocopying.

Electronic Document Delivery Service: Full-text articles and/or bibliographical data were provided through email from online resources. Besides electronic document delivery, 500 pages of printouts were also supplied against demand.

Online Full-Text Access to Journals/ Database: During the period under review, the library has provided services from more than 20000+ online journals and major databases like MathSciNet, Econlit with full text, Science Direct, Springer Link, T & F Journal online, Willy Inter-Science, Oxford University Press Journals, CUP Journals, JSTOR, IEEE/IEE publications, ACM Digital Library and Current Index to Statistics (CIS) on Web through consortia. Online access is available through a campus-wide network.

Publication exchange programme:

The library maintains the publication exchange programme of 'Sankhya'-the Indian Journal of Statistics' with 35 National and International Institutions/ Organizations. The 23 international agencies are from various countries of the world such as Bangladesh, Belgium, Brazil, Canada, China, Taiwan, Croatia, Czech Republic, Denmark, France, Hungary, Italy, Japan, Pakistan, Poland, Romania, Russia, Slovakia, Spain, Switzerland, Thailand, UK and USA.

Reprographic & Photographic Service:

During the period under report the Reprography & Photography Unit, Library Division has carried out its regular works of Photocopying more than 203317 copies (approx.), Total Program Covered 53, Photograph was taken 2081 snaps, Passport Print 350, Colour Print 7824, Spiral Binding 113, Lamination 42, Graphic Design 723.

The Unit renders unique services in graphic designing, image processing, developing digital photo archives, scanning and restoration of old photographs, art photography, scientific photographic work. It also provides services like modification of image files, poster printing, color printing, spiral binding, lamination, photographic coverage of various events like ISI Council meeting, ISI convocation, seminar, conference, visit of dignitaries, cultural and sports activities of the institute etc. It also carries out indoor photography like scientific photography for different scientific units. A Digital Photo Archive has been developed to store photographs along with their metadata.

Documentation Service:

A searchable bibliographic database has been prepared on scientific contributions made by the ISI scientists on all subject fields since 1934.

General Enquiry Assistance & Consultation Service:

Assistance has been extended to 280 external visitors including participants of the Winter School, NBHM Nurture Programme, Summer Research School and visiting students of different institutions.

Users have been provided off-campus E-resources access facility of Central Library via RemoteXs round the clock (24X7).

New initiatives taken by the library:

1. Nearly 1915 old and mutilated books were listed and the process of withdrawal from the koha collection is to be started soon.
2. IR was updated with for 105 records (16 dissertations, 55 theses, 17 question Papers, 15 ISI Scientist's Pub., 2 Annual Reports) consisting about 5000 Pages
3. Provided guidance and hospitality to at least 50 Post-Graduate Students of Lib. & Info Sc. & other courses who visited ISI Library in a group for their study tour.
4. 15 Journal articles,4 Book Chapters and 3196 pages of official documents were scanned and supplied to the users.
5. Preservation and conservation: Near about 1200 volumes of journals, books, and reports have been sent for binding this year which were pending for several years. 2 Rare and Valuable books, that have been damaged & mutilated, are Digitized and preserved for users.
6. Like each and every year, this year also library staff prepared the biographies of the Convocation Addressee and Special Guest and uploaded both Convocation Address and bio sketche(s) of the speakers and related documents in our Institutional Repositories.
7. Listing of segregation/categorization and processing of around 1200 very old documents (Books, Reports etc).
8. A new policy has been initiated for submission of doctoral dissertations (awarded by ISI) to the Institutional Repository with a mandate to make the public-funded research available through open-access. In this regard, a declaration of the individual researcher is prescribed for execution.
9. A no of online user awrenes programmes were organised. (Ask for Photos and Add here)

Projects

Internally funded Projects

COMPLETED PROJECTS

Sl.	Name of the Project	Starting Date	Duration	Principal Investigator
1	Arrangement & computerization of digitized archival collection of the P.C. Mahalanobis Memorial Museum & Archives	1ST April, 2019	2 years	Kishor Chandra Satpathy

COMPUTER AND STATISTICAL SERVICE CENTRE (CSSC), KOLKATA

Head of Unit : DEBA PRASAD MANDAL
Office : 4th Floor, S. N. Bose Bhavan, Indian Statistical Institute, Kolkata-700108

Research

The Computer and Statistical Service Centre (CSSC) is responsible for managing, maintaining and upgrading (from time to time) the IT infrastructure of the Institute, including servers for computing, server virtualization (cloud), relevant software, campus-wide networking (wired and wi-fi), internet security, IP telephony, video conferencing, e-library and internet facilities (NKN - 1 Gbps), and Site-to-Site Virtual Private Network (VPN) connectivity with Delhi, Bangalore, Chennai and North-East centres and the Giridih unit. Two computing laboratories having total capacity of 54 users are available for use by students of the Kolkata campus and for conducting laboratory classes of regular programmes like B.Stat., M.Tech.(CS), M.Tech.(QR&OR), M.S.(QE), M.Stat. throughout the year. The online teaching facility of the Institute is also being maintained by CSSC. Most of the online meetings (including council and academic council meetings) of the Institute are arranged and managed by CSSC. Regular classes are also conducted at other centres via video conferencing facilities. The acquisition and distribution of laptops and desktops to faculty, scientific staff and research scholars in Kolkata and Giridih are managed by CSSC.

Major Activities& Associated Resources

Resource	Brief Overview of Resources Available as on 31st March 2021
Servers	a) Four UCS Blade servers with total 528 logical CPU and 5TB RAM configured for the virtual server infrastructure of the Institute. b) One UCS Blade server with 104 CPU and 1 TB RAM and 3 Nos. of Nvidia GPU Card for GPGPU based computation. c) Matlab server d) ISILON storage with 260 TB usable space for NFS storage for all server and users data.
Virtualization	VMWare 6.5 virtualization managed by vCenter server appliance configured among four (04) servers to host the web, email and computational services of the Institute.
Networking	a) 1 Gbps NKN backbone for internet connectivity. b) One core switch (Cisco Nexus 7009) for L3 networking and DMZ. c) One L3 switch each in all the buildings in the campus connected to the core switch via fiber channel. d) Student hostels are connected to the core switch via fiber channel. e) The entire Kolkata campus is covered with wi-fi connectivity. f) Servers and storage at CSSC are connected internally with 10 Gbps backbone.
Software for use by students, faculty	Matlab, Mathematica, SPSS (including AMOS), Magma, R, Sage including programming facilities in Python, C and Java.
IP Telephony	a) IP telephone router through which all telephones in Kolkata campus are routed to BSNL. b) VoIP telephone system for communication within Kolkata campus and with outlying centres/ unit/ branches through VPN for zero cost internal telephone system.
Video Conferencing	a) Five video conferencing systems. b) One Cisco Meeting Server. c) One Zoom admin account with 26 user licenses
Internet Security	a) Firewall/ Proxy server with packet filtering. b) MAC based wi-fi authentication. c) SSL certificate for encryption. d) Email security appliance for email security.
VPN Connectivity	a) All centres/ unit/ branches of the Institute are connected with VPN which enable them to utilize the computational facility, FACT server, library resources and all software resources available in Kolkata campus. b) A Linux based gateway server for users to avail the computational facility from outside the ISI network.
Computing Laboratories (No. and capacity)	a) Two computing laboratories in CSSC having total capacity of 54 users and projector connectivity. These rooms are also being used for computer laboratory classes. b) The VC Room is also equipped with desktop computers for 44 users with networking facility and suitable for online classes and computer based tests.

Resources Acquired

Resource	Brief Overview
Networking	Network laying for Ethernet facilities in two rooms in 4th & 5th floors of S. N. Bose Bhavan for online classes
Software for use by students, faculty	Mathematica 12.0 for 20 users with one year subscription
Video Conferencing	One Zoom admin account with 26 user licenses

ACADEMIC CENTRES & TECHNOLOGY INNOVATION HUB

01

The Centre for Artificial Intelligence and Machine Learning (CAIML), Kolkata

Centre Head	:	NIKHIL RANJAN PAL
Number of Faculty	:	Fourteen (14), Associate Members
Number of Scientific Workers	:	One (1), Project Linked Personnel
Number of Non-scientific Workers	:	One (1), Associated Staff Member
Office	:	9th Floor, S N Bose Bhawan Kolkata - 700 108

02

The Centre for Research on the Economics of Climate, Food, Energy and Environment (CECFEE), Delhi

Centre Head	:	E. SOMANATHAN
Number of Faculty	:	Twenty-three (23); of which six are faculty in the Economics and Planning Unit of ISI, Delhi while more than half the researchers are faculty at other institutions like IISc, IIT-Mumbai, Delhi School of Economics, Institute of Economic Growth, Ashoka University, Shiv Nadar University, South Asian University, Duke University etc.
Number of Non-scientific Workers	:	One (1)
Number of Research Scholars	:	Two (2)
Number of Visiting Scientists	:	One (1)
Office	:	7 S.J.S. Sansanwal Marg, Delhi New Delhi, 110016

03

The Center for Soft Computing Research (CSCR), Kolkata

Centre Head	:	KUNTAL GHOSH
Number of Faculty/ Faculty-equivalent	:	Four (4)
Number of Scientific Workers	:	Three (3)
Number of Non-scientific Workers	:	Three (3)
Number of Research Scholars	:	Nine (9)
Office	:	1st Floor Floor, R.A. Fisher Bhawan Kolkata - 700108

04

R C Bose Centre for Cryptology and Security, Kolkata

Centre Head	:	BIMAL KUMAR ROY
Number of Faculty/ Faculty-equivalent	:	Six (6)
Number of Non-scientific Workers	:	Three (3)
Number of Research Scholars	:	Ten (10)
Office	:	3rd Floor, C D Deshmukh Bhawan Kolkata - 700 108

05

Technology Innovation Hub, Kolkata

Centre Head	:	ASHISH GHOSH
Number of Faculty	:	Eleven (11)
Office	:	4th Floor, Platinum Jubilee Building Kolkata - 700 108

1. THE CENTRE FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (CAIML), KOLKATA

The centre for Artificial Intelligence and Machine Learning (CAIML) has been established in 2019 with a mission to leverage the multidisciplinary nature of research and teaching at the Indian Statistical Institute (ISI) to establish a world class pan India centre of excellence for research, development, teaching, and training in Artificial Intelligence (AI), Machine Learning (ML), Data Science, and related areas. The centre is adorned by a set of eminent international AI/ML experts as advisors. The centre aims to use Machine Learning, Artificial Intelligence and Data Science as transformative technologies for human welfare and knowledge economy, thereby helping the nation in achieving its sustainable development goals.

The activities of CAIML are organized under the following four major verticals:

(i) Research,

(ii) Training and short-term course,

(iii) Collaboration and

(iv) Industry Liaison.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Malay Bhattacharyya	Crowd sourcing, Big Data Analysis, Computational Biology	Niranjan Nagarajan; Christopher E. Mason; Emmanuel Dias-Neto; Eran Elhaik; Christelle Desnues; Michael Poulsen
Nikhil Ranjan Pal	Machine Learning. Neural Networks, Computational Intelligence	Jian Wang; Tingwen Huang; Fanbiao Li
Utpal Garain	Deep learning: learning consequences via intervention	Nicholas Asher; Sujata Ghosh; Akshay Chaturvedi

Projects

Externally-funded

COMPLETED PROJECTS

Sl. No	Name of the project	Starting date	Completion date	Principal investigator(s)	Sanctioned amount (₹)
1	Workshop on Modelling Panel Data and Hierarchical Bayesian Modelling for Low Event Rate	1st January, 2021	1st February, 2021	Kiranmoy Das	3,60,000/-

Activities of the Centre

The Centre organized the following two workshops-

1. **Artificial Intelligence (AI) based Smart Agriculture for Sustainable Development -Online Workshop**

   Dates: February 26-28, 2021

   No of participants: Seventy one (71)

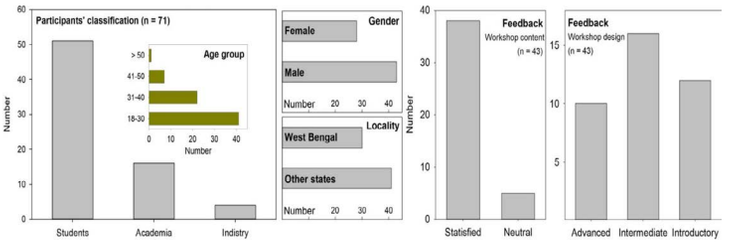
Objectives: Considering the importance of AI assisted sustainable smart agriculture, CAIML planned to organize an online workshop to demonstrate how data-driven approaches integrating AI and machine learning with big data technologies and high-performance computing could drive agricultural productivity while minimising its environmental impact. Keeping this objective in mind the workshop focussed on the relevance of AI assisted smart Agriculture and the tools and techniques needed for that. Some of the advanced applications of AI in agriculture were also discussed. The workshop talks emphasized on how an agricultural ecosystem can be developed so that the benefits of AI could reach small farmers.

Topics covered: (i) Overview of Smart agriculture, (ii) Overview of sustainable agriculture (with special reference to System for Rice Intensification), (iii) Statistical methodologies for agriculture, (iv) Design of experiments for Agriculture, (v) Machine learning tools for agriculture: Classification, Clustering, and Feature Analysis, (vi) The state of the art on Practice of AI for Agriculture, (vii) Remote sensing & GIS applications for smart agriculture, and (viii) Drones for precision agriculture.

Speakers: Topics were mostly explained by ISI professors. However, we invited four speakers, who are very renowned in the field, from outside. They were: (i) Professor Himanshu Pathak, Director, NIAM, Pune, (ii) Dr. Bimal Bhattacharya, ISRO, Ahmedabad, (iii) Dr. Basudeb Bhatta, Jadavpur University, and (iv) Dr. Aditi Sarkar, IIEST, Shibpur.

Participants: Considering the need of generating trained manpower in the field of AI for agricultural research, participation was invited from the final year students of BSc (Ag) and BE/B. Tech. in relevant fields, students pursuing Master's in Agriculture/Stat/ Math/CS/IT and in related areas, research scholars pursuing Ph.D. in relevant fields, faculty members engaged in teaching and research in relevant fields, and industry practitioners.

Workshop statistics and impact: Workshop statistics on several parameters are shown below to evaluate workshop's effectiveness on some useful parameters. From the participants' feedback it is clear that the first version of the workshop created an impressive impact among attendees. Considering the distinctive nature of the workshop, CAIML will attempt to make this event an annual one.



2. Statistical Machine Learning- Weekend Online Program

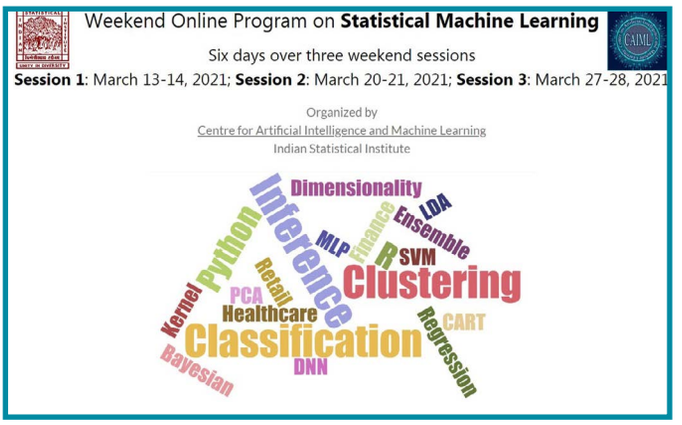
Dates: (Six days over three weekend sessions)

Session 1: March 13-14, 2021;

Session 2: March 20-21, 2021;

Session 3: March 27-28, 2021.

No of participants: Seventy seven (77)



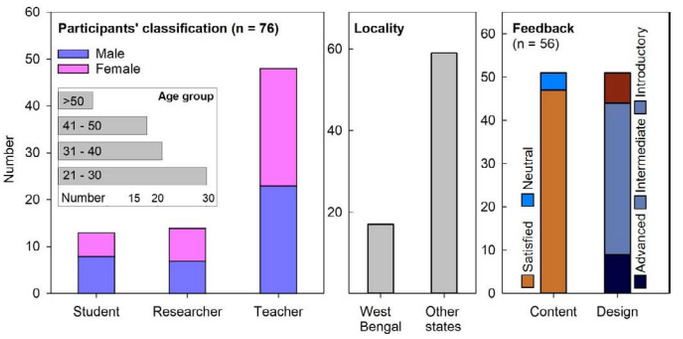
Objectives: Machine Learning and Artificial Intelligence are already affecting and likely to more strongly affect our everyday life including healthcare, education, entertainment, safety and security, to name a few. It is needless to emphasize that there is a lack of availability of properly trained manpower. To this end, this program was designed primarily for the college and university teachers teaching Mathematics, Statistics, Computer Science, Information Technology and related areas. Researchers in these areas including Ph.D. scholars were also welcome. To facilitate participation of teachers, lectures were held only during the weekends. Some key attributes of the program were, (i) Lectures during the weekends in online mode, (ii) Designed for college/university teachers and researchers, (iii) A balanced mixture of theory and practice and (iv) Some lectures by industry experts on applications in finance, healthcare and retail.

Topics Covered: (i) Overview of Machine Learning, (ii) Statistical Inference, (iii) Regression Analysis: Linear and Logistic, (iii) R/ python, (iv) Regression Analysis and Model selection, (v) Introduction to Classification and Clustering and their practical uses, (vi) Decision Tree and CART with implementation, (vii) Classification in Practice and SVM with Kernel Trick, (viii) Bayesian Learning, (ix) Ensemble Learning (Random Forest, Bagging, Boosting), (x) Dimensionality Reduction (PCA, LDA, Sammon's Projection), (xi) Neural Networks and Deep Neural Networks, (xi) Machine learning in healthcare, and (xii) Machine learning in retail.

Speakers: Topics were mostly explained by ISI professors. However, we invited three speakers from outside, two of them are practitioners. They were: (i) Shibasish Dasgupta, Pfizer, and CMI, (ii) Nagarajan Karuppiah, TCS Ltd., and (iii) Prof. Pabitra Mitra, IIT, Kharagpur.

Participants: Applications for participation in the program were invited mostly from the college and university teachers teaching Mathematics, Statistics, Computer Science, Information Technology and related areas. Researchers in these areas including Ph.D. scholars were also welcome.

Workshop statistics and impact: Workshop statistics on several parameters are shown below to evaluate workshop's effectiveness on some useful parameters. From the participants' feedback it is clear that the first version of the program was very effective for the attendees. Considering the need for such a program to generate suitably trained manpower in AI/ML and the overwhelming response from the target community, CAIML will attempt to organize more such events in future.



2. CENTRE FOR RESEARCH ON THE ECONOMICS OF CLIMATE, FOOD, ENERGY AND ENVIRONMENT (CECFEE), DELHI

CECFEE was established as a centre for excellence on July 24, 2020 pursuant to the decision of the ISI Council in its meeting held on June 09, 2020. The first meeting of the Board of Management of CECFEE on 23 March 2021 was chaired by Dr K. Vijay Raghavan, Principal Scientific Adviser to the Government of India, and Chair of the BoM.

Several CECFEE members were part of discussion forums and interviewed by the media. CECFEE research, has been widely covered in the national media – for example, on the impacts of heat on manufacturing output, was covered by all the major national newspapers.

The Umbrella Agreement providing for funding from the Environment and Development (EfD) Initiative 2021-2024 was approved.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Shivani Wadehra, Visiting Assistant Professor	Ascertaining the costs for collection and recycling of PET bottles between formal and informal sectors and creating appropriate incentives to increase it. (ICIMOD)	Abhiroop Mukhopadhyay
	Marine Collaborative Program (EfD) – Influencing households waste sorting behaviour.	Zihan (EfD China)

Projects

Externally-funded

NEW PROJECTS

Sl. No	Name of the project	Starting date	Duration	Principal investigator(s)	Sanctioned amount (₹)
1	Emissions Pricing for Development Program (EPDP)[1]	1st January, 2021	4 years	E. Somanathan	66,10,733/- (2021)
2	Distributional effects of the COVID-19 lockdowns in India[1]	1st January, 2021	2 years	R. Somanathan (co-PI Siva Athreya)	52,16,661/- (2021-2022)
3	Data quality assessment – during and post data collection for different indicator in the domains of demography, health and nutrition[2]	1st January, 2021	6 months	Mudit Kapoor	21,77,985/-
4	Impact of COVID lockdown and post lockdown recovery of the urban informal sector[1]	25th August, 2020	30th November, 2021	Saudamini Das	10,94.400/-

ONGOING PROJECTS

Sl. No	Name of the project	Starting date	Completion date	Principal investigator(s)	Sanctioned amount (₹)
1	Researching Refills: Resources and relationships required for sustaining LPG access in rural India[1]	1st June, 2019	31st December, 2021	E. Somanathan & Deepti Chatti	14,95,795/-
2	Adverse weather events, forced migration and human development outcomes in India: A district-level analysis[1]	1st January, 2020	31st December, 2021	Abhiroop Mukhopadhyay	24,38,382/-
3	The Causes and Consequences of Traffic Congestion in India[1]	1st January, 2020	31st December, 2021	Kanishka Kacker	22,51,458/-
4	Ascertaining the costs for collection and recycling of PET bottles between formal and informal sectors and creating appropriate incentives to increase it[3]	20th March, 2019	30th October, 2021	Shivani Wadehra	18,95,172/-
5	Effects of heat on the incomes of workers in the informal sector[1]	7th June, 2019	31st December, 2021	Saudamini Das	35,49,494/-
6	Clean air transitions in Indian Cities[1]	7th June, 2019	31st December, 2021	Rohini Somanathan	23,52,075/-

Sl. No	Name of the project	Starting date	Completion date	Principal investigator(s)	Sanctioned amount (₹)
7	Marine Collaborative[1]	15th September, 2018	31st Dec, 2021	Shivani Wadehra	41,29,123/- (2020)

COMPLETED PROJECTS

Sl. No	Name of the project	Starting date	Completion date	Principal investigator(s)	Sanctioned amount (₹)
1	Impacts of electric stoves on air pollution and women's welfare in rural India[1]	1st September, 2017	31st January, 2020	E. Somanathan	41,06,240/-
2	Does Decentralized Management of Irrigation ensure Efficient Use of Water? Evidence from India[1]	1st September, 2017	31st December, 2020	Mudit Kapoor & Sabyasachi Das	20,16,483/-
3	Field study of relation between paddy residue burning and severe air pollution[1]	11th April, 2018	31st December, 2020	E. Somanathan	11,62,598/-
4	Comprehensive National Nutrition Survey (CNNS) project[2]	1st June, 2019	31st December, 2020	Mudit Kapoor	93,91,021/-
5	A platform for linking community reforestation efforts with global actors and resources	10th November, 2020	31st December, 2020	E. Somanathan with R. Prabhakar and Ruchinilo Kemp	39,76,033/-

[1] Environment for Development Initiative (EfD), Sweden
[2] Population Council, India
[3] The International Centre for Integrated Mountain Development (ICIMOD), Nepal
[4] The Nature Conservancy (TNC), USA
[5] UNICEF, India

Activities of the Centre

1. An online event was organized by FSR-Climate and the European Association of Environmental and Resource Economists (EAERE) on 07 May 2020 to discuss the expected impacts of the COVID-19 pandemic on global climate policy and carbon markets. Invited Speaker - E. Somanathan

2. Kanishka Kacker and Shivani Wadehra are participating in a teacher training course offered by the EfD Initiative in collaboration with Teton Science Schools. The first part of the course in 2020 was entirely online and currently underway.

3. EfD's 14th Annual virtual meeting was held during November 16-20, 2020 – Keynote speech on the 4th day by Farzana Afridi on Women's work, production technology and the environment. Around 452 researchers participated in the annual meeting and many CECFEE researchers contributed to the discussions. Due to the pandemic, the annual conference of the EfD that was to be hosted by CECFEE was moved to a virtual mode.

Publications:

Nineteen publications, including a book chapter, were published during 2020 -2021. Among these, five publications with ISI affiliations feature under Publications in Journals section, under CECFEE (Chapter 5 of the AR) while the remaining 14 publications by CECFEE members (faculty from other institutions), in topics falling under CECFEE's scope, are listed below:

Bandyopadhyay, S. and Nilakantan, R. Manufacturing Slowdown in India: New Evidence from a Double Deflation Approach. Economic and Political Weekly. 55(15):60–63, 2020, Manufacturing Slowdown in India: New Evidence from a Double Deflation Approach - IIM Indore (iimidr.ac.in)

Bandyopadhyay, S. Gendered Well-Being: Cross-Sectional Evidence from Poor Urban Households in India. *Soc Indic Res* **151,** 281–308, 2020, https://doi.org/10.1007/s11205-020-02372-1

Bhuvandas, D. and **Gundimeda, H.** Welfare impacts of transport fuel price changes on Indian households: An application of LA-AIDS model, Energy Policy, Volume 144, 2020, 111583, https://doi.org/10.1016/j.enpol.2020.111583.

Das, S. Does mangrove plantation reduce coastal erosion? Assessment from the west coast of India. *Reg Environ Change* **20,** 58, 2020, https://doi.org/10.1007/s10113-020-01637-2

Das, S. Karl-Göran Mäler: the Adi-Guru of Environmental Economics, Ecology, Economy and Society–the INSEE Journal, 3(2):223–226, 2020, https://doi.org/10.37773/ees.v3i2.269

Gupta, S., **Gupta, E.** and Sarangi, G. K. Household Energy Poverty Index for India: An analysis of inter-state differences, Energy Policy, Volume 144, 2020, 111592, https://doi.org/10.1016/j.enpol.2020.111592.

Keil, A., **Krishnapriya, P. P.,** Mitra, A., Jat, M. L., Sidhu, H. S., Krishna, V. V. and Shyamsundar, P. Changing agricultural stubble burning practices in the Indo-Gangetic plains: is the Happy Seeder a profitable alternative?, International Journal of Agricultural Sustainability, 19:2, 128-151, 2021, DOI: 10.1080/14735903.2020.1834277

Kumar, A., Hazrana, J., and **Negi, D.S**. Understanding the geographic pattern of diffusion of modern crop varieties in India: a multilevel modeling approach. *Food Sec.* 13, 637–651, 2021, https://doi.org/10.1007/s12571-020-01114-y

Lukuyu, J., Fetter, R., **Krishnapriya, P. P.,** Williams, N. and Taneja, J. Building the supply of demand: Experiments in mini-grid demand stimulation, Development Engineering, Volume 6, 2021, 100058, https://doi.org/10.1016/j.deveng.2020.100058

Negi, D.S., Birthal, P., Kumar, A. and Tripathi, G. Farmers' social networks and the diffusion of modern crop varieties in India, International Journal of Emerging Markets, Vol. ahead-of-print No. ahead-of-print. 2020, https://doi.org/10.1108/IJOEM-04-2020-0407

Pascale, A., **Chakravarty, S.**, Lant, P., Smart, S. and Greig, C. The rise of (sub) nations: Sub-national human development, climate targets, and carbon dioxide emissions in 163 countries, Energy Research & Social Science, Volume 68, 101546, 2020, https://doi.org/10.1016/j.erss.2020.101546.

Shyamsundar, P., Cheek, J.Z., Rasmussen, L.V., Miller, D.C., Oldekop, J.A., Sauls, L.A., Sullivan-Wiley, K.A., Erbaugh, J.T. and **Krishnapriya, P.P.** Global Forces of Change: Implications for Alleviating Poverty and Sustaining Forests, Chapter 6, In: Forests, Trees and the Eradication of Poverty: Potential and Limitations. A Global Assessment Report, 2020 [Book chapter]

Singh, A. and **Gundimeda, H.** Why Regulations Come Up Short?: Some Observations from a Field Study of the Kanpur Leather Industry. Ecology Economy and Society–the INSEE Journal, 3, 2020, 10.37773/ees.v3i2.107.

Singh, A. and **Gundimeda, H**. Impact of bad outputs and environmental regulation on efficiency of Indian leather firms: a directional distance function approach, Journal of Environmental Planning and Management, 64:8, 1331-1351, 2021, DOI: 10.1080/09640568.2020.1822307

3. CENTER FOR SOFT COMPUTING RESEARCH (CSCR), KOLKATA

The Center for Soft Computing Research: A National Facility was established at the Indian Statistical Institute (ISI), Kolkata in 2004 by the Department of Science & Technology (DST), New Delhi under its prestigious IRHPA program. The Center has been declared in 2010 an Associate Institution of ISI. The focus of research is on Computing by Cognition. Research activities are conducted in different areas of soft computing especially theories of cognition, computational perception, and machine-mind architecture, while fore-front application areas include web intelligence, granular mining, cognitive vision, soft deep architecture, social network analysis, assistive technology and computing with words, among others.

Current Areas of Research

Faculty name	Research topic(s)	Collaborator(s)
Ashish Ghosh	Deep Learning; Data Science and Machine Learning, Automated Pollution Prediction, Rainfall Prediction	Sanghamita Bhoumik; Abhishek Kumar; Ankur Sarkar; Sayantan Chatterjee
Kuntal Ghosh	Cognitive Science, Cybernetics, Information processing in plants and small animals, Graph Manipulation Algorithms, Information Technology for Accessibility and Health Care Applications	Anjan Chowdhury; Keerthi S. Chandran; Amrita Mukherjee; Sandipa Roy; Satabdi Ghosh, Barnini Bhattacharyya; Shibsankar Roy; Bijay Bal; Arpan K Maiti
Sankar Kumar Pal	Granular Mining, Deep Learning, Rough Sets. Z-numbers, Soft Computing and Data Analytics	A. Pramanik; J. Maiti; Debarati B. Chakraborty
Shubhra Sankar Ray	Bioinformatics, Computational Biology, Neural Networks, Soft Computing	Sankar K. Pal; Joginder Singh

Projects

Externally-funded

NEW PROJECTS

Sl. No	Name of the project	Starting date	Duration	Principal investigator(s)	Sanctioned amount (₹)
1	SERB National Science Chair	1st August, 2020	31st July, 2023	Sankar Kumar Pal	1,32,00,000/-

ONGOING PROJECTS

Sl. No	Name of the project	Starting date	Completion date	Principal investigator(s)	Sanctioned amount (₹)
1	Networking on Data Science and Machine Learning under DST-ICPS Programme	23rd January, 2019	January, 2022	Ashish Ghosh	83,47,400/-
2	Coordination of Cluster Projects under Data Science Research	23rd January, 2019	January, 2022	Ashish Ghosh	58,90,000/-
3	Understanding vision from filling in and visual illusion perspectives with the help of computational modeling	30th November, 2017	November, 2021	Kuntal Ghosh	24,58,800/-

COMPLETED PROJECTS

Sl. No	Name of the project	Starting Date	Completion Date	Principal Investigator(s)	Sanctioned amount (₹)
1	INSA Distinguished Professor Chair	1st October, 2018	31st July, 2020	Sankar Kumar Pal	42,00,000/-
2	Influence of socio-economic status in the relationship between central obesity and cognitive development of school children of Kolkata, India and the changes in serum leptin and insulin resistance in different grades of central obesity	23rd April, 2018	22nd October, 2020	Satabdi Ghosh Mentor: Kuntal Ghosh	22,50,000/-
3	Development of computer vision based 3D Indian sign languages recognition to assist differently abled	6th November, 2017	December, 2020	Sandipa Roy Mentor: Kuntal Ghosh	18,78,500/-

4. R C BOSE CENTRE FOR CRYPTOLOGY & SECURITY

The Centre aims at the promotion of interdisciplinary research in Mathematics, Computer Science and Statistics towards furtherance of teaching, research as well as training and development in Cryptology and Cyber Security. It acts as a national hub for cryptographic requirements, cutting-edge research activities and indigenous capacity building in all relevant fields of study. Major activities of the Centre include teaching, training and research in Cryptology and Security. The Centre promotes sustained collaboration in focused research areas, and serves as a meeting point for eminent scholars. It also conducts training programs targeted to produce a critical mass of experts to cater to the national and international requirements in this niche area.

Research

The faculty members affiliated with the Centre work on various research topics in the domain of Cryptology and Security. The members of the Centre are also actively involved in sponsored research projects, funded by Government organizations as well as the Industry, in niche domains of the subject. The research programmes focus on the theoretical as well as the applied aspect of Cryptology and Security research.

The faculty members of the Centre supervise Post-graduate students of any discipline of the Institute in the domain of Cryptology and Security, and also offer guidance to full-time PhD candidates in Cryptology and Security selected through the usual JRF exam and interview process of the Institute. Cryptology and Security Research Unit (CSRU) is the only unit of R. C. Bose Centre for Cryptology and Security, which belongs to Computer and Communications Sciences Division (CCSD). Detailed academic activities of CSRU have been reported under the Computer and Communication Sciences Division (CCSD).

Projects

Externally-funded

ONGOING PROJECTS

Sl. No	Name of the project	Starting date	Completion Date	Principal investigator(s)	Sanctioned amount (₹)
1	National Technical Research Organization	30th November, 2019	31st March, 2022	Bimal K Roy	1,83,00,000/-

Activities of the Centre

The following series of TCS CSBS courses were held on –

1. June 17 – 19, 2020; lectures by Goutam Pal and Swagatam Das
2. June 24 – 26, 2020; lectures by Rana Barua, Goutam Pal and Swagatam Das
3. July 01 – 03, 2020; lectures by Rana Barua, Goutam Pal and Swagatam Das
4. August 11 – 14, 2020; lectures by Swagatam Das
5. March 16 – 20, 2021; lectures by Swagatam Das, Pinakpani Pal, Samarjit Das, Bimal Roy, K. Mandal and Subhomoy Maitra.

5. TECHNOLOGY INNOVATION HUB, Kolkata

A Technology Innovation Hub under National Mission on Interdisciplinary Cyber Physical System (NM-ICPS) funded by DST, New Delhi has been undertaken by Indian Statistical Institute on 07/08/2020. This hub aims to develop techniques and tools to address some of the challenges in Data Science. The main goal is to process scientifically and gather insights from the data obtained from different domains. In particular, attempts will be made to develop:

- Fast and scalable algorithms for learning
- Mathematical modelling, simulation and statistical inference from big data
- Developing novel data analytic models for two main application areas: smart agriculture and video surveillance
- Specific models for geo-spatial, climate informatics, oceanographic and cosmological data
- New models of deep learning and their parallel implementation for data reduction
- Classification and applications of the same for object recognition, video processing and design of smart surveillance systems
- Devise algorithms to analyse the complex and evolving networks in social media.
- New methodologies for designing effective medical diagnostic tools and non-invasive therapeutic measures with knowledge from imaging, genomics, histomics, and clinical data analysis.
- Text and document analysis and recognition.
- Statistical verification and testing of the proposed models.

The hub would further explore varied applications of the methods discussed above which include IoT based smart city and village design, smart agriculture, Smart camera based surveillance systems, Smart transportation systems, Smart medical diagnostic, and non-invasive therapeutic schemes. The approach of the hub is to pioneer the establishment of smart India. One of the major accomplishments of the hub would be to institutionalize a process that will bring industry projects into the classroom.

ISI, Kolkata

CHAPTER 04 AWARDS AND RECOGNITIONS

Science Academy Fellowships - 7

National - 4

International - 3

Awards - 10

Shanti Swarup Bhatnagar Prize in Mathematical Sciences - 1

National Science Chair - 2

INAE Woman Engineer Other Award -1

Members of the Faculty of this Institute have been recognized, both nationally and internationally, for their contributions to research and other academic activities. Like every other year, some faculty members have received prestigious awards and honours, in recognition of their excellence in their areas of expertise. Many of them have been elected members of learned societies while many others have taken up the academic responsibility of serving the editorial board of prestigious national and international peer reviewed journals. Their achievements are highlighted below-

4.1 SCIENCE ACADEMY FELLOWSHIPS (National and International)

INDIAN NATIONAL SCIENCE ACADEMY (INSA)

Rahul Roy, SMU, Delhi : Fellow, 2021

INDIAN ACADEMY OF SCIENCES (IAS, Bangalore)

Neena Gupta, SMU, Kolkata : Fellow 2021

National Academy of Agricultural Sciences (NAAS)

Arunava Goswami, AERU, Kolkata : Fellow, 2019-2020

WEST BENGAL ACADEMY OF SCIENCES (WAST)

Indranil Mukhopadhyay, HGU, Kolkata : Fellow 2020

THE WORLD ACADEMY OF SCIENCES (TWAS)

Sanghamitra Bandyopadhyay, MIU, Kolkata : Fellow 2020

YOUNG AFFILIATE (TWAS)

Neena Gupta, SMU, Kolkata : 2020

INTERNATIONAL ASSOCIATION FOR PATTERN RECOGNITION (IAPR)

Ashish Ghosh, MIU, Kolkata : Fellow 2020

4.2 AWARDS

SHANTI SWARUP BHATNAGAR PRIZE

Rajat Subhra Hazra, SMU, Kolkata : *in* Mathematical Sciences, 2020

Dr. Rajat Subhra Hazra falicitated by the Director, ISI

SWARNAJAYANTI FELLOWSHIP

Parthanil Roy, SMU, Bangalore : (2017-2023)

J C BOSE NATIONAL FELLOWSHIP

Arup Bose, SMU, Kolkata : (2019-2023)
B V Rajarama Bhat, SMU, Bangalore : (2017-2022)
Debashish Goswami, SMU, Kolkata : (2016-2021)
Sanghamitra Bandopadhyay, MIU, Kolkata : (2017-2022)
Sushmita Mitra, MIU, Kolkata : (2021-2026)

NATIONAL SCIENCE CHAIR, GoI

Partha P. Majumder, Emeritus Professor, ISI, Kolkata : (2020-2023)
Sankar K. Pal, CSCR Kolkata, Emeritus Professor and Ex-Director : (2020-2023)

INAE WOMAN ENGINEER OF THE YEAR AWARD, 2020

Sanghamitra Bandopadhyay, MIU, Kolkata
(Designing Lead Molecules : An Algorithmic Approach, INAE Award Function Lecture)

4.3 HONOURS & RECOGNITIONS

ASHISH GHOSH, MIU, Kolkata
In-charge, ChapNet and Ambassador programmes of IEEE Geoscience and Remote Sensing Society; 2020
Member, Governing Body of Asia Pacific Neural Network Society (APNNS); since 2021
Global Coordinator, IEEE Geoscience and Remote Sensing Society Chapters, 2020 onwards

B. SURY, SMU, Bangalore
Elected as President of the Indian Mathematical Society, 2020

B. S. DAYA SAGAR, SSIU, Bangalore
IEEE Geoscience and Remote Sensing Society (GRSS) Distinguished Lecturer (DL); 2020-2023

BIMAL KUMAR ROY, ASU, Kolkata
Chairman, National Statistical Commission, 2019-2022

DEBDULAL DUTTA ROY, PRU, Kolkata
Indian Academy of Applied Psychology, Best paper award, 2021

FARZANA AFRIDI, EPU, Delhi
Identifying and Alleviating Constraints to Women's Economic Empowerment IWWAGE-IFMR sub-award - A Bill and Melinda Gates Foundation Initiative, 2018-2021
Networks, Livelihoods and Well-being during a Pandemic: A Panel Study Using Matched Husband-Wife-Friends Data in Urban India (with Amrita Dhillon and Sanchari Roy) IGC Covid-19 Research Grant; 2020
Centralised vs. Decentralised Monitoring to Reduce Corruption (with Amrita Dhillon and Eilon Solan) DFID-Anti Corruption Evidence Grant; 2019-2021
Executive Committee, Annual SERI Conference; 2020

ISHA DEWAN, SMU, Delhi
President of India chapter of International Indian Statistical Association

KISHOR CHANDRA SATPATHY, Library, Kolkata
Certificate of Recognition awarded by the Academic Council of uLeKtz as one of the Top 50 Outstanding Librarians across India for the Year 2019 and conferred on 30 May 2020

MADHURA SWAMINATHAN, EAU, Bangalore
Member, Kerala Statistical Commission, 2020

MALAY BHATTACHARYYA, MIU, Kolkata
Member, The Lancet COVID-19 Commission: India Task Force, since 2021

MONISANKAR BISHNU, EPU, Delhi
Research Associate, The Centre for Applied Macroeconomic Analysis (CAMA), the Australian National University (ANU), Australia, 3 years
Affiliate, the Australian Research Council (ARC) Centre of Excellence in Population Ageing Research (CEPAR), 2020 onwards

PARTHA PRATIM MAJUMZAR, Emeritus Professor, ISI, Kolkata
Barclay Memorial Medal of the Asiatic Society, 2020
Sir Prafulla Chandra Ray Memorial Medal, University of Calcutta, 2020
3rd M.K. Pal Memorial Lecture, Saha Institute of Nuclear Physics, 2021
59th ICMR-NICED Foundation Day Oration, National Institute of Cholera & Enteric Diseases, 2021
238th Foundation Day Lecture of The Asiatic Society, Kolkata, 2021

SANGHAMITRA BANDYOPADHYAY, MIU, Kolkata
Fellow, International Association for Pattern Recognition (IAPR), 2020
Chief Guest & Convocation Speaker, St. Xavier's University, Kolkata, 2021
Chief Guest & Convocation Speaker, Narendrapur Ramkrishna Mission Residential College, Kolkata, 2021
Chief Guest & Convocation Speaker, West Bengal University of Science and Technology, Barasat, 2020

SANKAR KUMAR PAL, *Emeritus Professor*, CSCR, Kolkata
First Prof. C. Mohan Gold Medal for Excellence in Soft Computing, Soft Computing Research Society, 2020

SUSHMITA MITRA, MIU, Kolkata
IEEE CIS Distinguished Lecturer, 2019-2022
Chair Elect, IEEE Kolkata Section, 2021-2022

SUSMITA SUR-KOLAY, ACMU, Kolkata
Distinguished Alumnus Award*, IIT, Kharagpur*, 2020

TRIDIB KUMAR MONDAL, GSU, Kolkata
Prof. R.C. Misra Gold Medal from Wadia Institute of Himalayan Geology Dehradun, 2020

4.4 MEMBERSHIPS

ABHIROOP MUKHOPADHYAY, EPU, Delhi

Member : General Council (Ministry of Health and Family Welfare nominee), International Institute of Population Studies; 2020 onwards
Vaccine Cost Effectiveness Analysis (CEA) Working Group of the NTAGI (National Technical Advisory Group on Immunization); Sept 2020 onwards

ANITA NAILEKAR, SMU, Bangalore
Member : Board of Studies, Dept of Mathematics, BMSIT&M, Bangalore

ANTAR BANDYOPADHYAY, SMU, Delhi
Elected Member : International Statistical Institute (ISI); 2020-Life

ARUP BOSE, SMU, Kolkata
Adjunct Professor : School of Mathematics and Statistics, University of Hyderabad; 2020-2021
Member : National Committee for International Mathematical Union; 2020-2023
National Board of Higher Mathematics; 2019 till date
West Bengal State Council of Science & Technology; 2018-Jan, 2021
Indian National Science Academy Fellows Committee; 2020-2022
Faculty promotion/selection Committee, Aliah University, Kolkata; 2021 onwards
Faculty promotion/selection Committee, SRM University, Andhra Pradesh; 2020-Jan 2021
Convener : Indian Academy of Sciences Fellows Committee; 2019-2021

ASHISH GHOSH, MIU, Kolkata
Member : Asia Pacific Neural Network Society (APNNS); Indian Society for Fuzzy Mathematics and Information Processing (ISFUMIP)
Indian Unit for Pattern Recognition and Artificial Intelligence (IUPRAI)[an affiliated body of International Association of Pattern Recognition (IAPR)]

BISWANATH DUTTA, DRTC, Bangalore

External Member and Subject Expert : Doctoral Committee, Indian Institute of Information Technology(IIIT), Dharwad, Karnataka; 2021 onwards

Secretary : International Society for Knowledge Organization (ISKO), India Chapter; 2020 onwards
Organizing Committee cum Programme Committee member, IEEE International Conference on Semantic Computing, California; since 2017

B. S. DAYA SAGAR, SSIU, Bangalore

Member : Doctoral Committee, Indian Institute of Space Science and Technology, 2020-21;
Doctoral Committee, Savitribai Phule Pune University, 2021

Leader : Group-6 on Mathematical Modelling for Feature Extraction, Project on Chandrayaan-2 Mission; 2019-2020

B V RAJARAMA BHAT, SMU, Bangalore

Chairman : PAC, Mathematics SERB; June 2019 onwards
Curriculum Committee (MSc-Mathematics), MG University, Kottayam, Kerala; 2020-2021
UGC-SAP Committee, Alagappa University; 2016-2021

CHETAN GHATE, EPU, Delhi

Member : Research Advisory Board, ICRIER; July 2020 onwards
Planning and Monitoring Board, IIFT; Feb 2021 onwards

External Affiliate : Centre for Macroeconomics and Macro-finance (CReMMF), Swansea University, Wales, UK; June 2020 onwards

DARPA SAURAV JYETHI, TASU, North-East Centre, Tezpur

Member : Diversity Committee, International Society of Exposure Science (ISES), 2020-2021

DILIP SAHA, GSU, Kolkata

External Member : Board of Studies, Department of Geological Sciences, Jadavpur University; 2021

DHURJATI PRASAD SENGUPTA, GSU, Kolkata

Member : Board of Studies, Dept. of Geology, Presidency University, Kolkata, 2018 onwards
Undergraduate Board of Studies, Geology, University of Kolkata, Kolkata; 2019 0nwards
Ph. D, Committee, Dept.of Geology, Presidency University, 2018 onwards
Ph. D, Committee, Dept. of Geology, University of Calcutta, 2019 onwards

E. SOMANATHAN, EPU, Delhi

Member : Lancet Commission on COVID-19 Task Force on the Green Recovery; 2020 onwards
Board of the Environment for Development Initiative, University of Gothenburg; 2019 onwards
Board of Management of the TERI School of Advanced Studies; 2019 onwards
Economic Advisory Council Environmental Defense Fund, New York; 2021 onwards
Climate Change Research and Policy Network of the CEPR (Centre for Economic Policy Research), London; 2020 onwards
RWI Research Network, Leibniz-Institut für Wirtschaftsforschung e.V.; 2019 onwards

E. V. GIJO, SQC & OR, Bangalore

Expert Member : Curriculum Committee, M.G. University, Kerala; 2020-2021

FARZANA AFRIDI, EPU, Delhi

Core Committee Member : Society for Economic Research in India (SERI); 2018 onwards

Member : Editorial Board, The Indian Journal of Labour Economics; 2021-2026
Editorial Board 'Sarvekshana' the official journal of the National Sample Survey Organization of India, Ministry of Statistics and Program Implementation; 2019-2024
International Union for the Scientific Study of Population's (IUSSP) Panel on Population, Poverty and Inequality (PoPovIn); 2019-2021

Founding Member : The Feedback Initiative; 2021 onwards

KISHOR CHANDRA SATPATHY, Library, Kolkata

Expert Member : Committee for "Book Selection & Price Negotiation of National Library", National Library, Kolkata (2019 owards)

External Member : Advisory Committee for Collection Development of Print & E-Resources, National Library, Kolkata (2019 owards) Price Negotiation Committee for Purchase of E-Resources, Presidency University, Kolkata (2020 owards).

External Expert : MPhil & PhD thesis evaluation, Department of Library and Information Science, Calcutta University (2020 onwards).

Member : South Asian Librarian Advisory Board, Cambridge University Press (2020 owards)

KUNTAL GHOSH, MIU, Kolkata
Member: : Project Review and Steering Group for the Ministry of Electronics & Information Technology (MeitY), [project DISAAA: Development of an Integrated Solution for Automatic Assessment of Autism]; 2020-2021
Board of Studies, Department of Computer Applications, North Eastern Hill University; 2020-2021

M. KRISHNAMURTHY, DRTC, Bangalore
Member : Board of Studies, Bangalore University; 2020-2021
Board of Studies, Bharathiar University; 2020-2021

MADHURA SWAMINATHAN, EAU, Bangalore
Appointed Member : Governing Body, Institute for Social and Economic Change, Bangalore, 2019-21.
Council of Advisors, World Food Prize, Iowa, USA, 2019-21

MANDAR MITRA, CVPRU, Kolkata
Member : Board of Studies, RKM Vidyamandir, 2020-2021
Board of Studies, Heritage Institute of Technology, 2020-2021

MUDIT KAPOOR, EPU, Delhi
Member : Technical Advisory Group on National Data Project at NITI AAYOG, Jan 2021 onwards

NABANITA DAS, ACMU, Kolkata
Member : Board of Studies, School of Engineering, Mizoram State University; since 2018
Research Advisory Board, JCBCAT, DRDO, Kolkata; since 2018
Ph.D. Committee, IT Dept. Calcutta University; since 2019
Ph.D. Committee, IIEST, Howrah; since 2018

NILADRI SEKHAR DASH, LRU, Kolkata
Advisory Committee Member: Digitization of Sarala Mahabharata by Manuscript Section of the State
Member : IEEE Language Processing (Text) Subgroup, Language Technology Research Centre, International Institute of Information Technology, Hyderabad, India; 2020-2023
Board of Studies, MA Linguistics Programme, CAS in Linguistics, Annamalai University, Tamil Nadu, 2020-2022

PARTHA DE, PSU, Kolkata
Member : Population Environment Research Network, IUSSP, France; 2021

RAJAT KUMAR DE, MIU, Kolkata
Member : Academic Council, Guru Nanak Institute of Technology; 2020-2021

RITUPARNA SEN, ASU, Bangalore
Member of Council : International Society for Business and Industrial Statistics (ISBIS), 2019-2023

SANDIP DAS, ACMU, Kolkata
Member : Board of Studies, Vivekananda Educational and Research Institute; 2020-2021
Academic Council, Vivekananda Educational and Research Institute; 2020-2021

SANDIP MITRA, SOSU, Kolkata
Member : Board of Post Graduate Studies (BPGS), Department of Statistics, Assam Central University, Silchar; 2021-2022

SANGHAMITRA BANDYOPADYAY, MIU, Kolkata
Member : Prime Ministers Science, Technology, Innovation Advisory Council; 2018 till date
Fund for Improvement of S&T Infrastructure (FIST) Advisory Board, DS; 2020 onwards
Board of Governors, IIIT, Hyderabad; 2019-2022
Steering Board of Indo French Centre for Applied Mathematics (IFCAM) Phase II; 2018 - 2021
Chair : Expert Committee on Mathematical Sciences, Fund for Improvement of S&T Infrastructure (FIST) DST; 2020 onwards
Co-Chair : Thematic Group 18 of Science, Technology and Innovation Policy; 2020

SANKAR KUMAR PAL, CSCR, Kolkata
Member : COVID-19 India National Supermodel Committee, SERB-DST, GoI
Technical Advisory Group, Immunization Data: Innovating for Action (IDIA), Grand Challenge India, BIRAC
Dept of Biotechnology (DBT), GoI
Bill & Melinda Gates Foundation (BMGF)

SAURABH GHOSH, HGU, Kolkata
Member : Board of Studies, MIT World Peace University, 2020

SUSHMITA MITRA, MIU, Kolkata
Expert Member : EMR, SERB, DST, 2018 to date
Member Sectional Committee II, and several other Selection/Awards committees, INAE, 2017 to date
Board of Studies, Tezpur University & Govt. College of Ceramic Technology, 2017 to date
IEEE CIS Fellow Evaluation Committee, 2020 onwards
Inter Academy Panel for Women in STEMM, 2021-2024
VAJRA Selection Committee, 2021-2024

SUSMITA SUR KOLEY, ACMU, Kolkata
Member : Steering Committee, IEEE Computer Society Annual Symposium on VLSI; since 2011

SWAGATAM DAS, ECSU, Kolkata
Member : Board of Studies, Kerala University of Digital Sciences, Innovation and Technology [Digital University Kerala (DUK)], 2021
Board of Studies, G.H. Raisoni College of Engineering, Nagpur, 2020-2021

UMAPADA PAL, CVPRU, Kolkata
Member : Board of Studies, VIT, Vellore; since 2020
Board of Studies, Natura Institute of Technology; since 2018
PhD Research Committee, CSE, Jadavpur university; since 2017
BRS, Computer Science, Burdwan University; since 2019

4.5 EDITORIAL ASSIGNMENTS

ABHAY G. BHATT, SMU, Delhi
Editor : *Sankhya A*, Springer; since 2019
Editorial Board Member : *Proceedings of Mathematical Sciences*, Springer; since 2019

ABHIK GHOSH, ISRU, Kolkata
Technical Editor : *Sankhya*, Series A & B; 2016-2021

AMARTYA KUMAR DUTTA, SMU, Kolkata
Editorial Board Member : *The Mathematics Consortium, TMC Bulletin;* July 2019 *onwards*
Corresponding Editor : *Bhavana*; 2020 onwards

ANTAR BANDYOPADHYAY, SMU, Delhi
Associate Editor : *Journal of Statistical Planing and Inference (JSPI)*, Elsevier; since 2012
Sankhya Series A
Editorial Board Member : *Little Mathematical Treasures*, Ramanujan Mathematical Society & Universities Press; since 2012
Calcutta Statistical Association Bulletin, Calcutta Statistical Association; since 2016
Colombian Journal of Statistics (Revista Colombiana de Estad ⊠istica, RCE), Universidad Nacional de Colombia; since 2015

ANUP DEWANJI, ASU, Kolkata
Associate Editor : *Journal of Statistical Planning and Inference*, Elsevier; since 2012
: Calcutta Statistical Association Bulletin; since 2012

ARUNAVA SEN, EPU, Delhi

Associate Editor : *Social Choice and Welfare, Springer;* since 2000
: *Economic Theory, Springer;* since 2015
Advisory Editor : *Journal of Mathematical Economics;* 2020 onwards

ARUP BOSE, SMU, Kolkata

Associate Editor : *Random Matrix Theory and Applications*; July 2020 onwards

ASHIS KUMAR CHAKRABORTY, SQC & OR, Kolkata

Senior Associate Editor : *OPSEARCH*, Springer; Since 2020

ASHISH GHOSH, MIU, Kolkata

Associate Editor : *Research Reports in Computer Science*, Wiser Publishing, Singapore
Springer Nature Computer Science;
IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing;
IET Journal of Computer Vision;
Journal on Banking and Financial Technology (JBFT), Springer Nature;
Sadhana (Computer and Data Sciences), Springer Nature;
CAAI Transactions on Intelligence Technology (published from IET);
Communications in Computer and Information Science (CCIS), LNCS, Springer Nature.
Lead Guest Editor : *Special Stream of IEEE Geoscience and Remote Sensing Letters*;
Action Editor : *Neural Networks*, Elsevier

AYANENDRANATH BASU, ISRU, Kolkata

Guest Editor : *Statistics and Applications*, Volume 18, Issue 2, 2020 (Special issue in honour of Bimal and Bikas Sinha)
Member : Editorial Advisory Board, *Journal of Applied Statistics*; since 2013

B. S. DAYA SAGAR, SSIU, Bangalore

Editor-In-Chief : *Encyclopedia of Mathematical Geosciences*, Springer; 2019-2022
Editorial Board Member : *Computers & Geosciences*, Elsevier; since 2013
Mathematical Geosciences, Springer; since 2018
Guest Editor : *IEEE Journal of Selected Topics on Applied Earth Observation and Remote Sensing (JSTARS)*, IEEE; 2020-2022.
Advisory Board Member : *Indian Geophysical Union Journal*, IGU; 2021 onwards

BHABATOSH CHANDA, ECSU, Kolkata

Associate Editor : *Pattern Recognition*, Elsevier; since 2019

BISWANATH DUTTA, DRTC, Kolkata

Editorial Board Member : *International Journal of Metadata,* Semantics and Ontologies; since 2018

B. V. RAJARAMA BHAT, SMU, Bangalore

Editorial Board Member : *Proceedings of the Indian Academy of Sciences-Mathematics*
Journal of the Ramanujan Mathematical Society
Indian Journal of Pure and Applied Mathematics
Infinite Dimensional Analysis, Quantum Probability and Related Topics
Ramanujan Mathematical Society, Newsletter
Annals of Functional Analysis

B. SURY, SMU, Bangalore

Chief Editor : *Resonance*, Journal of Science Education

DEBASIS MISHRA, EPU, Delhi

Associate Editor : *Social Choice and Welfare,* Springer; 2016 onwards
Advisory Editor *Games and Economic Behaviour*, Elsevier; 2019 onwards

DEEPAYAN SARKAR, SMU, Delhi

Associate Editor : *Indian Journal of Pure and Applied Mathematics*; Since 2021

DIBAKAR GHOSH, PAMU, Kolkata
Associate Editor : *Frontier in Computational Neuroscience*; Since March 2021
Frontiers in Network Physiology; Since March 2021

DIGANTA MUKHERJEE, SOSU, Kolkata
Editorial Board Member : *International Econometric Review (formerly Eurasian Review of Econometrics), Econometric Research Association*, Turkey; 2006 onwards
Studies in Microeconomics, India; 2015 onwards
Review Editor : *Mathematical Finance (specialty section of Frontiers in Applied Mathematics and Statistics)*; 2021

DILIP SAHA, GSU, Kolkata
Associate Editor: : *Geological Magazine*, Cambridge University Press; since 2020
Section Editor, *Current Science*, Bangalore; since 2016

E.SOMANATHAN, EPU, Delhi
Co-Editor : *Environment and Development Economics* (Cambridge University Press); 2020 onwards

FARZANA AFRIDI, EPU, Delhi
Lead Academic : *International Growth Centre* (India program); since 2020
Editorial Board Member : *Sarvekshana', the official journal of the National Sample Survey Organization of India*, Ministry of Statistics and Program Implementation; 2019-2024

INDRANIL MUKHOPADHYAY, HGU, Kolkata
Associate Editor : Statistics and Applications; 2020 onwards

JIBAN K. PAL, Library, Kolkata
Honorary Member : Board of Editors, Re3data *(a global Registry of Research data Repositories)*, funded by German Research Foundation (DFG)

KANISHKA KACKER, EPU, Delhi
Associate Editor : *Journal of the Ramanujan Mathematical Society;* 2019 onwards

KINGSHOOK BISWAS, SMU, Kolkata
Associate Editor : *INSEE Journal*; 2020
Journal of Asian Economics; 2020

M. KRISHNAMURTHY, DRTC, Bangalore
Editor : *Journal of Information Science and Practice*, JISTAP

MADHURA SWAMINATHAN, EAU, Bangalore
Editorial Advisory Board : *Global Social Challenges*, Bristol University Press; 2021 onwards
Social Change and Development; since 2019
Editorial Board : *Review of Agrarian Studies*; since 2011

MONISANKAR BISHNU, EPU, Delhi
Associate Editor : *Journal of Asian Economics;* June 2020 onwards

NILADRI SEKHAR DASH, LRU, Kolkata
Editor-in-Chief : *Journal of Advanced Linguistic Studies* (ISSN: 2231-4075); 2010 onwards
Editorial Board Member : *Language Forum* (ISSN: 0253-9071); 2012 onwards
Journal of ELT and Applied Linguistics (ISSN: 2347-6575); 2013 onwards
Indian Journal of Applied Linguistics (ISSN: 0379-0037); 2013 onwards
The Journal of AsiaTEFL (e-ISSN 2466-1511); 2014 onwards
Springer Nature Social Sciences (ISSN: 2662-9283); 2020-2022

PRADIP BHATTACHARYYA, AERU, Kolkata
Special Issue Editor : *Applied Science Journal*, MDPI, USA; 2020-2021
Editorial Board Member : *NASS Journal of Agricultural Sciences*, Singapore; 2019-2021
Archives of Agronomy and Soil Science Sciences, Taylor & Francis; 2013-2021

PRADIPTA MAJI, MIU, Kolkata
Associate Editor : *Data Centric Engineering*, Cambridge University Press; 2021 onwards
Sadhana; since 2019

RAGHUNATH CHATTERJEE, HGU, Kolkata
Associate Editor : *Frontiers in Genetics*, Cancer Genetics and Oncogenomics; since 2020

RAHUL ROY, SMU, Delhi
Chief Editor : *Indian Journal of Pure and Applied Mathematics*, INSA and Springer; since 2021
Associate Editor : *Indian Journal of Pure and Applied Mathematics*, INSA and Springer; since 2016
Proceedings of the mathematical sciences, INSA and Springer; since 2016

RITABRATA MUNSHI, SMU, Kolkata
Chief Editor : *Journal of the Ramanujan Mathematical Society*; 2018 onwards
Editor : *Hardy-Ramanujan Journal;* 2014 onwards

RITA SAHARAY, ISRU, Kolkata
Associate Editor : *Sankhya*-Series A, Springer; since April 2016

RITUPARNA SEN, ASU, Bangalore
Editor : *Applied Stochastic Models in Business and Industry*, Wiley; since 2021
Associate Editor : *Sankhya* Series B, Springer; since 2016
Journal of the Indian Statistical Association; since 2020

SANGHAMITRA BANDYOPADYAY, MIU, Kolkata
Associate Editor : *IEEE Transactions on Artificial Intelligence*; IEEE Transactions on Systems, Man and Cybernatics: Systems; 2020 onwards

SANKAR KUMAR PAL, CSCR, Kolkata
Emeritus Professor
Associate Editor : *Information Sciences* (Elsevier)
: *Fuzzy Sets and Systems* (Elsevier)
: *Fundamenta Informaticae* (IOS Press)
International Journal Pattern Recognition and Artificial Intelligence (World Scientific)
: *International Journal Computational Intelligence and Applications* (World Scientific)
: *Journal of Data*, Information and Management (Springer)
LNCS Trans. on Rough Sets (Springer)
Executive Advisory Editor : *Data-Centric Engineering, Cambridge University Press*
International Journal of Approximate Reasoning
International Journal of Computational Science and Engineering
International Journal of Business Intelligence and Data Mining
International Journal of Machine Intelligence and Sensory Signal Processing

SAURABH GHOSH, HGU, Kolkata
Editor : Sankhya (Series B), Springer; 2019-2021

SHUBHRA SANKAR RAY, MIU, Kolkata
Associate Editor : *Sadhana, Indian Academy of Sciences; May 2019-2021*

SIVA ATHREYA, SMU, Bangalore
Editor in Chief : *Electronic Communications in Probability; 2021-2023*

SUDHEESH K KATTUMANNIL, ASU, Chennai
Associate Editor : *Journal of the Indian Statistical Association; since 2020*

SUSHMITA MITRA, MIU, Kolkata
Founding Associate Editor : *Wiley Interdisciplinary Reviews on Data Mining & Knowledge Discovery; since 2008 to date*
Associate Editor : *IEEE/ACM Transactions on Computational Biology and Bioinformatics; since 2010*
Information Sciences; since 2013
Transactions of INAE; since 2016
Fundamental Informaticae; since 2019

SUSMITA SUR-KOLAY, ACMU, Kolkata
Associate Editor : *ACM Transactions on Embedded Computing Systems; 2014-2020*

SWAGATAM DAS, ECSU, Kolkata
Associate Editor : *IEEE Transactions on Cybernetics; since 2020*
Pattern Recognition, Elsevier; since 2017
Information Sciences, Elsevier; since 2010
Neurocomputing, Elsevier; since 2013
Editorial Board Member : *Applied Soft Computing, Elsevier; since 2018*
Information Fusion, Elsevier; since 2020
Co-Editor-in-Chief : *Swarm and Evolutionary Computation*; since 2011
Editor : *Engineering Applications of Artificial Intelligence*, Elsevier; since 2013

TAPAN CHAKRABORTY, GSU, Kolkata
Associate Editor : *Indian Journal of Geosciences, Geological Survey of India; 2021-2022*

UJJWAL BHATTACHARYA, CVPRU, Kolkata
Co-Guest Editor : *Special Issue, Frontiers in Agronomy; since July 2020*

UMAPADA PAL, CVPR, Kolkata
Co-Editor-in-Chief : *Springer Nature Computer Science; since 2019*
Associate Editor *Pattern Recognition, Elsevier; since 2015*
Pattern Recognition Letters, Elsevier; since 2014
ACM TALLIP, ACM; since 2015
IET Biometric, IET; since 2016
International Journal of Document Analysis and Recognition, Springer; since 2015
International Journal of Pattern Recognition and Artificial Intelligence, World Scientific; since 2020

UTPAL GARAIN, CVPR, Kolkata
Associate Editor : International Journal of Document Analysis and Recognition, Springer; since Oct 2011.
Sádhanã, Springer; since May, 2019

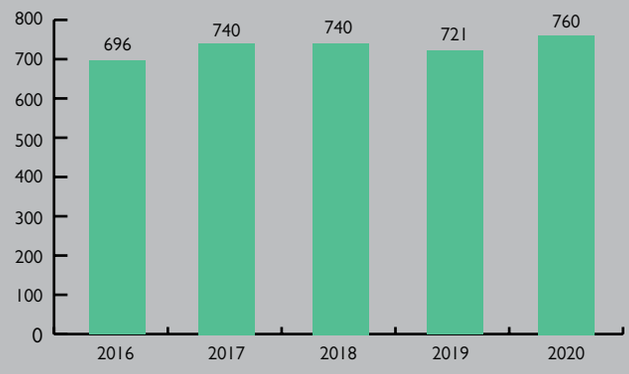
CHAPTER 05 PUBLICATIONS

Publications are formatted using APA Referencing Style (7th Ed.). Book references are arranged alphabetically by Author name(s) with the Division/Centre name in parenthesis. Articles published in Book Chapters and Conference Proceedings appear alphabetically for 2020 followed by 2021 under each Division. Journal articles also follow the same pattern but appear Unit-wise under each Division followed by CECFEE Delhi, CSCR Kolkata and the Administrative Services Division. Names in bold denote ISI faculty.

Total No of Publications:

Books	**:**	**11**
Book Chapters	**:**	**55**
Conference Proceedings	**:**	**68**
Journal Articles	**:**	**494**

Scientific Publications (last five years from Scopus)



5.1 PUBLICATIONS IN BOOKS & BOOK CHAPTERS

BOOKS

1. Chakraborty, P., **Maitra, S**., **Nandi, M**., & Talnikar, S. (2020). *Contact Tracing in Post-Covid World*. Springer Singapore, 135p. https://doi.org/10.1007/978-981-15-9727-5 [ASD]

2. **Dutta Roy, D.**, & Bhattacharya, S. (2020). *Fundamental Concepts of R-Programming*. Rabindrik Psychotherapy Research Institute, Kolkata. [SSD]

3. Majumder, P., **Mitra, M**., Gangopadhyay, S., & Mehta, P. (2020). *FIRE 2020: Forum for Information Retrieval Evaluation*. ACM. https://doi.org/10.1145/3441501 [CCSD]

4. **Nandi, S.**, & Kundu, D. (2020). *Statistical Signal Processing: Frequency Estimation*. Springer Singapore, 265p. https://doi.org/10.1007/978-981-15-6280-8 [TSMD]

5. Ramachandran, V. K., **Swaminathan, M.**, & Nagbhushan, S. (2020). *Women and Work in Rural India*. Tulika Books, 400p. ISBN: 978-819-392-696-3 [SSD]

6. **Chakraborty, A. K.**, & Chatterjee, M. (2021). *Handbook of Multivariate Process Capability Indices*. Chapman and Hall/CRC, 352p. https://doi.org/10.1201/9780429298349 [SQCOR]

7. Chakraborty, D. B., & **Pal, S. K**. (2021). *Granular Video Computing with Rough Sets, Deep Learning and in IoT*. World Scientific, 256p. https://doi.org/10.1142/12013 [CSCR]

8. Mukherjee, C. S., Roy, D., & **Maitra, S**. (2021). *Design and Cryptanalysis of ZUC: A Stream Cipher in Mobile Telephony*. Springer Singapore, 92p. https://doi.org/10.1007/978-981-33-4882-0 [ASD]

9. Mukhopadhyay, J., Sreedevi, I., **Chanda, B**., Chaudhury, S., & Namboodiri, V. P. (Eds.). (2021). *Digital Techniques for Heritage Presentation and Preservation*. Springer Switzerland, 272p. https://doi.org/10.1007/978-3-030-57907-4 [CCSD]

10. **Satpathy, K. C.** (Ed.). (2021). *What Next in Libraries? - Trends, Space & Partnerships*. Ahuja Book Company, 244p. ISBN: 978-9380316-109. [LDISD]

11. Uehara, R., Hong, S.-H., & **Nandy, S. C**. (Eds.). (2021). *WALCOM: Algorithms and Computation* (Lecture Notes in Computer Science, Volume 12635). Springer International Publishing, 334p. https://doi.org/10.1007/978-3-030-68211-8 [CCSD]

Book Chapters

Applied Statistics Division (ASD)

1. Chakraborty, P., & **Maitra, S.** (2020). More Glimpses of the RC4 Internal State Array. In K. Bhargavan, E. Oswald, & M. Prabhakaran (Eds.) *Progress in Cryptology – INDOCRYPT 2020* (Lecture Notes in Computer Science; Vol. 12578, pp.294-311). Springer. https://doi.org/10.1007/978-3-030-65277-7_13

2. Cogliati, B., Jha, A., & **Nandi, M.** (2020). How to Build Optimally Secure PRFs Using Block Ciphers. In S. Moriai, & H. Wang (Eds.) *Advances in Cryptology – ASIACRYPT 2020* (Lecture Notes in Computer Science; Vol. 12491, pp.754-784). Springer. https://doi.org/10.1007/978-3-030-64837-4_25

3. Dutta, A., & **Nandi, M.** (2020). BBB Secure Nonce Based MAC Using Public Permutations. In A. Nitaj, & A. Youssef (Eds.) *Progress in Cryptology – AFRICACRYPT 2020* (Lecture Notes in Computer Science; Vol. 12174, pp.172-191). Springer. https://doi.org/10.1007/978-3-030-51938-4_9

4. **Maitra, S.**, Mandal, B., Roy, M., & Tang, D. (2020). Experimental Results on Higher-Order Differential Spectra of 6 and 8-bit Invertible S-Boxes. In L. Batina, S. Picek, & M. Mondal (Eds.) *Security, Privacy, and Applied Cryptography Engineering* (Lecture Notes in Computer Science; Vol. 12586, pp.226-237). Springer, Cham. https://doi.org/10.1007/978-3-030-66626-2_12

5. **Nandi, M.** (2020). Mind the Composition: Birthday Bound Attacks on EWCDMD and SoKAC21. In A. Canteaut, & Y. Ishai (Eds.) *Advances in Cryptology – EUROCRYPT 2020* (Lecture Notes in Computer Science; Vol. 12105, pp.203-220). Springer. https://doi.org/10.1007/978-3-030-45721-1_8

6. **Sengupta, D**., Gupta, P., & Biswas, A. (2020). An Efficient Method for Computation of Entropy and Joint Entropy of Images. In D. Huang, V. Bevilacqua, & A. Hussain (Eds.) *Intelligent Computing Theories and Application* (Lecture Notes in Computer Science; Vol. 12463, pp.282-290). Springer. https://doi.org/10.1007/978-3-030-60799-9_24

7. Calderon-Garciduenas, L., Torres-Jardon, R., Gonzalez-Maciel, A., Reynoso-Robles, R., Brito-Aguilar, R., & **Mukherjee, P. S.** (2021). Alzheimer's Development and Progression in Urban Children and Young Adults: Nanoparticles, Mitochondria, Endoplasmic Reticulum and Cellular Havoc. In D. Brugge, & C. H. Fuller (Eds.) *Ambient Combustion Ultrafine Particles and Health* (Chapter-5). Nova Science Publishers.

Biological Sciences Division (BSD)

8. **Das, S.**, Dasgupta, N., & Hazra, A. (2021). Halophytes: A Glimpse of Indian Sundarbans – A World Heritage Site, Its Existing Status, and Sustainability. In M. Grigore (Ed.) *Handbook of Halophytes* (pp.163-197). Springer International Publishing. https://doi.org/10.1007/978-3-030-57635-6_6

Computer and Communication Sciences Division (CCSD)

9. Banik, A., Das, A. K., **Das, S.**, Maheshwari, A., & Sarvottamananda, S. (2020). Optimal Strategies in Single Round Voronoi Game on Convex Polygons with Constraints. In W. Wu, & Z. Zhang (Eds.) *Combinatorial Optimization and Applications* (Lecture Notes in Computer Science; Vol. 12577, pp.515-529). Springer. https://doi.org/10.1007/978-3-030-64843-5_35

10. Basavaraju, M., **Bishnu, A.**, Francis, M., & Pattanayak, D. (2020). The Linear Arboricity Conjecture for 3-Degenerate Graphs. In I. Adler, & H. Muller (Eds.) *Graph-Theoretic Concepts in Computer Science* (Lecture Notes in Computer Science; Vol. 12301, pp.376-387). Springer. https://doi.org/10.1007/978-3-030-60440-0_30

11. **Bishnu, A**., **Ghosh, A.**, Kolay, S., Mishra, G., & Saurabh, S. (2020). Fixed Parameter Tractability of Graph Deletion Problems over Data Streams. In D. Kim, R. N. Uma, Z. Cai, & D. H. Lee (Eds.) *Computing and Combinatorics* (Lecture Notes in Computer Science; Vol. 12273, pp.652-663). Springer. https://doi.org/10.1007/978-3-030-58150-3_53

12. Chakraborty, B., Das, A. K., **Das, S.**, & Mukherjee, J. (2020). Approximating k-Orthogonal Line Center. In W. Wu, & Z. Zhang (Eds.) *Combinatorial Optimization and Applications* (Lecture Notes in Computer Science; Vol. 12577, pp.47-60). Springer. https://doi.org/10.1007/978-3-030-64843-5_4

13. Chattopadhyay, S., Ghosh, R., **Banerjee, A.**, Gupta, A., & Jain, A. (2020). FINESSE: Fair Incentives for Enterprise Employees. In F. Dalpiaz. Et al (Eds.) *Research Challenges in Information Science* (Lecture Notes in Business Information Processing; Vol. 385, pp.191-211). Springer. https://doi.org/10.1007/978-3-030-50316-1_12

14. **Francis, M. C**., Neogi, R., & Raman, V. (2020). Recognizing k-Clique Extendible Orderings. In I. Adler, & H. Muller (Eds.) *Graph-Theoretic Concepts in Computer Science* (Lecture Notes in Computer Science; Vol. 12301, pp.274-285). Springer. https://doi.org/10.1007/978-3-030-60440-0_22

15. **Ghosh, S.,** & Ramanujam, R. (2020). Logics of Strategies and Preferences. In S. Sarukkai & M. Chakraborty (Eds.), *Handbook of Logical Thought in India* (pp.1-51). Springer India. https://doi.org/10.1007/978-81-322-1812-8_42-1

16. Mandal, S., **Molla, A. R.,** & Moses, W. K. (2020). Live Exploration with Mobile Robots in a Dynamic Ring, Revisited. In C. N. Pinotti et al (Eds.) *Algorithms for Sensor Systems* (Lecture Notes in Computer Science; Vol. 12503, pp.92-107). Springer. https://doi.org/10.1007/978-3-030-62401-9_7

17. Mittal, A., Shivakumara, P., **Pal, U.**, Lu, T., Blumenstein, M., & Lopresti, D. (2020). A New Context-Based Method for Restoring Occluded Text in Natural Scene Images. In X.

Bai et al (Eds.) *Document Analysis Systems* (Lecture Notes in Computer Science; Vol. 12116, pp.466-480). Springer. https://doi.org/10.1007/978-3-030-57058-3_33

18. **Molla, A. R.**, & Shur, D. (2020). Smoothed Analysis of Leader Election in Distributed Networks. In S. Devismes, & N. Mittal (Eds.) *Stabilization, Safety, and Security of Distributed Systems* (Lecture Notes in Computer Science; Vol. 12514, pp.183-198). Springer. https://doi.org/10.1007/978-3-030-64348-5_14

19. **Molla, A. R**., Mondal, K., & Moses, W. K. (2020). Efficient Dispersion on an Anonymous Ring in the Presence of Weak Byzantine Robots. In C. N. Pinotti et al (Eds.) *Algorithms for Sensor Systems* (Lecture Notes in Computer Science; Vol. 12503, pp.154-169). Springer. https://doi.org/10.1007/978-3-030-62401-9_11

20. Nandanwar, L., Shivakumara, P., Kumar, A., Lu, T., **Pal, U.,** & Lopresti, D. (2020). A New Common Points Detection Method for Classification of 2D and 3D Texts in Video/ Scene Images. In X. Bai et al (Eds.) *Document Analysis Systems* (Lecture Notes in Computer Science; Vol. 12116, pp.512-528). Springer. https://doi.org/10.1007/978-3-030-57058-3_36

21. Panda, S. P., Ray, K., & **Banerjee, A**. (2020). Dynamic Edge User Allocation with User Specified QoS Preferences. In E. Kafeza et al (Eds.) *Service-Oriented Computing* (Lecture Notes in Computer Science; Vol. 12571, pp.187-197). Springer. https://doi.org/10.1007/978-3-030-65310-1_15

22. Akhtar, S. S., **Das, S.**, & Gahlawat, H. (2021). Cops and Robber on Butterflies and Solid Grids. In A. Mudgal, & C. R. Subramanian (Eds.) *Algorithms and Discrete Applied Mathematics* (Lecture Notes in Computer Science; Vol. 12601, pp.272-281). Springer. https://doi.org/10.1007/978-3-030-67899-9_21

23. Bandopadhyay, S., **Ghosh, S. C.,** & Koley, S. (2021). Improved Bounds on the Span of L(1,2)-edge Labeling of Some Infinite Regular Grids. In C. Gentile et al (Eds.) *Graphs and Combinatorial Optimization* (AIRO; Vol. 5, pp.53-65). Springer. https://doi.org/10.1007/978-3-030-63072-0_5

24. Bhaumik, S., Jana, P., & **Mohanta, P. P.** (2021). Event and Activity Recognition in Video Surveillance for Cyber-Physical Systems. In K. K. Singh, A. Nayyar, S. Tanwar, & M. Abouhawwash (Eds.), *Emergence of Cyber Physical System and IoT in Smart Automation and Robotics*. (Advances in Science, Technology & Innovation: *IEREK Interdisciplinary Series for Sustainable Development;* pp.51-68*)*. Springer. https://doi.org/10.1007/978-3-030-66222-6_4

25. Braüner, T., Ghosh, A., & **Ghosh, S.** (2021). Understanding Responses of Individuals with ASD in Syllogistic and Decision-Making Tasks: A Formal Study. In L. Cleophas, & M. Massink (Eds.) *Software Engineering and Formal Methods* (Lecture Notes in Computer Science; Vol. 12524, pp.118-128). Springer. https://doi.org/10.1007/978-3-030-67220-1_10

26. Das, A. K., **Das, S.**, & Mukherjee, J. (2021). Approximation Algorithms for Orthogonal Line Centers. In A. Mudgal, & C. R. Subramanian (Eds.) *Algorithms and Discrete Applied Mathematics* (Lecture Notes in Computer Science; Vol. 12601, pp.43-54). Springer. https://doi.org/10.1007/978-3-030-67899-9_4

27. Das, A., Karar, S., **Das, N.**, & **Ghosh, S. C.** (2021). Pre-emptive Spectrum Access in Cognitive Radio for Better QoS. In C. R. Panigrahi, B. Pati, P. Mohapatra, R. Buyya, & K. Li (Eds.), *Progress in Advanced Computing and Intelligent Engineering* (Advances in Intelligence Systems and Computing; Vol. 1198, pp.115-126). Springer. https://doi.org/10.1007/978-981-15-6584-7_12

28. **Das, S.**, Dev, S. R., & Sarvottamananda, S. (2021). A Worst-Case Optimal Algorithm to Compute the Minkowski Sum of Convex Polytopes. In A. Mudgal, & C. R. Subramanian (Eds.) *Algorithms and Discrete Applied Mathematics* (Lecture Notes in Computer Science; Vol. 12601, pp.179-195). Springer. https://doi.org/10.1007/978-3-030-67899-9_14

29. **Das, S.**, Rao, S. B., & Sahoo, U. K. (2021). On Degree Sequences and Eccentricities in Pseudoline Arrangement Graphs. In A. Mudgal, & C. R. Subramanian (Eds.) *Algorithms and Discrete Applied Mathematics* (Lecture Notes in Computer Science; Vol. 12601, pp.259-271). Springer. https://doi.org/10.1007/978-3-030-67899-9_20

30. Dey, S., Maheshwari, A., & **Nandy, S. C.** (2021). Minimum Consistent Subset of Simple Graph Classes. In A. Mudgal, & C. R. Subramanian (Eds.) *Algorithms and Discrete Applied Mathematics* (Lecture Notes in Computer Science; Vol. 12601, pp.471-484). Springer. https://doi.org/10.1007/978-3-030-67899-9_37

31. Ghosal, S., & **Ghosh, S. C.** (2021). An Incremental Search Heuristic for Coloring Vertices of a Graph. In C. Gentile et al (Eds.) *Graphs and Combinatorial Optimization* (AIRO; Vol. 5, pp.39-52). Springer. https://doi.org/10.1007/978-3-030-63072-0_4

32. Kundu, S., **Das, N.**, & Saha, D. (2021). A Realistic Sensing Model for Event Area Estimation in Wireless Sensor Networks. In C. R. Panigrahi, B. Pati, P. Mohapatra, R. Buyya, & K. Li (Eds.) *Progress in Advanced Computing and Intelligent Engineering* (Advances in Intelligent Systems and Computing; Vol. 1198, pp.244-256). Springer. https://doi.org/10.1007/978-981-15-6584-7_24

33. Madireddy, R. R., **Nandy, S. C.**, & Pandit, S. (2021). On the Geometric Red-Blue Set Cover Problem. In R. Uehara et al (Eds.) *WALCOM:Algorithms and Computation* (Lecture Notes in Computer Science; Vol. 12635, pp.129-141). Springer. https://doi.org/10.1007/978-3-030-68211-8_11

34. Obaidullah, S. M., Mukherjee, H., Roy, K., & **Pal, U.** (2021). SigVer—A Deep Learning Based Writer Independent Bangla Signature Verification System. In S. K. Singh et al (Eds.) *Computer Vision and Image Processing* (CCIS; Vol. 1376, pp.440-450). Springer. https://doi.org/10.1007/978-981-16-1086-8_39

35. Pal, M., & **Bandyopadhyay, S.** (2021). Multi-modality of Occupants' Actions for Multi-Objective Building Energy Management. In S. Bhattacharyya, P. Dutta, & K. Datta (Eds.) *Intelligence Enabled Research* (Advances in Intelligent Systems and Computing; Vol. 1279, pp.11-19). Springer. https://doi.org/10.1007/978-981-15-9290-4_2

36. Prasad, P. K., Banerjee, P., Chanda, S., & **Pal, U.** (2021). Bengali Place Name Recognition - Comparative Analysis Using Different CNN Architectures. In S. K. Singh et al (Eds.) *Computer Vision and Image Processing* (CCIS; Vol. 1377, pp.341-353). Springer. https://doi.org/10.1007/978-981-16-1092-9_29

37. Wadhwani, M., Kundu, D., Chakraborty, D., & **Chanda, B.** (2021). Text Extraction and Restoration of Old Handwritten Documents. In J. Mukhopadhyay, I. Sreedevi, B. Chanda, S. Chaudhury, & V. P. Namboodiri (Eds.) *Digital Techniques for Heritage Presentation and Preservation* (pp.109-132). Springer International. https://doi.org/10.1007/978-3-030-57907-4_6

Library, Documentation and Information Science Division (LDISD)

38. Singha, K., & **Satpathy, K. C.** (2021). Understanding the Voice of Customer: A Mantra for Quality Service. In K. C. Satpathy (Ed.), *What Next in Libraries? - Trends, Space & Partnerships* (pp. 168–177). Ahuja Book Company.

Physics and Earth Sciences Division (PESD)

39. Ballio, F., Claut, D., Hosseini Sadabadi, S. A., Marion, A., Radice, A., Tait, S. J., **Sarkar, S.**, Simeone, G., & Zarrati, A. R. (2020). Lagrangian statistics of bed-load particle transport from experiments with a long measurement domain. In *River Flow 2020. Taylor and Francis* (pp.9). CRC Press. https://doi.org/10.1201/b22619-36

40. Saha, S., **Das, S. S.**, & Mondal, S. (2021). Gastropod Biozonation for the Jurassic Sediments of Kutch and Jaisalmer Basins and Its Application in Interbasinal Correlation. In S. Banejee & S. Sarkar (Eds.) *Mesozoic Stratigraphy of India: A Multi-proxy Approach* (pp.333-372). Springer.

Social Sciences Division (SSD)

41. **Somanathan, E.** (2020). Institutions, the Environment, and Development. In J.-M. Baland, F. Bourguignon, J.-P. Platteau, & T. Verdier (Eds.) *The Handbook of Economic Development and Institutions* (pp.733-750). Princeton University Press. https://doi.org/10.1515/9780691192017-022

42. **Das, S.** (2020). Child Education in India from the perspective of parentally provided inputs. In M. De Salis (Ed.) *Education in a competitive and globalizing world: Child education: Perspectives, opportunities and challenges* (pp. 73–100). NOVA.

43. **Dash, N. S.**, & Bhattacharyya, A. (2020). Digitization of Classical Indian Texts as a Part of Digital Humanities for Academic and Commercial Applications. In T. Khan (Ed.) *The Interplays of Language, Society and Culture* (pp. 17–39). Central Institute of Indian Languages.

44. Dutt, S., & **Dutta Roy, D.** (2020). Psyco-emotional disablism in persons with intellectual disabililty. In S. Ojha, & M. Asthana (Eds.) *Life Goal, Sprituality and Health* (pp. 141-160). Shree Publishers.

45. **Swaminathan, M.** (2020). Measuring Women's Work with Time Use Data. In M. Swaminathan, S. Nagbhushan, & V. K. Ramachandran (Eds.) *Women and Work in Rural India* (pp. 19–39). Tulika Books.

46. **Swaminathan, M.**, & Ramachandran, V. K. (2020). Introduction. In M. Swaminathan, S. Nagbhushan, & V. K. Ramachandran (Eds.) *Women and Work in Rural India* (pp. 11–18). Tulika Books.

47. **Dash, N. S.** (2021). The Norms and Rules of Part-of-Speech (POS) Tagging on a Written Text Corpus. In T. Khan (Ed.) *Alternative Horizons in Linguistics* (pp. 242–260). Lincom Europa.

48. **Jana, R.**, Vdhyarani, P., & Maruthakutti, R. (2021). Reciprocation of Indian States on Trade Relation. In M. Panda & H. Misra (Eds.) *Handbook of Research on Automated Feature Engineering and Advanced Applications in Data Science* (pp.249-261). IGI Global. https://doi.org/10.4018/978-1-7998-6659-6.ch014

Theoretical Statistics and Mathematics Division (TSMD)

49. **Goswami, D.** (2020). Quantum Symmetry of Classical Spaces. In P. K. Roy et al (Eds.) *Mathematical Analysis and Applications in Modeling: Springer Proceedings in Mathematics and Statistics* (pp.101-108). Springer. https://doi.org/10.1007/978-981-15-0422-8_8

50. Nagar, A., & **Raja, C. R. E.** (2020). Topological dynamics. In A. Nagar, Shah, R., & S. Sridharan (Eds.) *Elements of Dynamical Systems* (pp.55). TRIM 79.

51. **Rajeev, B.** (2020). On the Feynman–Kac Formula. In V. Joshua & S. Varadhan (Eds.), *Applied Probability and Stochastic Processes: Infosys Science Foundation Series* (pp.491-506). Springer. https://doi.org/10.1007/978-981-15-5951-8_29

52. **Munshi, R.** (2021). Twists of GL(3) L-functions. In W. Muller et al (Eds.) *Relative Trace Formulas* (pp.351-378). Springer. https://doi.org/10.1007/978-3-030-68506-5_11

Centre for Soft Computing Research (CSCR)

53. Das, C., Bose, S., Chanda, A., Singh, S., Das, S., & **Ghosh, K.** (2021). Impact of Prerequisite Subjects on Academic Performance Using Association Rule Mining. In C. R. Panigrahi, B. Pati, P. Mohapatra, R. Buyya, & K. C. Li (Eds.), *Progress in Advanced Computing and Intelligent Engineering. Advances in Intelligent Systems and Computing,* (Vol. 1199, pp. 227–236). Springer. https://doi.org/10.1007/978-981-15-6353-9_21

54. Raj, A., Consul, P., & **Pal, S. K.** (2021). Fast Neural Accumulator (NAC) Based Badminton Video Action Classification. In K. Arai, S. Kapoor, & R. Bhatia (Eds.), *Proceedings of the Intelligent Systems Conference* (pp. 452–467). Springer. https://doi.org/10.1007/978-3-030-55180-3_34

55. Roy, S., Maiti, A. K., Basak, G. K., & **Ghosh, K.** (2021). Difficulty with language comprehension and arithmetic word problems due to hearing impairment: Analysis and a possible remedy through a new Android-based assistive technology. In Kun Chang Lee et al (Ed.), *Data Analytics in Biomedical Engineering and Healthcare* (pp. 29–56). Elsevier (Academic Press). https://doi.org/10.1016/B978-0-12-819314-3.00003-3

5.2 Publication in Conference Proceedings

Applied Statistics Division (ASD)

1. Choudhury, D., & **Sen, R.** (2020). Index Tracking for NIFTY50. *Special Proceedings of the 22nd Annual Conference of SSCA*, pp.73–84.

2. Dodis, Y., Khovratovich, D., Mouha, N., & **Nandi, M.** (2021). T5: Hashing Five Inputs with Three Compression calls. *IACR Cryptology E-Prtint Archive, Report 2021/373,* pp.25:1-25:23. https://doi.org/10.4230/LIPIcs.ITC.2021.25

Computer and Communication Sciences Division (CCSD)

3. Alam, I., Jalan, D., Shaw, P., & **Mohanta, P. P.** (2020). Motion Based Video Skimming. *2020 IEEE Calcutta Conference (CALCON),* pp.407-411. https://doi.org/10.1109/CALCON49167.2020.9106488

4. Augustine, J. P. G., King, V., **Molla, A. R.**, Pandurangan, G., & Saia, J. (2020). Scalable and Secure Computation Among Strangers: Message-Competitive Byzantine Protocols. *34th International Symposium on Distributed Computing. Leibniz International Proceedings in Informatics, Virtual Conference,* 31:1-31:19.

5. Banerjee, P., Govindarajan, C., Jayachandran, P., & **Ruj, S.** (2020). Reliable, Fair and Decentralized Marketplace for Content Sharing Using Blockchain. *2020 IEEE International Conference on Blockchain (Blockchain),* pp.365-370. https://doi.org/10.1109/Blockchain50366.2020.00053

6. Banerjee, S., & **Mitra, S.** (2020). Evolving Optimal Convolutional Neural Networks. *2020 IEEE Symposium Series on Computational Intelligence (SSCI),* pp.2677-2683. https://doi.org/10.1109/SSCI47803.2020.9308201

7. Basu, S., **Mitra, S.**, & Saha, N. (2020). Deep Learning for Screening COVID-19 using Chest X-Ray Images. *2020 IEEE Symposium Series on Computational Intelligence (SSCI),*pp.2521-2527. https://doi.org/10.1109/SSCI47803.2020.9308571

8. Bhattacharya, A., Chakraborty, S., **Ghosh, A.**, Mishra, G., & Paraashar, M. (2020). Disjointness through the Lens of Vapnik-Chervonenkis Dimension: Sparsity and Beyond. *Leibniz International Proceedings in Informatics*, Vol.176, pp.23:1-23:15.

9. Biswas, S., & **Bandyopadhyay, S.** (2020). A Cross-Vertex Embedding Approach toward Understanding SARS-CoV-2 Variability. *2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA),* pp.611-616. https://doi.org/10.1109/ICCCA49541.2020.9250807

10. Chakraborti, T., McCane, B., Mills, S., & **Pal, U.** (2020). CoCoNet: A Collaborative Convolutional Network applied to fine-grained bird species classification. *2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ),* pp.1-6. https://doi.org/10.1109/IVCNZ51579.2020.9290677

11. Chakraborty, D., **Das, S.**, Foucaud, F., Gahlawat, H., Lajou, D., & Roy, B. (2020). Algorithms and Complexity for Geodetic Sets on Planar and Chordal Graphs. *31st International Symposium on Algorithms and Computation*, Vol.181, pp.7:1-7:15.

12. **Chakraborty, S.**, Chattopadhyay, A., Mande, N. S. ., & Paraashar, M. (2020). Quantum Query-To-Communication Simulation Needs a Logarithmic Overhead . *35th Computational Complexity Conference*, Vol.169, pp.32:1-32:15.

13. Das, A., Suwanwiwat, H., **Pal, U.**, & Blumenstein, M. (2020). ICFHR 2020 Competition on Short answer ASsessment and Thai student SIGnature and Name COMponents Recognition and Verification (SASIGCOM 2020). *2020 17th International Conference on Frontiers in Handwriting Recognition (ICFHR),* pp.222-227. https://doi.org/10.1109/ICFHR2020.2020.00049

14. Das, D., Santosh, K. C., & **Pal, U.** (2020). Cross-Population Train/Test Deep Learning Model: Abnormality Screening in Chest X-Rays. *2020 IEEE 33rd International Symposium on Computer-Based Medical Systems (CBMS),* pp.514-519. https://doi.org/10.1109/CBMS49503.2020.00103

15. Das, S., Kishore, P. S. R., & **Bhattacharya, U.** (2020). An End-To-End Framework For Pose Estimation Of Occluded Pedestrians. *2020 IEEE International Conference on Image Processing (ICIP),* pp.1446-1450. https://doi.org/10.1109/ICIP40778.2020.9191147

16. Dasgupta, K., Das, S., & **Bhattacharya, U.** (2020). Scale-Invariant Multi-Oriented Text Detection in Wild Scene Image. *2020 IEEE International Conference on Image Processing (ICIP),* pp.2041-2045. https://doi.org/10.1109/ICIP40778.2020.9191102

17. Dey, S., Foucaud, F., **Nandy, S. C.**, & Sen, A. (2020). Discriminating Codes in Geometric Setups. *31st International Symposium on Algorithms and Computation*, pp.24:1-24:16.

18. **Dutta, B**., & DeBellis, M. (2020). CODO: An Ontology for Collection and Analysis of Covid-19 Data. *Proceedings of the 12th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management,* pp.76-85. https://doi.org/10.5220/0010112500760085

19. Jana, A., Saha, D., & **Paul, G.** (2020). Differential Fault Analysis of NORX. *Proceedings of the 4th ACM Workshop on Attacks and Solutions in Hardware Security,* pp.67-79. https://doi.org/10.1145/3411504.3421213

20. Jana, D., & **Pal, P.** (2020). ESSENCE Kernel in Overcoming Challenges of Agile Software Development. *2020 IEEE 17th India Council International Conference (INDICON),* pp.1-8. https://doi.org/10.1109/INDICON49873.2020.9342375

21. Kshemkalyani, A. D., **Molla, A. R.**, & Sharma, G. (2020). Efficient Dispersion of Mobile Robots on Dynamic Graphs.

2020 IEEE 40th International Conference on Distributed Computing Systems (ICDCS), pp.732-742. https://doi.org/10.1109/ICDCS47774.2020.00100

22. Lall, S., Ray, S., & **Bandyopadhyay, S.** (2020). Identifying novel SARS-CoV2–human protein interactions using graph embedding. *28th Conference on Intelligent Systems for Molecular Biology*, pp.1–2.

23. Maheshwari, A., Mehrabi, S., **Roy, S.**, & Smid, M. (2020). Covering Points With Pairs of Concentric Disks. *32nd Canadian Conference on Computational Geometry 2020*, pp.33–38.

24. Majumdar, R., & **Sur-Kolay, S.** (2020). Approximate Ternary Quantum Error Correcting Code with Low Circuit Cost. *2020 IEEE 50th International Symposium on Multiple-Valued Logic (ISMVL),* pp.34-39. https://doi.org/10.1109/ISMVL49045.2020.00-33

25. Majumdar, R., & **Sur-Kolay, S.** (2020). Special Session: Quantum Error Correction in Near Term Systems. *2020 IEEE 38th International Conference on Computer Design (ICCD),* pp.9-12. https://doi.org/10.1109/ICCD50377.2020.00015

26. Meel. K. S., Pote, Y., & **Chakraborty, S.** (2020). On Testing of Samplers. *34th Conference on Neural Information Processing Systems*. https://arxiv.org/abs/2010.12918v1

27. Mitra, S., Chittimalli, P. K., & **Banerjee, A.** (2020, February). Analyzing Business Systems comprised of Rules and Processes using Decision Diagrams. *Proceedings of the 13th Innovations in Software Engineering Conference on Formerly Known as India Software Engineering Conference,* pp.1-5. https://doi.org/10.1145/3385032.3385051

28. Mondal, M. N., **Sur-Kolay, S.**, & Bhattacharya, B. B. (2020, July). Current Comparator-Based Reconfigurable Adder and Multiplier on Hybrid Memristive Crossbar. *2020 IEEE Computer Society Annual Symposium on VLSI (ISVLSI),* pp.494-499. https://doi.org/10.1109/ISVLSI49217.2020.000-8

29. Nandi, A., Jana, N. D., & **Das, S.** (2020). Improving the Performance of Neural Networks with an Ensemble of Activation Functions. *2020 International Joint Conference on Neural Networks (IJCNN),* pp.1-7. https://doi.org/10.1109/IJCNN48605.2020.9207277

30. Ray, K., & **Banerjee, A**. (2020). Trace-driven Modeling and Verification of a Mobility-Aware Service Allocation and Migration Policy for Mobile Edge Computing. *2020 IEEE International Conference on Web Services (ICWS),* pp.310-317. https://doi.org/10.1109/ICWS49710.2020.00047

31. Ray, K., **Banerjee, A.**, & Narendra, N. C. (2020). Proactive Microservice Placement and Migration for Mobile Edge Computing. *2020 IEEE/ACM Symposium on Edge Computing (SEC),* pp.28-41. https://doi.org/10.1109/SEC50012.2020.00010

32. Ray, P., & **Pal, P.** (2020). Extending the SEMAT Kernel for the Practice of Designing and Implementing Microservice-Based Applications using Domain Driven Design. *2020 IEEE 32nd Conference on Software Engineering Education and Training (CSEE&T),* pp.1-4. https://doi.org/10.1109/CSEET49119.2020.9206200

33. Roy, A. P., Koley, S. K., & **Garain, U.** (2020). Eyes speak out Mind: Deep models for Gaze-based Analysis of Bilingual And Monolingual Reading. *2020 IEEE 17th India Council International Conference (INDICON),* pp.1-7. https://doi.org/10.1109/INDICON49873.2020.9342182

34. Roy, D., Santra, S., & **Chanda, B.** (2020). Incorporating Human Body Shape Guidance for Cloth Warping in Model to Person Virtual Try-on Problems. *2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ),* pp.1-6. https://doi.org/10.1109/IVCNZ51579.2020.9290603

35. Roy, P., Bhattacharya, S., Ghosh, S., & **Pal, U.** (2020). STEFANN: Scene Text Editor using Font Adaptive Neural Network. *The IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pp.13228–13237.

36. Saha, S., & **Bandyopadhyay, S.** (2020). Versatility-preserving Multi-omics Data Analysis by Ranking the Nodes in Multilayer Network. *2020 IEEE 5th International Conference on Computing Communication and Automation (ICCCA),* pp.617-622. https://doi.org/10.1109/ICCCA49541.2020.9250749

37. Sarwar, M. M. S., Ray, R., & **Banerjee, A.** (2020). A Contrastive Plan Explanation Framework for Hybrid System Models. *18th ACM-IEEE International Conference on Formal Methods and Models for System Design*, pp.1–11. https://doi.org/10.1109/MEMOCODE 51338.2020.9315040

38. Sen, S., Malta, M. C., Katoriya, D., **Dutta, B.**, & Dutta, A. (2020). Labeled k-partite Graph for Statement Annotation in the Web of Data. *2020 IEEE/WIC/ACM International Joint Conference on Web Intelligence and Intelligent Agent Technology (WI-IAT),* pp.63-71. https://doi.org/10.1109/WIIAT50758.2020.00014

39. Singh, D., Chattopadhyay, A., & **Ghosh, S. C.** (2020). Distributed Relay Selection in Presence of Dynamic Obstacles in Millimeter Wave D2D Communication. *ICC 2020 - 2020 IEEE International Conference on Communications (ICC)*, pp.1–6. https://doi.org/10.1109/ICC40277.2020.9148816

40. Banerjee, P., Muthaiah, A., & **Ruj, S.** (2021). Blockchain Enabled Data Trading with User Consent. *2021 International Conference on COMmunication Systems & NETworkS (COMSNETS),* pp.263-271. https://doi.org/10.1109/COMSNETS51098.2021.9352817

41. Bhattacharya, A., **Bishnu, A.**, Mishra, G., & Upasana, A. (2021). Even the Easiest Graph Coloring Problem Is Not Easy in Streaming! *12th Innovations in Theoretical Computer Science Conference*, pp.15:1-15:19. https://doi.org/10.4230/LIPIcs.ITCS.2021.15

42. Chakraborty, J., Chakraborty, B., & **Bhattacharya, U.** (2021). DenseRecognition of Spoken Languages. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.9674-9681. https://doi.org/10.1109/ICPR48806.2021.9412413

43. Chakraborty, S., Paul, D., & **Das, S.** (2021). Automated clustering of high-dimensional data with a feature weighted mean shift algorithm. *Proceedings of the AAAI Conference on Artificial Intelligence*, pp.6930–6938. https://ojs.aaai.org/index.php/AAAI/article/view/16854

44. Chanda, S., Haitink, D. A. W., Prasad, P. K., Baas, J., **Pal, U.**, & Schomaker, L. (2021). Recognizing Bengali Word Images - A Zero-Shot Learning Perspective. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.5603-5610. https://doi.org/10.1109/ICPR48806.2021.9412607

45. Chattopadhyay, S., Chakraborty, T., **Ghosh, K.**, & Das, A. K. (2021). Uncovering patterns in heavy-tailed networks: A journey beyond scale-free. *8th ACM IKDD CODS and 26th COMAD,* pp.136-144. https://doi.org/10.1145/3430984.3431021

46. Das, D., Santosh, K. C., & **Pal, U.** (2021). Inception-based Deep Learning Architecture for Tuberculosis Screening using Chest X-rays. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.3612-3619. https://doi.org/10.1109/ICPR48806.2021.9412748

47. Das, S., & **Ghosh, S.** (2021). Receiving Messages in Their Correct Order: Analyzing Broadcast Protocols in Dynamic Epistemic Logics. *Proceedings of the 13th International Conference on Agents and Artificial Intelligence,* Vol.2, pp.851-858. https://doi.org/10.5220/0010253608510858

48. Dasgupta, K., Das, S., & **Bhattacharya, U.** (2021). Stratified Multi-Task Learning for Robust Spotting of Scene Texts. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.3130-3137. https://doi.org/10.1109/ICPR48806.2021.9411951

49. Dasgupta, S., Das, S., & **Bhattacharya, U.** (2021). CardioGAN: An Attention-based Generative Adversarial Network for Generation of Electrocardiograms. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.3193-3200. https://doi.org/10.1109/ICPR48806.2021.9412905

50. Ghose, S., Chowdhury, P. N., Roy, P. P., & **Pal, U.** (2021). Modeling Extent-of-Texture Information for Ground Terrain Recognition. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.4766-4773. https://doi.org/10.1109/ICPR48806.2021.9412703

51. Kumar, A., Ghose, S., Chowdhury, P. N., Roy, P. P., & **Pal, U.** (2021). UDBNET: Unsupervised Document Binarization Network via Adversarial Game. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.7817-7824. https://doi.org/10.1109/ICPR48806.2021.9412442

52. Majumdar, R., Larkin, J., Gurreschi, G. G., & **Sur-Kolay, S.** (2021). *Effects of Noise Models on QAOAMAX-CUT Performance,* pp.15–19.

53. **Molla, A. R.**, Mondal, K., & Moses, W. K. (2021). Byzantine Dispersion on Graphs. *2021 IEEE International Parallel and Distributed Processing Symposium (IPDPS),* pp.942-951. https://doi.org/10.1109/IPDPS49936.2021.00103

54. Nandanwar, L., Shivakumara, P., Kundu, S., **Pal, U.**, Lu, T., & Lopresti, D. (2021). Chebyshev-Harmonic-Fourier-Moments and Deep CNNs for Detecting Forged Handwriting. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.6562-6569. https://doi.org/10.1109/ICPR48806.2021.9412179

55. Nandanwar, L., Shivakumara, P., Raghavendra, R., Lu, T., **Pal, U.**, Lopresti, D., & Anuar, N. B. (2021). Local Gradient Difference Features for Classification of 2D-3D Natural Scene Text Images. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.1112-1119. https://doi.org/10.1109/ICPR48806.2021.9412534

56. Roy, D., Mukherjee, D., & **Chanda, B.** (2021). An Unsupervised Approach towards Varying Human Skin Tone Using Generative Adversarial Networks. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.10681-10688. https://doi.org/10.1109/ICPR48806.2021.9412852

57. Sairam, G. A., Kolli, P., Immidisetty, A., Kumar, P., Sudhan B, M., & **Bhattacharyya, M.** (2021). Scalable Database Normalization Powered by the Crowd. *8th ACM IKDD CODS and 26th COMAD,* pp.213-217. https://doi.org/10.1145/3430984.3431032

58. Sardar, L., Bansal, G., **Ruj, S.**, & Sakurai, K. (2021). Securely Computing Clustering Coefficient for Outsourced Dynamic Encrypted Graph Data. *2021 International Conference on COMmunication Systems & NETworkS (COMSNETS),* pp.465-473. https://doi.org/10.1109/COMSNETS51098.2021.9352809

59. Tewari, B. P., & **Ghosh, S. C.** (2021). Inter-AP Communication Protocol Based Frequency Assignment in IEEE 802.11 WLAN. *Proc. of the 13th International Conference on Communication Systems & Networks*, pp.193–196. https://doi.org/10.1109/COMSNETS 51098.2021.9352736

Physical and Earth Sciences Division (PESD)

60. Chakraborty, S., **Sengupta, D. P.**, & Chakravorti, S. (2020). *Preliminary taphonomic observations on larger benthic foraminifera of Fulra Limestone*, TaphCon 2020, pp.24.

61. Ezcurra, M. D., Bandyopadhyay, S., Butler, R. E., **Sengupta, D. P.**, Sen, K., Sookia, R., & Nesbitt, S. (2020). A New Proterosuchid Archosauriform from the Lower Triassic Panchet Formation of India. *Meeting of the Argentinian Palaeontological Association, Buenos Aires*.

62. Frolov, N., Maksimenko, V., **Ghosh, D.**, Majhi, S., & Rakshit, S. (2020). Route to Coherence in a Frequency-Heterogeneous Kuramoto Network. *2020 4th Scientific School on Dynamics of Complex Networks and Their Application in Intellectual Robotics (DCNAIR),* pp.82-84. https://doi.org/10.1109/DCNAIR50402.2020.9216818

63. Das Gupta, D., & **Maiti, S. K.** (2020). Generating pure spin current using spin battery: Effects of coupling and temperature. *AIP Conference Proceedings*, Vol. 2265(1), 030531 https://doi.org/10.1063/5.0016864

64. Koley, A., & **Maiti, S. K.** (2020). Magnetic response of interacting electrons in an ordered-disordered separated system: An exact result. *AIP Conference Proceedings*, Vol. 2265(1), 030441. https://doi.org/10.1063/5.0017005

65. **Mondal, T. K.,** & Bhowmick, S. (2021). Role of pre-existing fabric in abetting fracture formation, fluid flow and vein emplacement in the metavolcanics: a domain for shallow crustal gold mineralization in the Archean greenstone belt. *The 23rd EGU General Assembly (April 2021)*. https://doi.org/10.5194/egusphere-egu21-1943

Statistical Quality Control and Operations Research Division (SQC&ORD)

66. Das, P. K., & **Gauri, S. K.** (2020). (T, RN,α,p) Inventory Policy for a FMCG Retail Supply Chain. *Proceedings of the 3rd Asia Pacific Management Research Conference (APMRC 2019), Advances in Economics, Business and Management Research,* Atlantis Press, pp. 1-5. https://doi.org/10.2991/aebmr.k.200812.001

Social Sciences Division (SSD)

67. Nagajothi, K., **Rajashekara, H. M.**, & **Daya Sagar, B. S.** (2020). Quantitative Analysis of Watersheds Partitioned from Cartosat Dem of Lower Indus Sub-Basin Via Multifractal Spectra. *IGARSS 2020 - 2020 IEEE International Geoscience and Remote Sensing Symposium,* pp.881-884. https://doi.org/10.1109/IGARSS39084.2020.9323994

68. Roy, D., **Mukherjee, D.**, & **Chanda, B.** (2021). An Unsupervised Approach towards Varying Human Skin Tone Using Generative Adversarial Networks. *2020 25th International Conference on Pattern Recognition (ICPR),* pp.10681-10688. https://doi.org/10.1109/ICPR48806.2021.9412852

5.3 Publications in Journals

APPLIED STATISTICS DIVISION (ASD)

ASU, Bangalore

1. Das, S., & **Sen, R.** (2020). Sparse Portfolio Selection via Bayesian Multiple Testing. *Sankhya B*. https://doi.org/10.1007/s13571-020-00240-z

2. Sikaria, S., **Sen, R.**, & Upadhye, N. S. (2021). Bayesian Filtering for Multi-period Mean–Variance Portfolio Selection. *Journal of Statistical Theory and Practice*, *15,* 40. https://doi.org/10.1007/s42519-021-00175-2

ASU, Chennai

3. Bhati, D., **Kattumannil, S. K.**, & Sreelakshmi, N. (2021). Jackknife empirical likelihood based inference for probability weighted moments. *Journal of the Korean Statistical Society*, *50*(1), 98-116. https://doi.org/10.1007/s42952-020-00062-9

4. **Kattumannil, S. K.**, & Mathew, D. C. (2021). A family of non-parametric tests for decreasing mean time to failure with censored data. *Communications in Statistics - Theory and Methods*, *50*(1), 203-215. https://doi.org/10.1080/03610926.2019.1634207

ASU, Kolkata

5. Bhattacharyya, S., & **Sarkar, P.** (2020). Improved SIMD implementation of Poly1305. *IET Information Security*, *14*(5), 521–530. https://doi.org/10.1049/iet-ifs.2019.0605

6. Chakraborti, A., Datta, N., Jha, A., Mancillas-López, C., **Nandi, M.**, & Sasaki, Y. (2020). ESTATE: A Lightweight and Low Energy Authenticated Encryption Mode. *IACR Transactions on Symmetric Cryptology*, *2020*(S-1), 350–389. https://doi.org/10.13154/tosc.v2020.iS1.350-389

7. Chakraborti, A., Datta, N., Jha, A., Mitragotri, S., & **Nandi, M.** (2020). From Combined to Hybrid: Making Feedback-based AE even Smaller. *IACR Transactions on Symmetric Cryptology*, *2020*(S-1), 417–445. https://doi.org/10.13154/tosc.v2020.iS1.417-445

8. Chakraborti, A., Iwata, T., Minematsu, K., & **Nandi, M.** (2020). Blockcipher-Based Authenticated Encryption: How Small Can We Go? *Journal of Cryptology*, *33*(3), 703–741. https://doi.org/10.1007/s00145-019-09325-z

9. Chakraborti, A., **Nandi, M.**, Talnikar, S., & Yasuda, K. (2020). On the Composition of Single-Keyed Tweakable Even-Mansour for Achieving BBB Security. *IACR Transactions on Symmetric Cryptology*, *2020*(2), 1–39. https://doi.org/10.13154/tosc.v2020.i2.1-39

10. **Chakraborty, A.**, Sivaram, A., Samavedham, L., & Venkatasubramanian, V. (2020). Mechanism discovery and model identification using genetic feature extraction and statistical testing. *Computers & Chemical Engineering*, *140,* 106900. https://doi.org/10.1016/j.compchemeng.2020.106900

11. Chakraborty, B., Jha, A., & **Nandi, M.** (2020). On the Security of Sponge-type Authenticated Encryption Modes. *IACR Transactions on Symmetric Cryptology*, *2020*(2), 93–119. http://dx.doi.org/10.46586/tosc.v2020.i2.93-119

12. Das, S., **Dewanji, A.**, & Kundu, S. (2020). Software reliability based on renewal process modeling for error occurrence due to each bug with periodic debugging schedule. *Probability in the Engineering and Informational Sciences*, 1–18. https://doi.org/10.1017/S0269964820000303

13. Das, S., Kundu, D., & **Dewanji, A.** (2020). Software reliability modeling based on NHPP for error occurrence in each fault with periodic debugging schedule. *Communications in Statistics - Theory and Methods*, 1–13. https://doi.org/10.1080/03610926.2020.1828462

14. Jha, A., & **Nandi, M.** (2020). Tight Security of Cascaded LRW2. *Journal of Cryptology*, *33*(3), 1272–1317. https://doi.org/10.1007/s00145-020-09347-y

15. **Maitra, S.**, Mandal, B., Martinsen, T., Roy, D., & Stanica, P. (2020). Analysis on Boolean Function in a Restricted (Biased) Domain. *IEEE Transactions on Information Theory*, *66*(2), 1219–1231. https://doi.org/10.1109/TIT.2019.2932739

16. Mukherjee, C. S., & **Maitra, S.** (2020). Exact Quantum Query Algorithms Outperforming Parity -- Beyond The Symmetric functions. *CoRR*, *abs/2008.06317*, 1–22. https://arxiv.org/abs/2008.06317

17. Mukherjee, C. S., & **Maitra, S.** (2020). Classical-Quantum Separations in Certain Classes of Boolean Functions – Analysis using the Parity Decision Trees. *ArXiv*, *abs/2004.12942*, 1–13. https://arxiv.org/abs/2004.12942

18. Mukhopadhyay, M., & **Sarkar, P.** (2020). Faster initial splitting for small characteristic composite extension degree fields. *Finite Fields and Their Applications*, *62*, 101629. https://doi.org/10.1016/j.ffa.2019.10162

19. **Nandi, M.**, & Pandit, T. (2020). Delegation-based conversion from CPA to CCA-secure predicate encryption. *International Journal of Applied Cryptography*, *4*(1), 16–35. https://doi.org/10.1504/IJACT.2020.107163

20. Nath, K., & **Sarkar, P.** (2020). Efficient elliptic curve Diffie-Hellman computation at the 256-bit security level. *IET Information Security*, *14*(6), 633–640. https://doi.org/10.1049/iet-ifs.2019.0620

21. Bhattacherjee, S., & **Sarkar, P.** (2021). Weighted voting procedure having a unique blocker. *International Journal of Game Theory*, *50*(1), 279–295. https://doi.org/10.1007/s00182-020-00751-z

22. Biswas, A., & **Sarkar, P.** (2021). Separation results for boolean function classes. *Cryptography and Communications*, *13*(3), 451–458. https://doi.org/10.1007/s12095-021-00488-w

23. **Chakraborty, A.**, Mitra, S., De, D., Pal, A. J., Ghaemi, F., Ahmadian, A., & Ferrara, M. (2021). Determining Protein–Protein Interaction Using Support Vector Machine: A Review. *IEEE Access*, *9*, 12473–12490. https://doi.org/10.1109/ACCESS.2021.3051006

24. Chakraborty, C., Chakraborty, P., & **Maitra, S.** (2021). Glimpses are forever in RC4 amidst the spectre of biases. *Discrete Applied Mathematics*, *298*, 84–102. https://doi.org/10.1016/j.dam.2021.03.021

25. Chakraborty, P., & **Maitra, S.** (2021). Further clarification on Mantin's Digraph Repetition Bias in RC4. *Designs, Codes and Cryptography*, *89*(1), 127–141. https://doi.org/10.1007/s10623-020-00814-y

26. Curtius, K., **Dewanji, A.**, Hazelton, W. D., Rubenstein, J. H., & Luebeck, G. E. (2021). Optimal Timing for Cancer Screening and Adaptive Surveillance Using Mathematical Modeling. *Cancer Research*, *81*(4), 1123–1134. https://doi.org/10.1158/0008-5472.CAN-20-0335

27. Ghosh, S., & **Sarkar, P.** (2021). Variants of Wegman-Carter message authentication code supporting variable tag lengths. *Designs, Codes and Cryptography*, *89*(4), 709–736. https://doi.org/10.1007/s10623-020-00840-w

28. Kumar, A., **Maitra, S.**, & Mukherjee, C. S. (2021). On approximate real mutually unbiased bases in square dimension. *Cryptography and Communications*, *13*(2), 321–329. https://doi.org/10.1007/s12095-020-00468-6

29. **Sarkar, P.**, & Singha, S. (2021). Verifying solutions to LWE with implications for concrete security. *Advances in Mathematics of Communications*, *15*(2), 257–266. https://doi.org/10.3934/amc.2020057

ISRU, Kolkata

30. Basu, A., **Ghosh, A.**, Mandal, A., Martin, N., & Pardo, L. (2020). Robust Wald-type tests in GLM with random design based on minimum density power divergence estimators. *Statistical Methods & Applications*. https://doi.org/10.1007/s10260-020-00544-4

31. **Bose, S.**, **Pal, A.**, Mukherjee, A., & Das, D. (2020). Improved Language-Independent Speaker Identification in a Non-contemporaneous Setup. *International Journal of Machine Learning and Computing*, *10*(5), 630–636. https://doi.org/10.18178/ijmlc.2020.10.5.984

32. Calderón-Garcidueñas, L., González-Maciel, A., Reynoso-Robles, R., Hammond, J., Kulesza, R., Lachmann, I., Torres-Jardón, R., **Mukherjee, P. S.**, & Maher, B. A. (2020). Quadruple abnormal protein aggregates in brainstem pathology and exogenous metal-rich magnetic nanoparticles (and engineered Ti-rich nanorods). The substantia nigrae is a very early target in young urbanites and the gastrointestinal tract a key brainstem portal. *Environmental Research*, *191*, 110139. https://doi.org/10.1016/j.envres.2020.110139

33. Calderón-Garcidueñas, L., Torres-Jardón, R., Franco-Lira, M., Kulesza, R., González-Maciel, A., Reynoso-Robles, R., Brito-Aguilar, R., García-Arreola, B., Revueltas-Ficachi, P., Barrera-Velázquez, J. A., García-Alonso, G., García-Rojas, E., **Mukherjee, P. S.**, & Delgado-Chávez, R. (2020). Environmental Nanoparticles, SARS-CoV-2 Brain Involvement, and Potential Acceleration of Alzheimer's and Parkinson's Diseases in Young Urbanites Exposed to Air Pollution. *Journal of Alzheimer's Disease*, *78*(2), 479–502. https://doi.org/10.3233/JAD-200891

34. Calderón-Garcidueñas, L., Torres-Jardón, R., Kulesza, R. J., Mansour, Y., González-González, L. O., Gónzalez-Maciel, A., Reynoso-Robles, R., & **Mukherjee, P. S.** (2020). Alzheimer disease starts in childhood in polluted Metropolitan Mexico City. A major health crisis in progress. *Environmental Research*, *183*, 109137. https://doi.org/10.1016/j.envres.2020.109137

35. Calderón-Garcidueñas, L., Torres-Solorio, A. K., Kulesza, R. J., Torres-Jardón, R., González-González, L. O., García-Arreola, B., Chávez-Franco, D. A., Luévano-Castro, S. C., Hernández-Castillo, A., Carlos-Hernández, E., Solorio-López, E., Crespo-Cortés, C. N., García-Rojas, E., **Mukherjee, P. S.**, Morales-Aguirre, M., Ramírez-Sánchez, S., Vacaseydel-Aceves, N., Carrillo-Cortez, S., Márquez-Celedonio, F., … Brito-Aguilar, R. (2020). Gait and balance disturbances are common in young urbanites and associated with cognitive impairment. Air pollution and the historical development of Alzheimer's disease in the young. *Environmental Research*, *191*, 110087. https://doi.org/10.1016/j.envres.2020.110087

36. Castilla, E., **Ghosh, A.**, Martin, N., & Pardo, L. (2020). Robust semiparametric inference for polytomous logistic regression with complex survey design. *Advances in Data Analysis and Classification, 15*(3), 1-34. https://doi.org/10.1007/s11634-020-00430-7

37. Chandra, N. K., & **Bhattacharya, S.** (2020). Asymptotic theory of dependent Bayesian multiple testing procedures under possible model misspecification. *Annals of the Institute of Statistical Mathematics*. https://doi.org/10.1007/s10463-020-00770-3

38. **Ghosh, A.**, & Majumdar, S. (2020). Ultrahigh-Dimensional Robust and Efficient Sparse Regression Using Non-Concave Penalized Density Power Divergence. *IEEE Transactions on Information Theory*, *66*(12), 7812–7827. https://doi.org/10.1109/TIT.2020.3013015

39. Roy, S., & **Bhattacharya, S.** (2020). Bayes Meets Riemann – Bayesian Characterization of Infinite Series with Application to Riemann Hypothesis. *International Journal of Applied Mathematics and Statistics*, *59*(2), 81–128. https://arxiv.org/abs/1601.01452

40. Basak, S., **Basu, A.**, & Jones, M. C. (2021). On the 'optimal' density power divergence tuning parameter. *Journal of Applied Statistics*, *48*(3), 536–556. https://doi.org/10.1080/02664763.2020.1736524

41. Basu, A., **Ghosh, A.**, Martin, N., & Pardo, L. (2021). A Robust Generalization of the Rao Test. *Journal of Business & Economic Statistics*, 1–30. https://doi.org/10.1080/07350015.2021.1876711

42. Biswas, J., & **Das, K.** (2021). A Bayesian quantile regression approach to multivariate semi-continuous longitudinal data. *Computational Statistics*, *36*(1), 241–260. https://doi.org/10.1007/s00180-020-01002-1

43. **Bose, A.**, & **Mukherjee, S. S.** (2021). Bulk behaviour of skew-symmetric patterned random matrices. *Statistics and Applications*, *19*(1), 41–60. https://www.ssca.org.in/media/3_19_1_2021_SA_Arup_Bose.pdf

44. **Das, K.**, Ghosh, P., & Daniels, M. J. (2021). Modeling Multiple Time-Varying Related Groups: A Dynamic Hierarchical Bayesian Approach With an Application to the Health and Retirement Study. *Journal of the American Statistical Association*, *116*(534), 558–668. https://doi.org/10.1080/01621459.2021.1886105

45. Das, N., & **Bhandari, S. K.** (2021). Bound on FWER for correlated normal. *Statistics & Probability Letters*, *168*(C–108943). https://doi.org/10.1016/j.spl.2020.108943

46. Dutta, G., & **SahaRay, R.** (2021). Optimal and Efficient Designs for Comparing a Set of Test Treatments with a Set of Controls in a Heteroscedastic One-Way Layout with Covariates. *Journal of Statistical Theory and Practice*, *15*(26). https://doi.org/10.1007/s42519-020-00157-w

47. Gajurel, A., Chittoori, B., **Mukherjee, P. S.**, & Sadegh, M. (2021). Machine learning methods to map stabilizer effectiveness based on common soil properties. *Transportation Geotechnics*, *27*, 100506. https://doi.org/10.1016/j.trgeo.2020.100506

48. **Ghosh, A.**, & Basu, A. (2021). A Scale-Invariant Generalization of the Rényi Entropy, Associated Divergences and Their Optimizations Under Tsallis' Nonextensive Framework. *IEEE Transactions on Information Theory*, *67*(4), 1241–1261. https://doi.org/10.1109/TIT.2021.3054980

49. **Ghosh, A.**, Basu, A., & Pardo, L. (2021). Robust Wald-type tests under random censoring. *Statistics in Medicine*, *40*(5), 1285–1305. https://doi.org/10.1002/sim.8841

50. **Ghosh, A.**, Majumder, T., & Basu, A. (2021). General Robust Bayes Pseudo-Posteriors: Exponential Convergence Results with Applications. *Statistica Sinica*, Preprint No. SS-2019-0450. https://doi.org/10.5705/ss.202019.0450

51. **Ghosh, A.**, **SahaRay, R.**, Chakrabarty, S., & Bhadra, S. (2021). Robust generalised quadratic discriminant analysis. *Pattern Recognition*, *117*, 107981. https://doi.org/10.1016/j.patcog.2021.107981

52. **Ghosh, A.**, Shreya, P., & Basu, B. (2021). Maximum entropy framework for a universal rank order distribution with socio-economic applications. *Physica A: Statistical Mechanics and Its Applications*, *563*, 125433. https://doi.org/10.1016/j.physa.2020.125433

53. **Ghosh, A.**, & Thoresen, M. (2021). Consistent Fixed-Effects Selection in Ultra-high dimensional Linear Mixed Models with Error-Covariate Endogeneity. *Statistica Sinica*, *31*, 1–30. https://doi.org/10.5705/ss.202019.0421

54. Guha, A., Biswas, A., & **Ghosh, A.** (2021). A nonparametric two-sample test using a general φ -divergence-based mutual information. *Statistica Neerlandica*, *75*(2), 180–202. https://doi.org/10.1111/stan.12232

55. Lall, S., Sinha, D., **Ghosh, A.**, Sengupta, D., & Bandyopadhyay, S. (2021). Stable feature selection using copula based mutual information. *Pattern Recognition*, *112*, 107697. https://doi.org/10.1016/j.patcog.2020.107697

56. Majumder, S., Biswas, A., Roy, T., **Bhandari, S. K**., & **Basu, A.** (2021). Statistical inference based on a new weighted likelihood approach. *Metrika*, *84*(1), 97–120. https://doi.org/10.1007/s00184-020-00778-y

57. Mukhopadhyay, S., & **Bhattacharya, S.** (2021). Bayesian MISE convergence rates of Polya urn based density estimators: asymptotic comparisons and choice of prior parameters. *Statistics*, *55*(1), 120–151. https://doi.org/10.1080/02331888.2021.1883614

58. Nandy, A., Basu, A., & **Ghosh, A.** (2021). Robust inference for skewed data in health sciences. *Journal of Applied Statistics*. https://doi.org/10.1080/02664763.2021.1891527

59. Sarkar, P., Wang, Y. X. R., & **Mukherjee, S. S.** (2021). When random initializations help: a study of variational inference for community detection. *Journal of Machine Learning Research*, *22*, 1–46. https://jmlr.org/papers/v22/19-630.html

BIOLOGICAL SCIENCES DIVISION (BSD)

AERU, Kolkata

60. Bhattacharya, A., Purkait, S., Bag, A., & **Chattopadhyay, R. R.** (2020). Chemical profiling, cytotoxicity study and assessment of antioxidant potential of hydro-ethanol extract of peels of some selected varieties of potato in various in vitro models and in lipid substrate enriched with omega-3 fatty acids. *European Food Research and Technology*, *246*(7), 1469–1482. https://doi.org/10.1007/s00217-020-03504-0

61. Chanda, S., **Mandal Biswas, S.**, & Sarkar, P. K. (2020). Phytochemicals and antiviral properties of five dominant medicinal plant species in Bankura district, West Bengal: An overview. *Journal of Pharmacognosy and Phytochemistry*, *9*(6), 1420–1427. https://doi.org/10.22271/phyto.2020.v9.i6u.13145

62. Chandel, Y. S., Bhadu, S. S., Salalia, R., Thakur, S., Kumar, S., Somvanshi, V. S., **Mukherjee, A.**, & Walia, R. K. (2020). Prevalence and spread of potato cyst nematodes, Globodera spp. in northern hilly areas of India. *Current Science*, *118*(12), 1946–1952. https://doi.org/10.18520/cs/v118/i12/1946-1952

63. Hazra, A., Bhowmick, S., Sengupta, C., & **Das, S.** (2020). Lowest copy nuclear genes in disentangling plant molecular systematic. *Taiwania*, *65*(4), 413–422. https://doi.org/10.6165/tai.2020.65.413

64. Mondal, S., Ghosh, S., **Mukherjee, A.**, & Rahaman Khan, M. (2020). Ecological analysis of nematodes associated with vegetable-maize cropping system at Dhapa, Kolkata (India). *Journal of Asia-Pacific Entomology*, *23*(4), 942–949. https://doi.org/10.1016/j.aspen.2020.07.017

65. Mondal, S., Khan, M. R., & **Mukherjee, A.** (2020). Spatial distribution and risk area assessment of Aphelenchoides besseyi using geostatistical approaches in Giridih district of Jharkhand, India. *Journal of Nematology*, *52*, 1–16. https://doi.org/10.21307/jofnem-2020-033

66. Mukherjee, N., Mitra, S., Adak, S., Chakraborty, S., Sau, A., & **Goswami, A.** (2020). Evaluation of the growth response of spore forming lactic acid Bacillus–Bacillus coagulans in presence of oxide nanoparticles. *Applied Nanoscience*, *10*(11), 4075–4086. https://doi.org/10.1007/s13204-020-01512-w

67. Mukhopadhyay, S., Sharma, R. C., Bhattacharya, S., & **Banik, P.** (2020). Evidences of Allee Effect in Winter Crops: A Model Based Study. *International Journal of Plant Production*, *14*(2), 287–297. https://doi.org/10.1007/s42106-019-00084-2

68. Nadim, S. S., & **Chattopadhyay, J.** (2020). Occurrence of backward bifurcation and prediction of disease transmission with imperfect lockdown: A case study on COVID-19. *Chaos, Solitons & Fractals*, *140*, 110163. https://doi.org/10.1016/j.chaos.2020.110163

69. Nadim, S. S., Ghosh, I., & **Chattopadhyay, J.** (2020). Global Dynamics of a Vector-Borne Disease Model with Two Transmission Routes. *International Journal of Bifurcation and Chaos*, *30* (06). https://doi.org/10.1142/S0218127420500832

70. Nadim, S. S., Ghosh, I., Martcheva, M., & **Chattopadhyay, J.** (2020). Impact of venereal transmission on the dynamics of vertically transmitted viral diseases among mosquitoes. *Mathematical Biosciences*, *325*, 108366. https://doi.org/10.1016/j.mbs.2020.108366

71. Pal, S., Hossain, M., Panday, P., Pati, N. C., Pal, N., & **Chattopadhyay, J.** (2020). Cooperation delay induced chaos in an ecological system. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *30*(8). https://doi.org/10.1063/5.0012880

72. Purkait, S., Bhattacharya, A., Bag, A., & **Chattopadhyay, R. R.** (2020). Evaluation of antibiofilm efficacy of essential oil components β-caryophyllene, cinnamaldehyde and eugenol alone and in combination against biofilm formation and preformed biofilms of *Listeria monocytogenes* and *Salmonella typhimurium*. *Letters in Applied Microbiology*, *71*(2), 195–202. https://doi.org/10.1111/lam.13308

73. Sardar, T., Nadim, S. S., Rana, S., & **Chattopadhyay, J.** (2020). Assessment of lockdown effect in some states and overall India: A predictive mathematical study on COVID-19 outbreak. *Chaos, Solitons & Fractals*, *139*, 110078. https://doi.org/10.1016/j.chaos.2020.110078

74. Sau, A., Saha, B., & **Bhattacharya, S.** (2020). An extended stochastic Allee model with harvesting and the risk of extinction of the herring population. *Journal of Theoretical Biology*, *503,* 110375. https://doi.org/10.1016/j.jtbi.2020.110375

75. Singh, P., Hazra, A., **Mondal Biswas, S**., Chakraborty, S., Das, S. & Dasgupta, N. (2020). Identification of stress-induced plant microRNAs and their targets from a true mangrove Rhizophora apiculata – an in silico approach. *International Journal of Bioinformatics and Biological Science*, *8*(1), 13–17. https://doi.org/10.30954/2319-5169.01.2020.3

76. Bhattacharya, A., Purkait, S., Bag, A., & **Chattopadhyay, R. R.** (2021). Evaluation of antimicrobial and antioxidant efficacy of hydro ethanol extract of peels of *Kufri Chandramukhi* , *Kufri Chipsona-3* , and *Kufri Jyoti* potato varieties alone and in combination. *Journal of Food Safety*. https://doi.org/10.1111/jfs.12901

77. Bhattacharya, E., Pal, U., Dutta, R., Bhowmik, P. C., & **Mandal Biswas, S.** (2021). Antioxidant, antimicrobial and DNA damage protecting potential of hot taste spices: a comparative approach to validate their utilization as functional foods. *Journal of Food Science and Technology*. https://doi.org/10.1007/s13197-021-05122-4

78. Bose, R., Bhattacharya, E., Pramanik, A., Hughes, T. A., & **Mandal Biswas, S.** (2021). Potential oil resources from underutilized seeds of Sterculia foetida, L. - Quality assessment and chemical profiling with other edible vegetable oils based on fatty acid composition, oxidative stability, antioxidant activity and cytotoxicity. *Biocatalysis and Agricultural Biotechnology*, *33,* 102002. https://doi.org/10.1016/j.bcab.2021.102002

79. Das, S., Ghosh, P., Banerjee, S., Pyne, S., **Chattopadhyay, J.**, & Mukhopadhyay, I. (2021). Determination of critical community size from an HIV/AIDS model. *PLOS ONE*, *16*(1), e0244543-. https://doi.org/10.1371/journal.pone.0244543

80. Datta Majumdar, T., Ghosh, C. K., & **Mukherjee, A.** (2021). Dual Role of Copper Nanoparticles in Bacterial Leaf Blight-Infected Rice: A Therapeutic and Metabolic Approach. *ACS Agricultural Science & Technology*, *1*(3), 160–172. https://doi.org/10.1021/acsagscitech.0c00064

81. Ghosh, I., Nadim, S. S., & **Chattopadhyay, J.** (2021). Zoonotic MERS-CoV transmission: modeling, backward bifurcation and optimal control analysis. *Nonlinear Dynamics*, *103*(3), 2973–2992. https://doi.org/10.1007/s11071-021-06266-w

82. Harms, N. E., Knight, I. A., Pratt, P. D., Reddy, A. M., **Mukherjee, A.**, Gong, P., Coetzee, J., Raghu, S., & Diaz, R. (2021). Climate Mismatch between Introduced Biological Control Agents and Their Invasive Host Plants: Improving Biological Control of Tropical Weeds in Temperate Regions. *Insects*, *12*(6), 1–22. https://doi.org/10.3390/insects12060549

83. Hazra, A., & **Das, S.** (2021). Implications of microRNA variant markers in agriculture - Paradigm and perspectives. *Plant Gene*, *25,* 100267. https://doi.org/10.1016/j.plgene.2020.100267

84. Hazra, A., Kumar, R., Sengupta, C., & **Das, S.** (2021). Genome-wide SNP discovery from Darjeeling tea cultivars - their functional impacts and application toward population structure and trait associations. *Genomics*, *113*(1), 66–78. https://doi.org/10.1016/j.ygeno.2020.11.028

85. Hazra, A., Mahadani, P., Das, S., Bhattacharya, S., Kumar, R., Sengupta, C., & **Das, S.** (2021). Insight to the ancestral relations and varietal diversity of Indian tea [Camellia sinensis (L.) Kuntze] through plastid and nuclear phylogenetic markers. *Genetic Resources and Crop Evolution*, *68*(2), 773–783. https://doi.org/10.1007/s10722-020-01022-2

86. Hazra, A., Saha, S., Dasgupta, N., Kumar, R., Sengupta, C., & **Das, S.** (2021). Ecophysiological traits differentially modulate secondary metabolite accumulation and antioxidant properties of tea plant [Camellia sinensis (L.) O. Kuntze]. *Scientific Reports*, *11,* 2795. https://doi.org/10.1038/s41598-021-82454-3

87. Kundu, S., Dasgupta, N., Chakraborty, B., Paul, A., Ray, S., & **Bhattacharya, S.** (2021). Growth acceleration is the key for identifying the most favorable food concentration of Artemia sp. *Ecological Modelling*, *455,* 109639. https://doi.org/10.1016/j.ecolmodel.2021.109639

88. Majumder, S., & **Banik, P.** (2021). Inhibition of arsenic transport from soil to rice grain with a sustained field-scale aerobic rice cultural practice. *Journal of Environmental Management*, *279,* 111620. https://doi.org/10.1016/j.jenvman.2020.111620

89. Majumder, S., Biswas, P. K., & **Banik, P.** (2021). Impact of Water Regimes and Amendments on Inorganic Arsenic Exposure to Rice. *International Journal of Environmental Research and Public Health*, *18*(9), 1–12. https://doi.org/10.3390/ijerph18094643

90. Mandal, D. S., Chekroun, A., Samanta, S., & **Chattopadhyay, J.** (2021). A mathematical study of a crop-pest–natural enemy model with Z-type control. *Mathematics and Computers in Simulation*, *187*, 468–488. https://doi.org/10.1016/j.matcom.2021.03.014

91. Mondal, S., Ghosh, S., & **Mukherjee, A.** (2021). Application of biochar and vermicompost against the rice root-knot nematode (Meloidogyne graminicola): an eco-friendly approach in nematode management. *Journal of Plant Diseases and Protection*, *128*(3), 819–829. https://doi.org/10.1007/s41348-021-00433-2

92. **Mukherjee, A.,** Banerjee, A. K., & Raghu, S. (2021). Biological control of Parkinsonia aculeata: Using species distribution models to refine agent surveys and releases. *Biological Control*, *159,* 104630. https://doi.org/10.1016/j.biocontrol.2021.104630

93. Nadim, S. S., Ghosh, I., & **Chattopadhyay, J.** (2021). Short-term predictions and prevention strategies for COVID-19: A model-based study. *Applied Mathematics and Computation*, *404,* 126251. https://doi.org/10.1016/j.amc.2021.126251

94. Pant, V., Patwardhan, C., Patil, K., Bhowmick, A. R., **Mukherjee, A.**, & Banerjee, A. K. (2021). ILORA: A database of alien vascular flora of India. *BioRxiv*. https://doi.org/10.1101/2021.05.28.446252

95. Paul, A., Reja, S., Kundu, S., & **Bhattacharya, S.** (2021). COVID-19 pandemic models revisited with a new proposal: Plenty of epidemiological models outcast the simple population dynamics solution. *Chaos, Solitons & Fractals*, *144,* 110697. https://doi.org/10.1016/j.chaos.2021.110697

96. Purkait, S., Bhattacharya, A., Bag, A., & **Chattopadhyay, R. R.** (2021). TLC bioautography–guided isolation of essential oil components of cinnamon and clove and assessment of their antimicrobial and antioxidant potential in combination. *Environmental Science and Pollution Research*, *28*(1), 1131–1140. https://doi.org/10.1007/s11356-020-10559-9

97. Tiwari, P. K., Amri, K. A. N. Al, Samanta, S., Khan, Q. J. A., & **Chattopadhyay, J.** (2021). A systematic study of autonomous and nonautonomous predator–prey models with combined effects of fear, migration and switching. *Nonlinear Dynamics*, *103*(2), 2125–2162. https://doi.org/10.1007/s11071-021-06210-y

BAU, Kolkata

98. Das, B. M., Kundu Choudhury, T., Mozumdar, A., & **Roy, S. K.** (2021). Prevalence of Hypertension and its socio-demographic correlates: A microlevel study among Santals of Bankua districts, West Bengal India. *International Journal of Anthropology*, *36*(1–2), 61–80. https://doi.org/10.14673/IJA2021121072

99. Das, S., **Mukhopadhyay, S.**, & Mukhopadhyay, B. (2021). Frailty syndrome with sarcopenia among rural older adults in West Bengal, India: a cross-sectional study. *Asian Journal of Gerontology and Geriatrics*, *16*(1). https://doi.org/10.12809/ajgg-2021-458-oa

HGU, Kolkata

100. Aruru, M., Gurewitsch, R., Das, S., Ghosh, P., Sen, B., **Mukhopadhyay, I.**, & Pyne, S. (2020). A data-driven approach to COVID-19: Resources, policies, and best practices. *BLDE University Journal of Health Sciences*, *5*, 226–231. https://doi.org/10.4103/bjhs.bjhs_37_20

101. Karmakar, B., & **Mukhopadhyay, I.** (2020). Statistical Validity and Consistency of Big Data Analytics: A General Framework. *Statistics and Applications*, *18*(2), 369–381. https://doi.org/arXiv:1803.10901v1

102. Pyne, T., Dhauria, M., Chaudhury, D., & Valecha, D., **Ghosh, S.**, Nandagopal, K., Sengupta, M., & Das, M. (2020). Bengali translations, reliability assessment and validations of four happiness scales in a representative population from Kolkata, India. *International Journal of Indian Psychology*, *8*, 1439–1461. https://doi.org/10.25215/0804.157

103. Saha, G., Singh, R., Mandal, A., Das, S., Chattopadhyay, E., Panja, P., Roy, P., DeSarkar, N., Gulati, S., Ghatak, S., **Ghosh, S.**, Banerjee, S., Roy, B., Ghosh, S., Chaudhuri, D., Arora, N., Biswas, N. K., & Sikdar, N. (2020). A novel hotspot and rare somatic mutation p.A138V, at TP53 is associated with poor survival of pancreatic ductal and periampullary adenocarcinoma patients. *Molecular Medicine*, *26,* 59. https://doi.org/10.1186/s10020-020-00183-1

104. Chanda, K., Laha, S., **Chatterjee, R.**, & Mukhopadhyay, D. (2021). Amyloid precursor protein intra-cellular domain (AICD), Aβ and their confounding synergistic effects differentially regulate the degradome of cellular models of Alzheimer's disease. *Gene Reports*, *23,* 101082. https://doi.org/10.1016/j.genrep.2021.101082

105. Das, S., Ghosh, P., Banerjee, S., Pyne, S., **Chattopadhyay, J.**, & **Mukhopadhyay, I.** (2021). Determination of critical community size from an HIV/AIDS model. *PLOS ONE*, *16*(1), e0244543. https://doi.org/10.1371/journal.pone.0244543

106. Laha, S., Saha, C., Dutta, S., Basu, M., **Chatterjee, R.**, Ghosh, S., & Bhattacharyya, N. P. (2021). In silico analysis of altered expression of long non-coding RNA in SARS-CoV-2 infected cells and their possible regulation by STAT1, STAT3 and interferon regulatory factors. *Heliyon*, *7*(3), e06395. https://doi.org/10.1016/j.heliyon.2021.e06395

107. Sarkar, P., Malik, S., Laha, S., Das, S., Bunk, S., Ray, J. G., **Chatterjee, R.**, & Saha, A. (2021). Dysbiosis of Oral Microbiota During Oral Squamous Cell Carcinoma Development. *Frontiers in Oncology*, *11,* 614448. https://doi.org/10.3389/fonc.2021.614448

COMPUTER AND COMMUNICATION SCIENCES DIVISION (CCSD)

ACMU, Kolkata

108. Acharyya, A., De, M., **Nandy, S. C.**, & Pandit, S. (2020). Variations of largest rectangle recognition amidst a bichromatic point set. *Discrete Applied Mathematics*, *286*, 35–50. https://doi.org/10.1016/j.dam.2019.05.012

109. Ajay, J., Das, A., Dutta, B., Karmakar, A., **Roy, S.**, & Saikia, N. (2020). Problems on One Way Road Networks. *Journal of Graph Algorithms and Applications*, *24*(3), 523–546. https://doi.org/10.7155/jgaa.00544

110. Banerjee, S., Misra, N., & **Nandy, S. C.** (2020). Color spanning objects: Algorithms and hardness results. *Discrete Applied Mathematics*, *280*, 14–22. https://doi.org/10.1016/j.dam.2018.02.014

111. Bhattacharya, B. K., De, M., **Nandy, S. C.**, & **Roy, S.** (2020). Constant work-space algorithms for facility location problems. *Discrete Applied Mathematics*, *283*, 456–472. https://doi.org/10.1016/j.dam.2020.01.040

112. Bhattacharya, B., **Das, S.**, & Kameda, T. (2020). Linear-time fitting of a a k-step function. *Discrete Applied Mathematics*, *280*, 43–52. https://doi.org/10.1016/j.dam.2017.11.005

113. **Bishnu, A.**, Desai, S., **Ghosh, A.**, Mishra, G., & Paul, S. (2020). Existence of planar support for geometric hypergraphs using elementary techniques. *Discrete Mathematics*, *343*(6), 111853. https://doi.org/10.1016/j.disc.2020.111853

114. Chattopadhyay, S., & **Banerjee, A.** (2020). QoS Constrained Large Scale Web Service Composition Using Abstraction Refinement. *IEEE Transactions on Services Computing*, *13*(3), 529–544. https://doi.org/10.1109/TSC.2017.2707548

115. Chattopadhyay, S., & **Banerjee, A.** (2020). QoS-aware Automatic Web Service Composition with Multiple Objectives. *ACM Transactions on the Web*, *14*(3), 1–38. https://doi.org/10.1145/3389147

116. Das, A., **Ghosh, S. C.**, **Das, N.**, & Das Barman, A. (2020). Cooperative Spectrum Mobility in Heterogeneous Opportunistic Networks for IoT. *Wireless Personal Communications*, *110*(4), 2065–2085. https://doi.org/10.1007/s11277-019-06830-z

117. Das, M., **Banerjee, A.**, Chaudhuri, M., & Sardar, B. (2020). Shared Pattern History Tables in Multicomponent Branch Predictors With a Dealiasing Cache. *IEEE Embedded Systems Letters*, *12*(3), 95–98. https://doi.org/10.1109/LES.2019.2957512

118. **Das, S.**, Ghosh, P., Prabhu, S., & Sen, S. (2020). Relative clique number of planar signed graphs. *Discrete Applied Mathematics*, *280*, 86–92. https://doi.org/10.1016/j.dam.2018.03.005

119. **Das, S.**, Nandy, A., & Sarvottamananda. (2020). Optimizing movement in convex and non-convex path-networks to establish connectivity. *Discrete Applied Mathematics*, *286*, 62–77. https://doi.org/10.1016/j.dam.2019.04.028

120. **Das, S.**, Nandy, A., & Sarvottamananda, S. (2020). Linear time algorithms for Euclidean 1-center in Rd with non-linear convex constraints. *Discrete Applied Mathematics*, *280*, 71–85. https://doi.org/10.1016/j.dam.2019.09.009

121. Dutta, B., Karmakar, A., & **Roy, S.** (2020). Optimal facility location problem on polyhedral terrains using descending paths. *Theoretical Computer Science*, *847*, 68–75. https://doi.org/10.1016/j.tcs.2020.09.037

122. Dutta, B., & **Roy, S.** (2020). Approximate Shortest Paths in Polygons with Violations. *International Journal of Computational Geometry & Applications*, *30*(01), 79–95. https://doi.org/10.1142/S0218195920500041

123. **Ghosh, A.**, Kolay, S., & Mishra, G. (2020). FPT Algorithms for Embedding into Low-Complexity Graphic Metrics. *ACM Transactions on Computation Theory*, *12*(1), 1–41. https://doi.org/10.1145/3369933

124. Ghosh, S. K., & **Ghosh, S. C.** (2020). Analyzing Handover Performances of Mobility Management Protocols in Ultra-dense Networks. *Journal of Network and Systems Management*, *28*(4), 1427–1452. https://doi.org/10.1007/s10922-020-09544-x

125. Ghoshal, S., Banu, S., Chakrabarti, A., **Sur-Kolay, S.**, & Pandit, A. (2020). 3D reconstruction of spine image from 2D MRI slices along one axis. *IET Image Processing*, *14*(12), 2746–2755. https://doi.org/10.1049/iet-ipr.2019.0800

126. **Mukhopadhyaya, K.**, & Nakano, S. (2020). Guest Editors' Foreword (in the Special Issue on Selected Papers from the 13th International Conference and Workshops on Algorithms and Computation, WALCOM 2019). *Journal of Graph Algorithms and Applications*, *24*(2), 63–64. https://doi.org/10.7155/jgaa.00518

127. Sadhu, S., Roy, S., Nandi, S., **Nandy, S. C.**, & **Roy, S.** (2020). Efficient Algorithm for Computing the Triangle Maximizing the Length of Its Smallest Side Inside a Convex Polygon. *International Journal of Foundations of Computer Science*, *31*(04), 1–25. https://doi.org/10.1142/S0129054120500173

128. Acharyya, A., Maheshwari, A., & **Nandy, S. C.** (2021). Color-spanning localized query. *Theoretical Computer Science*, *861*, 85–101. https://doi.org/10.1016/j.tcs.2021.02.013

129. Basappa, M., Jallu, R. K., Das, G. K., & **Nandy, S. C.** (2021). The Euclidean k-supplier problem in IR2. *Operations Research Letters*, *49*(1), 48–54. https://doi.org/10.1016/j.orl.2020.10.008

130. Bensmail, J., **Das, S.**, Nandi, S., Paul, S., Pierron, T., Sen, S., & Sopena, É. (2021). Pushable chromatic number of graphs with degree constraints. *Discrete Mathematics*, *344*(1), 112151. https://doi.org/10.1016/j.disc.2020.112151

131. Bhagat, S., Das, B., Chakraborty, A., & **Mukhopadhyaya, K.** (2021). k-Circle Formation and k-epf by Asynchronous Robots. *Algorithms*, *14*(2), 62. https://doi.org/10.3390/a14020062

132. Bhattacharya, B., Bishnu, A., Cheong, O., **Das, S.**, Karmakar, A., & Snoeyink, J. (2021). Computation of spatial skyline points. *Computational Geometry*, *93*(101698). https://doi.org/10.1016/j.comgeo.2020.101698

133. **Bishnu, A.**, **Ghosh, A.**, Mathew, R., Mishra, G., & Paul, S. (2021). Grid obstacle representation of graphs. *Discrete Applied Mathematics*, *296*, 39–51. https://doi.org/10.1016/j.dam.2020.09.027

134. Chakraborty, D., **Das, S.**, Francis, M. C., & Sen, S. (2021). On rectangle intersection graphs with stab number at most two. *Discrete Applied Mathematics*, *289*, 354–365. https://doi.org/10.1016/j.dam.2020.11.003

135. Das, A. K., **Das, S.**, & Mukherjee, J. (2021). Largest triangle inside a terrain. *Theoretical Computer Science*, *858*, 90–99. https://doi.org/10.1016/j.tcs.2020.12.018

136. Das, G. K., **Nandy, S. C.**, & Rahman, M. S. (2021). Algorithms and Discrete Mathematics – celebrating the silver jubilee of IIT, Guwahati (Editorial). *Theoretical Computer Science*, *864*, 139–140. https://doi.org/10.1016/j.tcs.2021.03.019

137. Ghoshal, A. K., **Das, N.**, & Das, S. (2021). Influence of community structure on misinformation containment in online social networks. *Knowledge-Based Systems*, *213*, 106693. https://doi.org/10.1016/j.knosys.2020.106693

138. Mukherjee, S., & **Ghosh, S. C.** (2021). Scalable and fair resource sharing among 5G D2D users and legacy 4G users: A game theoretic approach. *Ad Hoc Networks*, *115*, 102436. https://doi.org/10.1016/j.adhoc.2021.102436

139. Paul, S., Banerjee, P., & **Sur-Kolay, S.** (2021). A study on flare minimisation in EUV lithography by post-layout re-allocation of wire segments. *IET Circuits, Devices & Systems*, *15*(4), 310–329. https://doi.org/10.1049/cds2.12028

140. Saha, D., & **Sur-Kolay, S.** (2021). Minimization of WCRT with Recovery Assurance from Hardware Trojans for Tasks on FPGA-based Cloud. *ACM Transactions on Embedded Computing Systems*, *20*(1), 1-25. https://doi.org/10.1145/3409479

141. Sarkar, S., & **Ghosh, S. C.** (2021). Relay selection in millimeter wave D2D communications through obstacle learning. *Ad Hoc Networks*, *114*, 102419. https://doi.org/10.1016/j.adhoc.2021.102419

CSRU, Kolkata

142. Ahmed, N., Michelin, R. A., Xue, W., **Ruj, S.**, Malaney, R., Kanhere, S. S., Seneviratne, A., Hu, W., Janicke, H., & Jha, S. K. (2020). A Survey of COVID-19 Contact Tracing Apps. *IEEE Access*, *8*, 134577–134601. https://doi.org/10.1109/ACCESS.2020.3010226

143. **Chakraborty, D.**, Ghosh, S., López, C. M., & Sarkar, P. (2020). FAST: Disk encryption and beyond. *Advances in Mathematics of Communications*. https://doi.org/10.3934/amc.2020108

144. Das, N., & **Paul, G.** (2020). Improving the security of "measurement-device-independent quantum communication without encryption." *Science Bulletin*, *65*(24), 2048–2049. https://doi.org/10.1016/j.scib.2020.09.015

145. Das, N., & **Paul, G.** (2020). Two efficient measurement device independent quantum dialogue protocols. *International Journal of Quantum Information*, *18*(07), 2050038. https://doi.org/10.1142/S0219749920500380

146. Das, S., **Paul, G.**, & Banerji, A. (2020). Hyper-hybrid entanglement, in distinguishability, and two-particle entanglement swapping. *Physical Review A*, *102*, 052401.

https://doi.org/10.1103/PhysRevA.102.05240

147. Das, S., & **Paul, G.** (2020). A New Error-Modeling of Hardy's Paradox for Superconducting Qubits and Its Experimental Verification. *ACM Transactions on Quantum Computing*, *1*(1), 1–24. https://doi.org/10.1145/3396239

148. Karati, S., & **Sarkar, P.** (2020). Kummer for Genus One Over Prime-Order Fields. *Journal of Cryptology*, *33*(1), 92–129. https://doi.org/10.1007/s00145-019-09320-4

149. Mitra, A., Chattopadhyay, P., **Paul, G.**, & Zarikas, V. (2020). Binary Black Hole Information Loss Paradox and Future Prospects. *Entropy*, *22*(12), 1387. https://doi.org/10.3390/e22121387

150. Rahman, M., & **Paul, G.** (2020). Quantum Attacks on HCTR and Its Variants. *IEEE Transactions on Quantum Engineering*, *1*, 3102408, 1–8. https://doi.org/10.1109/TQE.2020.3041426

151. Tahir, S., Steponkus, L., **Ruj, S.**, Rajarajan, M., & Sajjad, A. (2020). A parallelized disjunctive query based searchable encryption scheme for big data. *Future Generation Computer Systems*, *109*, 583–592. https://doi.org/10.1016/j.future.2018.05.048

152. **Chakraborty, D.**, Dutta, A., & Kundu, S. (2021). Designing tweakable enciphering schemes using public permutations. *Advances in Mathematics of Communications*. https://doi.org/10.3934/amc.2021021

153. Das, N., & **Paul, G.** (2021). Secure multi-party quantum conference and XOR computation. *Quantum Information and Computation*, *21*(3–4), 203–232. http://dx.doi.org/10.26421/QIC21.3-4-2

CSU, Chennai

154. Chudnovsky, M., **Karthick, T.**, Maceli, P., & Maffray, F. (2020). Coloring graphs with no induced five-vertex path or gem. *Journal of Graph Theory*, *95*(4), 527–542. https://doi.org/10.1002/jgt.22572

155. Arora, A., Ram, S., & **Venkateswarlu, A.** (2021). Unimodular polynomial matrices over finite fields. *Journal of Algebraic Combinatorics*, *53*(4), 1299–1312. https://doi.org/10.1007/s10801-020-00963-2

156. Babu, J., Chandran, L. S., **Francis, M.**, Prabhakaran, V., Rajendraprasad, D., & Warrier, N. J. (2021). On graphs whose eternal vertex cover number and vertex cover number coincide. *Discrete Applied Mathematics*, (In press). https://doi.org/10.1016/j.dam.2021.02.004

157. Chakraborty, D., Das, S., **Francis, M. C.**, & Sen, S. (2021). On rectangle intersection graphs with stab number at most two. *Discrete Applied Mathematics*, *289*, 354–365. https://doi.org/10.1016/j.dam.2020.11.003

158. Choudum, S. A., **Karthick, T.**, & Belavadi, M. M. (2021). Structural domination and coloring of some (P7, C7)-free graphs. *Discrete Mathematics*, *344*(3), 112244. https://doi.org/10.1016/j.disc.2020.112244

CVPRU, Kolkata

159. Bhunia, A. K., Mukherjee, S., Sain, A., Bhunia, A. K., Roy, P. P., & **Pal, U.** (2020). Indic handwritten script identification using offline-online multi-modal deep network. *Information Fusion*, *57*, 1–14. https://doi.org/10.1016/j.inffus.2019.10.010

160. Bhunia, A. K., Roy, P. P., Sain, A., & **Pal, U.** (2020). Zone-based keyword spotting in Bangla and Devanagari documents. *Multimedia Tools and Applications*, *79*(37–38), 27365–27389. https://doi.org/10.1007/s11042-019-08442-y

161. Chowdhury, P. N., Shivakumara, P., Jalab, H. A., Ibrahim, R. W., **Pal, U.**, & Lu, T. (2020). A new Fractal Series Expansion based enhancement model for license plate recognition. *Signal Processing: Image Communication*, *89*, 115958. https://doi.org/10.1016/j.image.2020.115958

162. Chowdhury, P. N., Shivakumara, P., Kanchan, S., Raghavendra, R., **Pal, U.**, Lu, T., & Lopresti, D. (2020). Graph attention network for detecting license plates in crowded street scenes. *Pattern Recognition Letters*, *140*, 18–25. https://doi.org/10.1016/j.patrec.2020.09.018

163. Chowdhury, P. N., Shivakumara, P., **Pal, U.**, Lu, T., & Blumenstein, M. (2020). A new augmentation-based method for text detection in night and day license plate images. *Multimedia Tools and Applications*, *79*(43–44), 33303–33330. https://doi.org/10.1007/s11042-020-09681-0

164. Nag, S., Shivakumara, P., **Pal, U.**, Lu, T., & Blumenstein, M. (2020). A new unified method for detecting text from marathon runners and sports players in video (PR-D-19-01078R2). *Pattern Recognition*, *107*, 107476. https://doi.org/10.1016/j.patcog.2020.107476

165. Nandanwar, L., Shivakumara, P., Mondal, P., Raghunandan, K. S., **Pal, U.**, Lu, T., & Lopresti, D. (2020). Forged text detection in video, scene, and document images. *IET Image Processing*, *14*(17), 4744–4755. https://doi.org/10.1049/iet-ipr.2020.0590

166. Sadhukhan, P., & **Palit, S.** (2020). Adaptive learning of minority class prior to minority oversampling. *Pattern Recognition Letters*, *136*, 16–24. https://doi.org/10.1016/j.patrec.2020.05.020

167. Xue, M., Shivakumara, P., Wu, X., Lu, T., **Pal, U.**, Blumenstein, M., & Lopresti, D. (2020). Deep invariant texture features for water image classification. *SN Applied Sciences*, *2*(12), 2068. https://doi.org/10.1007/s42452-020-03882-w

168. Xue, M., Shivakumara, P., Zhang, C., Xiao, Y., Lu, T., **Pal, U.**, Lopresti, D., & Yang, Z. (2020). Arbitrarily-Oriented Text Detection in Low Light Natural Scene Images. *IEEE Transactions on Multimedia*. https://doi.org/10.1109/TMM.2020.3015037

169. Chaturvedi, A., & **Garain, U.** (2021). Mimic and Fool: A Task-Agnostic Adversarial Attack. *IEEE Transactions on Neural Networks and Learning Systems*, *32*(4), 1801–1808. https://doi.org/10.1109/TNNLS.2020.2984972

170. Nandanwar, L., Shivakumara, P., Kanchan, S., Basavaraja, V., Guru, D. S., **Pal, U.**, Lu, T., & Blumenstein, M. (2021). DCT-phase statistics for forged IMEI numbers and air ticket detection. *Expert Systems with Applications*, *164*, 114014. https://doi.org/10.1016/j.eswa.2020.114014

171. Rahman, A., Roy, P., & **Pal, U.** (2021). Air Writing: Recognizing Multi-Digit Numeral String Traced in Air Using RNN-LSTM Architecture. *SN Computer Science*, *2*(1), 20. https://doi.org/10.1007/s42979-020-00384-9

DRTC, Bangalore

172. Adhikari, A., Dutta, A., **Dutta, B.**, & Mondal, D. (2020). Semantic similarity measurement: an intrinsic information content model. *International Journal of Metadata, Semantics and Ontologies*, *14*(3), 218–233. https://doi.org/10.1504/IJMSO.2020.10035205

173. **Krishnamurthy, M.**, Bhalachandra, S. D., & Sajana C. (2020). Scientometrics analysis of recent trends in Global Corona virus Research. *Research Square*. https://doi.org/10.21203/rs.3.rs-43995/v1

174. **Krishnamurthy, M.**, & Prakash, M. (2020). Evaluation of Knowledge and skills of Health Library Professionals in Karnataka: A Study. *Library Philosophy and Practice*, *4074*. https://digitalcommons.unl.edu/libphilprac/4074/

175. **Madalli, D. P.**, Sagar, B. G., Gopalji, & Kumar, A. A. (2020). A model for survival rate projection of Covid 19 patients. *Research Square*. https://doi.org/10.21203/rs.3.rs-28560/v2

176. Sen, S., Malta, M. C., **Dutta, B.**, & Dutta, A. (2020). State-of-the-Art Approaches for Meta-Knowledge Assertion in the Web of Data. *IETE Technical Review*, 1–38. https://doi.org/10.1080/02564602.2020.1819891

177. Namtirtha, A., Dutta, A., **Dutta, B.**, Sundararajan, A., & Simmhan, Y. (2021). Best influential spreaders identification using network global structural properties. *Scientific Reports*, *11*, 2254. https://doi.org/10.1038/s41598-021-81614-9

178. Tiwari, A., & **Madalli, D. P.** (2021). Maturity models in LIS study and practice. *Library and Information Science Research*, *43*(1), 101069. https://doi.org/10.1016/j.lisr.2020.101069

ECSU, Kolkata

179. Akhtar, Y., & **Mukherjee, D. P.** (2020). Context-based ensemble classification for the detection of architectural distortion in a digitised mammogram. *IET Image Processing*, *14*(4), 603–614. https://doi.org/10.1049/iet-ipr.2019.0639

180. Anshu, A., Hayashi, M., & **Warsi, N. A.** (2020). Secure Communication Over Fully Quantum Gel'fand-Pinsker Wiretap Channel. *IEEE Transactions on Information Theory*, *66*(9), 5548–5566. https://doi.org/10.1109/TIT.2020.3005015

181. Carrasco, J., García, S., Rueda, M. M., **Das, S.**, & Herrera, F. (2020). Recent trends in the use of statistical tests for comparing swarm and evolutionary computing algorithms: Practical guidelines and a critical review. *Swarm and Evolutionary Computation*, *54*, 100665. https://doi.org/10.1016/j.swevo.2020.100665

182. Chakraborty, S., & **Das, S.** (2020). Detecting Meaningful Clusters from High-dimensional Data: A Strongly Consistent Sparse Center-based Clustering Approach. *IEEE Transactions on Pattern Analysis and Machine Intelligence*. https://doi.org/10.1109/TPAMI.2020.3047489

183. Kumar, A., **Das, S.**, & Mallipeddi, R. (2020). A Reference Vector-Based Simplified Covariance Matrix Adaptation Evolution Strategy for Constrained Global Optimization. *IEEE Transactions on Cybernetics*, 1–14. https://doi.org/10.1109/TCYB.2020.3013950

184. Kumar, A., Wu, G., Ali, M. Z., Mallipeddi, R., Suganthan, P. N., & **Das, S.** (2020). A test-suite of non-convex constrained optimization problems from the real-world and some baseline results. *Swarm and Evolutionary Computation*, *56*, 100693. https://doi.org/10.1016/j.swevo.2020.100693

185. Maity, A., & **Das, S.** (2020). Efficient hybrid local search heuristics for solving the travelling thief problem. *Applied Soft Computing*, *93*, 106284. https://doi.org/10.1016/j.asoc.2020.106284

186. Mondal, R., Dey, M. S., & **Chanda, B.** (2020). Image Restoration by Learning Morphological Opening-Closing Network. *Mathematical Morphology - Theory and Applications*, *4*(1), 87–107. https://doi.org/10.1515/mathm-2020-0103

187. **Pal, N. R.** (2020). In Search of Trustworthy and Transparent Intelligent Systems With Human-Like Cognitive and Reasoning Capabilities. *Frontiers in Robotics and AI*, *7*(76). https://doi.org/10.3389/frobt.2020.00076

188. Paul, D., & **Das, S.** (2020). A Bayesian non-parametric approach for automatic clustering with feature weighting. *Stat*, *9*(1), e306. https://doi.org/10.1002/sta4.306

189. Roy, S. K., **Chanda, B.**, Chaudhuri, B. B., Ghosh, D. K., & Dubey, S. R. (2020). Local jet pattern: a robust descriptor for texture classification. *Multimedia Tools and Applications*, *79*(7–8), 4783–4809. https://doi.org/10.1007/s11042-018-6559-3

190. Santra, B., Paul, A., & **Mukherjee, D. P.** (2020). Deterministic dropout for deep neural networks using composite random forest. *Pattern Recognition Letters*, *131*, 205–212. https://doi.org/10.1016/j.patrec.2019.12.023

191. Santra, B., Shaw, A. K., & **Mukherjee, D. P.** (2020). Graph-based non-maximal suppression for detecting products on the rack. *Pattern Recognition Letters*, *140*, 73–80. https://doi.org/10.1016/j.patrec.2020.09.023

192. Tiwary, A. K., Ghosh, S., Singh, R., **Mukherjee, D. P.**, **Shankar, B. U.**, & Dash, P. S. (2020). Automated coal petrography using random forest. *International Journal of Coal Geology*, *232*, 103629. https://doi.org/10.1016/j.coal.2020.103629

193. Umer, S., **Mohanta, P. P.**, Rout, R. K., & Pandey, H. M. (2020). Machine learning method for cosmetic product recognition: a visual searching approach. *Multimedia Tools and Applications*. https://doi.org/10.1007/s11042-020-09079-y

194. Bhandari, A., & **Pal, N. R.** (2021). Can edges help convolution neural networks in emotion recognition? *Neurocomputing*, *433*, 162–168. https://doi.org/10.1016/j.neucom.2020.12.092

195. Chakraborty, S., & **Das, S.** (2021). On uniform concentration bounds for Bi-clustering by using the Vapnik–Chervonenkis theory. *Statistics & Probability Letters*, *175*, 109102. https://doi.org/10.1016/j.spl.2021.109102

196. Gupta, A., Datta, S., & **Das, S.** (2021). Fuzzy Clustering to Identify Clusters at Different Levels of Fuzziness: An Evolutionary Multiobjective Optimization Approach. *IEEE Transactions on Cybernetics*, *51*(5), 2601–2611. https://doi.org/10.1109/TCYB.2019.2907002

197. Halim, A. H., Ismail, I., & **Das, S.** (2021). Performance assessment of the metaheuristic optimization algorithms: an exhaustive review. *Artificial Intelligence Review*, *54*(3), 2323–2409. https://doi.org/10.1007/s10462-020-09906-6

198. Kumar, A., **Das, S.**, & Mallipeddi, R. (2021). An Inversion-Free Robust Power-Flow Algorithm for Microgrids. *IEEE Transactions on Smart Grid*, *12*(4), 2844–2859. https://doi.org/10.1109/TSG.2021.3064656

199. Kumar, A., **Das, S.**, Misra, R. K., & Singh, D. (2021). A υ-Constrained Matrix Adaptation Evolution Strategy With Broyden-Based Mutation for Constrained Optimization. *IEEE Transactions on Cybernetics*, 1–13. https://doi.org/10.1109/TCYB.2020.3042853

200. Paul, D., Chakraborty, S., & **Das, S.** (2021). On the uniform concentration bounds and large sample properties of clustering with Bregman divergences. *Stat*, *10*(1), e360. https://doi.org/10.1002/sta4.360

201. Wang, J., Zhang, H., Wang, J., Pu, Y., & **Pal, N. R.** (2021). Feature Selection Using a Neural Network With Group Lasso Regularization and Controlled Redundancy. *IEEE Transactions on Neural Networks and Learning Systems*, *32*(3), 1110–1123. https://doi.org/10.1109/TNNLS.2020.2980383

MIU, Kolkata

202. Bakshi, A., & **Ghosh, K.** (2020). Tiny Squares at the Hermann Grid Corners Can Completely Remove the Illusion. *Perception*, *49*(2), 232–239. https://doi.org/10.1177/0301006619897193

203. Banerjee, A., & **Maji, P.** (2020). A Spatially Constrained Probabilistic Model for Robust Image Segmentation. *IEEE Transactions on Image Processing*, *29*, 4898–4910. https://doi.org/10.1109/TIP.2020.2975717

204. Banerjee, S., & **Mitra, S.** (2020). Machine learning: an introduction. *Current Indian Eye Research*, *7*, 40–48.

205. Chakraborty, A., & **Bandyopadhyay, S.** (2020). conLSH: Context based Locality Sensitive Hashing for mapping of noisy SMRT reads. *Computational Biology and Chemistry*, *85*, 107206. https://doi.org/10.1016/j.compbiolchem.2020.107206

206. Chatterjee, S., Mukhopadhyay, A., & **Bhattacharyya, M.** (2020). A Review of Judgment Analysis Algorithms for Crowdsourced Opinions. *IEEE Transactions on Knowledge and Data Engineering*, *32*(7), 1234–1248. https://doi.org/10.1109/TKDE.2019.2904064

207. Chng, K. R., Li, C., Bertrand, D., Ng, A. H. Q., Kwah, J. S., Low, H. M., Tong, C., Natrajan, M., Zhang, M. H., Xu, L., Ko, K. K. K., Ho, E. X. P., Av-Shalom, T. V., Teo, J. W. P., Khor, C. C., Danko, D., Bezdan, D., Afshinnekoo, E., Ahsanuddin, S., … Nagarajan, N., & **Bhattacharyya, M.** (2020). Cartography of opportunistic pathogens and antibiotic resistance genes in a tertiary hospital environment. *Nature Medicine*, *26*(6), 941–951. https://doi.org/10.1038/s41591-020-0894-4

208. Dasgupta, A., Nayak, L., Das, R., Basu, D., Chandra, P., & **De, R. K.** (2020). Pattern and Rule Mining for Identifying Signatures of Epileptic Patients from Clinical EEG Data. *Fundamenta Informaticae*, *176*(2), 141–166. https://doi.org/10.3233/FI-2020-1968

209. Ghosh, K., & **Mitra, S.** (2020). Computational Intelligence and Brain Understanding: Preface. *Fundamenta Informaticae*, *176*(2), 139–140. https://doi.org/10.3233/FI-2020-1967

210. Khan, A., & **Maji, P.** (2020). Low-Rank Joint Subspace Construction for Cancer Subtype Discovery. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, *17*(4), 1290–1302. https://doi.org/10.1109/TCBB.2019.2894635

211. Kirtania, R., Mitra, S., & **Shankar, B. U.** (2020). A novel adaptive k-NN classifier for handling imbalance: Application to brain MRI. *Intelligent Data Analysis*, *24*(4), 909–924. https://doi.org/10.3233/IDA-194647

212. Kumar, D., & **Maji, P.** (2020). Selection of relevant texture descriptors for recognition of HEp-2 cell staining patterns. *International Journal of Machine Learning and Cybernetics*, *11*(9), 2127–2147. https://doi.org/10.1007/s13042-020-01106-6

213. **Maji, P.,** & Mahapatra, S. (2020). Circular Clustering in Fuzzy Approximation Spaces for Color Normalization of Histological Images. *IEEE Transactions on Medical Imaging*, *39*(5), 1735–1745. https://doi.org/10.1109/TMI.2019.2956944

214. Mallick, K., Mallik, S., **Bandyopadhyay, S.**, & Chakraborty, S. (2020). A Novel Graph Topology based GO-Similarity Measure for Signature Detection from Multi-Omics Data and its Application to Other Problems. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*. https://doi.org/10.1109/TCBB.2020.3020537

215. Mandal, A., & **Maji, P.** (2020). CanSuR: a robust method for staining pattern recognition of HEp-2 cell IIF images. *Neural Computing and Applications*, *32*(21), 16471–16489. https://doi.org/10.1007/s00521-019-04108-w

216. Mandal, S., Mitra, S., & **Shankar, B. U.** (2020). FuzzyCIE: fuzzy colour image enhancement for low-exposure images. *Soft Computing*, *24*(3), 2151–2167. https://doi.org/10.1007/s00500-019-04048-6

217. Paul, J., **Shankar, B. U.**, & Bhattacharyya, B. (2020). Change Detection in Multispectral Remote Sensing Images with Leader Intelligence PSO and NSCT Feature Fusion. *ISPRS International Journal of Geo-Information*, *9*(7), 462–485. https://doi.org/10.3390/ijgi9070462

218. Ray, S., Lall, S., & **Bandyopadhyay, S.** (2020). CODC: a Copula-based model to identify differential coexpression. *Npj Systems Biology and Applications*, *6*(20). https://doi.org/10.1038/s41540-020-0137-9

219. Roy, R., Ghosh, S., & **Ghosh, A.** (2020). Clinical ultrasound image standardization using histogram specification. *Computers in Biology and Medicine*, *120*, 103746. https://doi.org/10.1016/j.compbiomed.2020.103746

220. Roy, S., & **Maji, P.** (2020). Medical Image Segmentation by Partitioning Spatially Constrained Fuzzy Approximation Spaces. *IEEE Transactions on Fuzzy Systems*, *28*(5), 965–977. https://doi.org/10.1109/TFUZZ.2020.2965896

221. Sardar, M., Banerjee, S., & **Mitra, S.** (2020). Iris Segmentation Using Interactive Deep Learning. *IEEE Access*, *8*, 219322–219330. https://doi.org/10.1109/ACCESS.2020.3041519

222. Sen, R., Tagore, S., & **De, R. K.** (2020). ASAPP: Architectural Similarity-based Automated Pathway Prediction System and its Application in Host-Pathogen Interactions. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, *17*(2), 506–515. https://doi.org/10.1109/TCBB.2018.2872527

223. Sinha, D., Sinha, P., Saha, R., **Bandyopadhyay, S.**, & Sengupta, D. (2020). Improved dropClust R package with integrative analysis support for scRNA-seq data. *Bioinformatics*, *36*(6), 1946–1947. https://doi.org/10.1093/bioinformatics/btz823

224. Tiwary, A. K., Ghosh, S., Singh, R., Mukherjee, D. P., **Shankar, B. U.**, & Dash, P. S. (2020). Automated coal petrography using random forest. *International Journal of Coal Geology*, *232*, 103629. https://doi.org/10.1016/j.coal.2020.103629

225. Afshinnekoo, E., Bhattacharya, C., Burguete-García, A., Castro-Nallar, E., Deng, Y., Desnues, C., Dias-Neto, E., Elhaik, E., Iraola, G., Jang, S., Łabaj, P. P., Mason, C. E., Nagarajan, N., Poulsen, M., Prithiviraj, B., Siam, R., Shi, T., Suzuki, H., Werner, J., … **Bhattacharyya, M.** (2021). COVID-19 drug practices risk antimicrobial resistance evolution. *The Lancet Microbe*, *2*(4), e135–e136. https://doi.org/10.1016/S2666-5247(21)00039-2

226. Biswas, S., Ray, S., & **Bandyopadhyay, S.** (2021). Colored Network Motif Analysis by Dynamic Programming Approach: An Application in Host Pathogen Interaction Network. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, *18*(2), 550–561. https://doi.org/10.1109/TCBB.2019.2923173

227. Chakraborty, A., Morgenstern, B., & **Bandyopadhyay, S.** (2021). S-conLSH: alignment-free gapped mapping of noisy long reads. *BMC Bioinformatics*, *22*(1), 64. https://doi.org/10.1186/s12859-020-03918-3

228. Das, R., **Shankar, B. U.**, Chakraborty, T., & Ghosh, K. (2021). Automatic grain segmentation in cross-polarized photomicrographs of sedimentary rocks using psychophysics inspired models. *Innovations in Systems and Software Engineering*, *17*(2), 167–183. https://doi.org/10.1007/s11334-021-00400-y

229. Dasgupta, A., Bakshi, A., Chowdhury, N., & **De, R. K.** (2021). A control theoretic three timescale model for analyzing energy management in mammalian cancer cells. *Computational and Structural Biotechnology Journal*, *19*, 477–508. https://doi.org/10.1016/j.csbj.2020.12.019

230. Gupta, K., Lalit, M., Biswas, A., Sanada, C. D., Greene, C., Hukari, K., Maulik, U., **Bandyopadhyay, S.**, Ramalingam, N., Ahuja, G., Ghosh, A., & Sengupta, D. (2021). Modeling expression ranks for noise-tolerant differential expression analysis of scRNA-seq data. *Genome Research*, *31*(4), 689–697. https://doi.org/10.1101/gr.267070.120

231. Khan, A., & **Maji, P.** (2021). Approximate Graph Laplacians for Multimodal Data Clustering. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *43*(3), 798–813. https://doi.org/10.1109/TPAMI.2019.2945574

232. Lall, S., Sinha, D., Ghosh, A., Sengupta, D., & **Bandyopadhyay, S.** (2021). Stable feature selection using copula based mutual information. *Pattern Recognition*, *112*, 107697. https://doi.org/10.1016/j.patcog.2020.107697

233. Law, A., & **Ghosh, A.** (2021). Multi-Label Classification Using Binary Tree of Classifiers. *IEEE Transactions on Emerging Topics in Computational Intelligence*, 1–13. https://doi.org/10.1109/TETCI.2021.3075717

234. **Mitra, S.** (2021). Deep Learning with Radiogenomics towards Personalized Management of Gliomas. *IEEE Reviews in Biomedical Engineering*. https://doi.org/10.1109/RBME.2021.3075500

235. Pal, M., & **Bandyopadhyay, S.** (2021). Decomposition in decision and objective space for multi-modal multi-objective optimization. *Swarm and Evolutionary Computation*, *62*, 100842. https://doi.org/10.1016/j.swevo.2021.100842

236. **Ray, S. S.**, Agrawal, S., & Ghosh, S. (2021). Decision Theoretic Rough Set-Based Neighborhood for Self-Organizing Map. *SN Computer Science*, *2*(102). https://doi.org/10.1007/s42979-021-00490-2

SSIU, Bangalore

237. Challa, A., Danda, S., **Sagar, B. S. D.**, & Najman, L. (2020). Power Spectral Clustering. *Journal of Mathematical Imaging and Vision*, *62*(9), 1195–1213. https://doi.org/10.1007/s10851-020-00980-7

238. **Daya Sagar, B. S.** (2020). Digital Elevation Models: An Important Source of Data for Geoscientists [Education]. *IEEE Geoscience and Remote Sensing Magazine*, *8*(4), 138–142. https://doi.org/10.1109/MGRS.2020.3031910

239. Dheer, P., Pati, S., Chowdhury, K. K., & **Majumdar, K. K.** (2020). Enhanced gamma band mutual information is associated with impaired consciousness during temporal lobe seizures. *Heliyon*, *6*(12), e05769. https://doi.org/10.1016/j.heliyon.2020.e05769

240. Gogineni, R., Chaturvedi, A., & **Daya Sagar, B. S.** (2020). A variational pan-sharpening algorithm to enhance the spectral and spatial details. *International Journal of Image and Data Fusion*, 1–23. https://doi.org/10.1080/19479832.2020.1838629

241. Kothari, N. S., & **Meher, S. K.** (2020). Semisupervised classification of remote sensing images using efficient neighborhood learning method. *Engineering Applications of Artificial Intelligence*, *90*, 103520. https://doi.org/10.1016/j.engappai.2020.103520

242. Kothari, N. S., **Meher, S. K.**, & Panda, G. (2020). Improved Spatial Information Based Semisupervised Classification of Remote Sensing Images. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *13*, 329–340. https://doi.org/10.1109/JSTARS.2019.2961985

243. **Meher, S. K.** (2020). Rough-Wavelet Feature Space, Deep Autoencoder, and Hyperspectral Image Classification. *IEEE Geoscience and Remote Sensing Letters*, *17*(3), 489–493. https://doi.org/10.1109/LGRS.2019.2923540

244. **Meher, S. K.** (2020). Granular space, knowledge-encoded deep learning architecture and remote sensing image classification. *Engineering Applications of Artificial Intelligence*, *92*, 103647. https://doi.org/10.1016/j.engappai.2020.103647

245. Sagnika, S., Mishra, B. S. P., & **Meher, S. K.** (2020). Improved method of word embedding for efficient analysis of human sentiments. *Multimedia Tools and Applications*, *79*(43–44), 32389–32413. https://doi.org/10.1007/s11042-020-09632-9

246. Challa, A., Barman, G., Danda, S., & **Daya Sagar, B. S.** (2021). Band Selection Using Dilation Distances. *IEEE Geoscience and Remote Sensing Letters*, 1–5. https://doi.org/10.1109/LGRS.2021.3057117

247. Dheer, P., & **Majumdar, K. K.** (2021). A nonparametric algorithm for estimating mutual information between digital signals. *Digital Signal Processing*, *116*, 103111. https://doi.org/10.1016/j.dsp.2021.103111

248. **Meher, S. K.**, & Kothari, N. S. (2021). Interpretable Rule-Based Fuzzy ELM and Domain Adaptation for Remote Sensing Image Classification. *IEEE Transactions on Geoscience and Remote Sensing*, *59*(7), 5907–5919. https://doi.org/10.1109/TGRS.2020.3024796

249. Nagajothi, K., Rajashekara, H. M., & **Daya Sagar, B. S.** (2021). Universal Fractal Scaling Laws for Surface Water Bodies and Their Zones of Influence. *IEEE Geoscience and Remote Sensing Letters*, *18*(5), 781–785. https://doi.org/10.1109/LGRS.2020.2988119

250. Soor, S., Challa, A., Danda, S., **Daya Sagar, B. S.**, & Najman, L. (2021). Iterated Watersheds, A Connected Variation of K-Means for Clustering GIS Data. *IEEE Transactions on Emerging Topics in Computing*, *9*(2), 626–636. https://doi.org/10.1109/TETC.2019.2910147

LIBRARY, DOCUMENTATION & INFORMATION SCIENCE DIVISION (LDISD)

LDISD, Kolkata

251. **Satpathy, K. C.** (2020). Indian Library Professionals at the Crossroad: Who is to be Blamed? *Lisforum Orissa*, *Annual Issue*, 63–65.

252. **Pal, Jiban K.** (2021). Visualizing the knowledge outburst in global research on COVID-19. *Scientometrics*, *126*(5), 4173–4193. https://doi.org/10.1007/s11192-021-03912-3

253. **Pal, Jiban K.** (2021). Reframing the Debate on Quality vs Quantity in Research Assessment. *DESIDOC Journal of Library & Information Technology*, *41*(1), 70–71. https://doi.org/10.14429/djlit.41.1.16682

PHYSICS AND EARTH SCIENCES DIVISION (PESD)

GSU, Kolkata

254. **Banerjee, A.**, Słowakiewicz, M., & **Saha, D.** (2020). On the oxygenation of the Archaean and Proterozoic oceans. *Geological Magazine*, 1–8. https://doi.org/10.1017/S0016756820001363

255. Bhowmick, S., & **Mondal, T. K.** (2020). Control of pre-existing fabric in fracture formation, reactivation and vein emplacement under variable fluid pressure conditions: an example from Archean greenstone belt, India. *Solid Earth*, *11*(4), 1227–12446. https://doi.org/10.5194/se-11-1227-2020

256. Datta, D., **Mukherjee, D.**, & Ray, S. (2020). Taphonomic signatures of a new Upper Triassic phytosaur (Diapsida, Archosauria) bonebed from India: aggregation of a juvenile-dominated paleocommunity. *Journal of Vertebrate Paleontology*, *39*(6), e1726361. https://doi.org/10.1080/02724634.2019.1726361

257. Garbin, R. C., **Bandyopadhyay, S.**, & Joyce, W. G. (2020). A taxonomic revision of geoemydid turtles from Siwalik-age of India and Pakistan. *European Journal of Taxonomy*, *652*, 1–67. https://doi.org/10.5852/ejt.2020.652

258. Goswami, S., & **Ghosh, P.** (2020). Evolution of sedimentation pattern in a continental rift basin of India, between the Late Triassic and the early Middle Jurassic: Tectonic and climatic controls. *Sedimentary Geology*, *405*, 105679. https://doi.org/10.1016/j.sedgeo.2020.105679

259. Khan, S., Majumder, T., **Patranabis-Deb, S.**, & **Saha, D.** (2020). Deformation Structures in a Large Slump Horizon, Paleoproterozoic Vempalle Formation, Cuddapah Basin, Southern India. *The Journal of Geology*, *128*(6), 517–534. https://doi.org/10.1086/712290

260. Majumder, T., & **Patranabis-Deb, S.** (2020). Lithostratigraphy of the Papaghni Group around Daditota-Gooty area, Andhrapradesh, India and its tectonic implication. *Journal of the Geological Society of India*, *96*, 151–162.

261. Teschner, E. M., Chakravorti, S., **Sengupta, D. P.**, & Konietzko-Meier, D. (2020). Climatic influence on the growth pattern of *Panthasaurus maleriensis* from the Late Triassic of India deduced from paleohistology. *PeerJ*, *8*, e9868. https://doi.org/10.7717/peerj.9868

262. Wernette, S. J., **Hughes, N. C.**, Myrow, P. M., & Sardsud, A. (2020). The Furongian (late Cambrian) trilobite Thailandium's endemicity reassessed along with a new species of Prosaukia

from Ko Tarutao, Thailand. *Thai Geoscience Journal*, *1*(1), 63–82. http://dx.doi.org/10.14456/tgj.2020.6

263. Wernette, S. J., **Hughes, N. C.**, Myrow, P. M., & Sardsud, A. (2020). *Satunarcus* , a new late Cambrian trilobite genus from southernmost Thailand and a reevaluation of the subfamily Mansuyiinae Hupé, 1955. *Journal of Paleontology*, *94*(5), 867–880. https://doi.org/10.1017/jpa.2020.23

264. Bachhar, P., **Saha, D.**, Santosh, M., Liu, H.-D., Kwon, S., Banerjee, A., Patranabis-Deb, S., & Deb, G. K. (2021). Mantle heterogeneity and crust-mantle interaction in the Singhbhum craton, India: New evidence from 3340 Ma komatiites. *Lithos*, *382–383*, 105931. https://doi.org/10.1016/j.lithos.2020.105931

265. Banerjee, A., **Patranabis-Deb, S.**, Saha, D., & Santosh, M. (2021). Inorganic silicification of ancient carbonate rocks. *Journal of Sedimentary Research*, *91*(2), 186–196. https://doi.org/10.2110/jsr.2020.099

266. Bardhan, S., Saha, S., **Das, S. S.**, & Saha, R. (2021). Paleoecology of naticid–molluscan prey interaction during the Late Jurassic (Oxfordian) in Kutch, India: evolutionary implications. *Journal of Paleontology*, *95*(5), 974–993. https://doi.org/10.1017/jpa.2021.24

267. Dai, T., **Hughes, N. C.**, Zhang, X., & Fusco, G. (2021). Absolute axial growth and trunk segmentation in the early Cambrian trilobite *Oryctocarella duyunensis*. *Paleobiology*, *47*(3), 517–532. https://doi.org/10.1017/pab.2020.63

268. Dai, T., **Hughes, N. C.**, Zhang, X., & Peng, S. (2021). Development of the early Cambrian oryctocephalid trilobite *Oryctocarella duyunensis* from western Hunan, China. *Journal of Paleontology*, *95*(4), 777–792. https://doi.org/10.1017/jpa.2020.111

269. Das, R., **Shankar, B. U.**, **Chakraborty, T.**, & **Ghosh, K.** (2021). Automatic grain segmentation in cross-polarized photomicrographs of sedimentary rocks using psychophysics inspired models. *Innovations in Systems and Software Engineering*, *17*(2), 167–183. https://doi.org/10.1007/s11334-021-00400-y

270. Debnath, A., Taral, S., Mullick, S., & **Chakraborty, T.** (2021). The Neogene Siwalik Succession of the Arunachal Himalaya: A Revised Lithostratigrphic Classification and its Implications for the Regional Paleogeography. *Journal of the Geological Society of India*, *97*(4), 339–350. https://doi.org/10.1007/s12594-021-1692-4

271. Hou, J., **Hughes, N. C.**, & Hopkins, M. J. (2021). The trilobite upper limb branch is a well-developed gill. *Science Advances*, *7*(14), eabe7377. https://doi.org/10.1126/sciadv.abe7377

272. **Hughes, N. C.**, Adrain, J. M., Holmes, J. D., Hong, P. S., Hopkins, M. J., Hou, J.-B., Minelli, A., Park, T.-Y. S., Paterson, J. R., Peng, J., Webster, M., Zhang, X.-G., Zhang, X.-L., & Fusco, G. (2021). Articulated trilobite ontogeny: suggestions for a methodological standard. *Journal of Paleontology*, *95*(2), 298–304. https://doi.org/10.1017/jpa.2020.96

273. **Saha, D.**, Bachhar, P., Deb, G. K., Patranabis-Deb, S., & Banerjee, A. (2021). Tectonic evolution of the Paleoarchean to Mesoarchean Badampahar-Gorumahisani belt, Singhbhum craton, India – Implications for coexisting arc and plume signatures in a granite-greenstone terrain. *Precambrian Research*, *357*, 106094. https://doi.org/10.1016/j.precamres.2021.106094

274. Sharma, N., Mondal, S., **Das, S. S.**, Bose, K., & Saha, S. (2021). Morphological conservatism of the family Naticidae (Gastropoda) through time: potential causes and consequences. *Paleobiology*, *47*(3), 487–502. https://doi.org/10.1017/pab.2020.62

275. Singh, A. K., Upadhyay, D., Pruseth, K. L., Mezger, K., Nanda, J. K., Maiti, S., & **Saha, D.** (2021). Shock Metamorphic Features in the Archean Simlipal Complex, Singhbhum Craton, Eastern India: Possible Remnant of a Large Impact Structure. *Journal of the Geological Society of India*, *97*(1), 35–47. https://doi.org/10.1007/s12594-021-1623-4

276. Wernette, S. J., **Hughes, N. C.**, Myrow, P. M., & Aung, A. K. (2021). The first systematic description of Cambrian fossils from Myanmar: Late Furongian trilobites from the southern part of the Shan State and the early Palaeozoic palaeogeographical affinities of Sibumasu. *Journal of Asian Earth Sciences*, *214*, 104775. https://doi.org/10.1016/j.jseaes.2021.104775

PAMU, Kolkata

277. Alimuddin, M., Guha, T., & **Parashar, P.** (2020). Independence of work and entropy for equal-energetic finite quantum systems: Passive-state energy as an entanglement quantifier. *Physical Review E*, *102*(1), 012145. https://doi.org/10.1103/PhysRevE.102.012145

278. Alimuddin, M., Guha, T., & **Parashar, P.** (2020). Structure of passive states and its implication in charging quantum batteries. *Physical Review E*, *102*(2), 022106. https://doi.org/10.1103/PhysRevE.102.022106

279. Baral, P., Roy, S. K., & **Pal, S.** (2020). Prospects of probing dark energy with eLISA: Standard versus null diagnostics. *Monthly Notices of the Royal Astronomical Society*, *500*(3), 2896–2907. https://doi.org/10.1093/mnras/staa3346

280. Bera, A., & **Ghosh, S.** (2020). Stimulated Hawking emission from electromagnetic analogue black hole: Theory and observation. *Physical Review D*, *101*(10), 105012. https://doi.org/10.1103/PhysRevD.101.105012

281. Biswas, D., & **Ghosh, S.** (2020). Quantum mechanics of a particle on a torus knot: Curvature and torsion effects. *EPL (Europhysics Letters)*, *132*(1), 10004. https://doi.org/10.1209/0295-5075/132/10004

282. Chakraborty, S., & **Maiti, S. K.** (2020). Fractal lattice as an efficient thermoelectric device. *Journal of Physics: Conference Series*, *1579*, 012004. https://doi.org/10.1088/1742-6596/1579/1/012004

283. Chowdhury, S. N., Majhi, S., & **Ghosh, D.** (2020). Distance Dependent Competitive Interactions in a Frustrated Network of Mobile Agents. *IEEE Transactions on Network*

Science and Engineering, *7*(4), 3159–3170. https://doi.org/10.1109/TNSE.2020.3017495

284. Das, P., Upadhyay, R. K., Das, P., & **Ghosh, D.** (2020). Exploring dynamical complexity in a time-delayed tumor-immune model. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *30*(12), 123118. https://doi.org/10.1063/5.0025510

285. Frolov, N., Maksimenko, V., Majhi, S., Rakshit, S., **Ghosh, D.**, & Hramov, A. (2020). Chimera-like behavior in a heterogeneous Kuramoto model: The interplay between attractive and repulsive coupling. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *30*(8), 081102. https://doi.org/10.1063/5.0019200

286. Ganguly, S., & **Maiti, S. K.** (2020). Electronic transport through a driven quantum wire: possible tuning of junction current, circular current and induced local magnetic field. *Journal of Physics: Condensed Matter*, *33*(4), 045301. https://doi.org/10.1088/1361-648X/abc200

287. Ganguly, S., & **Maiti, S. K.** (2020). High figure of merit in an ac driven graphene nanoribbon. *Journal of Physics: Conference Series*, *1579*, 012005. https://doi.org/10.1088/1742-6596/1579/1/012005

288. Guha, T., Alimuddin, M., & **Parashar, P.** (2020). Thermodynamic advancement in the causally inseparable occurrence of thermal maps. *Physical Review A*, *102*(3), 032215. https://doi.org/10.1103/PhysRevA.102.032215

289. Gupta, D. Das, & **Maiti, S. K.** (2020). Can a sample having zero net magnetization produce polarized spin current? *Journal of Physics: Condensed Matter*, *32*(50), 505803. https://doi.org/10.1088/1361-648X/abac24

290. Majhi, S., Chowdhury, S. N., & **Ghosh, D.** (2020). Perspective on attractive-repulsive interactions in dynamical networks: Progress and future. *EPL (Europhysics Letters)*, *132*(2), 20001. https://doi.org/10.1209/0295-5075/132/20001

291. Mukherjee, A., Dey, M., & **Maiti, S. K.** (2020). Spin selective transmission through a multi-terminal Rashba ring with AAH modulation. *Journal of Physics: Conference Series*, *1579*, 012017. https://doi.org/10.1088/1742-6596/1579/1/012017

292. Naskar, A., & **Pal, S.** (2020). Enhanced tensor non-Gaussianities in presence of a source. *The European Physical Journal C*, *80*(12), 1158. https://doi.org/10.1140/epjc/s10052-020-08735-9

293. Rakshit, S., Bera, B. K., Bollt, E. M., & **Ghosh, D.** (2020). Intralayer Synchronization in Evolving Multiplex Hypernetworks: Analytical Approach. *SIAM Journal on Applied Dynamical Systems*, *19*(2), 918–963. https://doi.org/10.1137/18M1224441

294. Rakshit, S., & **Ghosh, D.** (2020). Generalized synchronization on the onset of auxiliary system approach. *Chaos:An Interdisciplinary Journal of Nonlinear Science*, *30*(11), 111102. https://doi.org/10.1063/5.0030772

295. Ray, A., & **Ghosh, D.** (2020). Another New Chaotic System: Bifurcation and Chaos Control. *International Journal of Bifurcation and Chaos*, *30*(11), 2050161. https://doi.org/10.1142/S0218127420501618

296. Ray, A., Rakshit, S., Basak, G. K., Dana, S. K., & **Ghosh, D.** (2020). Understanding the origin of extreme events in El Niño southern oscillation. *Physical Review E*, *101*(6), 062210. https://doi.org/10.1103/PhysRevE.101.062210

297. Saha, A., Dey, M., & **Maiti, S. K**. (2020). Spectral features of one dimensional phononic quasicrystals. *Journal of Physics: Conference Series*, *1579*, 012018. https://doi.org/10.1088/1742-6596/1579/1/012018

298. Sarkar, M., Dey, M., & **Maiti, S. K.** (2020). A driven ferromagnetic chain with binary hopping as an efficient spin polarizer. *Journal of Physics: Conference Series*, *1579*, 012015. https://doi.org/10.1088/1742-6596/1579/1/012015

299. Sarkar, M., Dey, M., **Maiti, S. K.**, & Sil, S. (2020). Engineering spin polarization in a driven multistranded magnetic quantum network. *Physical Review B*, *102*(19), 195435. https://doi.org/10.1103/PhysRevB.102.195435

300. **Sarkar, S.**, & Dey, S. (2020). Self-preserving characteristics in wall-wake flow downstream of an isolated bedform. *Environmental Fluid Mechanics*, *20*(4), 1119–1139. https://doi.org/10.1007/s10652-020-09744-8

301. Sarkar, S., & **Maiti, S. K.** (2020). Localization to delocalization transition in a double stranded helical geometry: effects of conformation, transverse electric field and dynamics. *Journal of Physics: Condensed Matter*, *32*(50), 505301. https://doi.org/10.1088/1361-648X/abb05f

302. Sarkar, S., Dey, M., & **Maiti, S. K.** (2020). Energy spectra and quantized Hall conductance in a 2D lattice subjected to light irradiation. *Journal of Physics: Conference Series*, *1579*, 012016. https://doi.org/10.1088/1742-6596/1579/1/012016

303. Anwar, M. S., Kundu, S., & **Ghosh, D.** (2021). Enhancing synchrony in asymmetrically weighted multiplex networks. *Chaos, Solitons & Fractals*, *142*, 110476. https://doi.org/10.1016/j.chaos.2020.110476

304. Banik, M., Guha, T., Alimuddin, M., **Kar, G.**, Halder, S., & Bhattacharya, S. S. (2021). Multicopy Adaptive Local Discrimination: Strongest Possible Two-Qubit Nonlocal Bases. *Physical Review Letters*, *126*(21), 210505. https://doi.org/10.1103/PhysRevLett.126.210505

305. Chiribella, G., Banik, M., Bhattacharya, S. S., Guha, T., Alimuddin, M., Roy, A., Saha, S., Agrawal, S., & **Kar, G.** (2021). Indefinite causal order enables perfect quantum communication with zero capacity channels. *New Journal of Physics*, *23*(3), 033039. https://doi.org/10.1088/1367-2630/abe7a0

306. Chowdhury, S. N., Rakshit, S., Buldú, J. M., **Ghosh, D.**, & Hens, C. (2021). Antiphase synchronization in multiplex networks with attractive and repulsive interactions. *Physical Review E*, *103*(3), 032310. https://doi.org/10.1103/PhysRevE.103.032310

307. Das, P., Das, S., Das, P., Rihan, F. A., Uzuntarla, M., & **Ghosh, D.** (2021). Optimal control strategy for cancer remission using combinatorial therapy: A mathematical

model-based approach. *Chaos, Solitons & Fractals*, *145*, 110789. https://doi.org/10.1016/j.chaos.2021.110789

308. Dey, M., Sarkar, M., & **Maiti, S. K.** (2021). Spin polarization in an ac-driven magnetic material with vanishing net magnetization: a new proposal. *Journal of Physics D: Applied Physics*, *54*(21), 215301. https://doi.org/10.1088/1361-6463/abe26f

309. Dixit, S., Nag Chowdhury, S., **Ghosh, D.**, & Dev Shrimali, M. (2021). Dynamic interaction induced explosive death. *EPL (Europhysics Letters)*, *133*(4), 40003. https://doi.org/10.1209/0295-5075/133/40003

310. Dixit, S., Nag Chowdhury, S., Prasad, A., **Ghosh, D.**, & Shrimali, M. D. (2021). Emergent rhythms in coupled nonlinear oscillators due to dynamic interactions. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *31*(1), 011105. https://doi.org/10.1063/5.0039879

311. Ganguly, S., & **Maiti, S. K.** (2021). A new prescription to achieve a high degree of spin polarization in a spin–orbit coupled quantum ring: efficient engineering by irradiation. *Journal of Physics: Condensed Matter*, *33*(14), 145305. https://doi.org/10.1088/1361-648X/abdffe

312. Ganguly, S., & **Maiti, S. K.** (2021). An ordered-disordered separated graphene nanoribbon: high thermoelectric performance. *Journal of Physics D: Applied Physics*, *54*(2), 025301. https://doi.org/10.1088/1361-6463/abb978

313. Ganguly, S., & **Maiti, S. K.** (2021). Selective spin transmission through a driven quantum system: A new prescription. *Journal of Applied Physics*, *129*(12), 123902. https://doi.org/10.1063/5.0045566

314. Ganguly, S., **Maiti, S. K.**, & Sil, S. (2021). Favorable thermoelectric performance in a Rashba spin-orbit coupled ac-driven graphene nanoribbon. *Carbon*, *172*, 302–307. https://doi.org/10.1016/j.carbon.2020.09.085

315. Ghosh, A., Shreya, P., & **Basu, B.** (2021). Maximum entropy framework for a universal rank order distribution with socio-economic applications. *Physica A: Statistical Mechanics and Its Applications*, *563*, 125433. https://doi.org/10.1016/j.physa.2020.125433

316. Hazrati, M., Panahi, S., Parastesh, F., Jafari, S., & **Ghosh, D.** (2021). Role of links on the structural properties of different network topologies. *EPL (Europhysics Letters)*, *133*(4), 40001. https://doi.org/10.1209/0295-5075/133/40001

317. Koley, A., **Maiti, S. K.**, Ojeda Silva, J. H., & Laroze, D. (2021). Spin Dependent Transport through Driven Magnetic System with Aubry-Andre-Harper Modulation. *Applied Sciences*, *11*(5), 2309. https://doi.org/10.3390/app11052309

318. Kundu, S., Majhi, S., & **Ghosh, D.** (2021). Persistence in multilayer ecological network consisting of harvested patches. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *31*(3), 033154. https://doi.org/10.1063/5.0047221

319. Maurya, S. K., Gopmandal, P. P., De, S., Ohshima, H., & **Sarkar, S.** (2021). Electrokinetics of Concentrated Suspension of Soft Particles with pH-Regulated Volumetric Charges. *Langmuir*, *37*(2), 703–712. https://doi.org/10.1021/acs.langmuir.0c02805

320. Menon, A., & **Basu, B.** (2021). Anomalous Hall transport in tilted multi-Weyl semimetals. *Journal of Physics: Condensed Matter*, *33*(4), 045602. https://doi.org/10.1088/1361-648X/abb9b8

321. Muhuri, A., Sinha, D., & **Ghosh, S.** (2021). Entanglement induced by noncommutativity: anisotropic harmonic oscillator in noncommutative space. *The European Physical Journal Plus*, *136*(1), 35. https://doi.org/10.1140/epjp/s13360-020-00972-x

322. Nag Chowdhury, S., Kundu, S., Banerjee, J., Perc, M., & **Ghosh, D.** (2021). Eco-evolutionary dynamics of cooperation in the presence of policing. *Journal of Theoretical Biology*, *518*, 110606. https://doi.org/10.1016/j.jtbi.2021.110606

323. Oyeleke, K. S., Olusola, O. I., Vincent, U. E., **Ghosh, D**., & McClintock, P. V. E. (2021). Parametric vibrational resonance in a gyroscope driven by dual-frequency forces. *Physics Letters A*, *387*, 127040. https://doi.org/10.1016/j.physleta.2020.127040

324. Pal, K., **Ghosh, D.**, & Gangopadhyay, G. (2021). Synchronization and metabolic energy consumption in stochastic Hodgkin-Huxley neurons: Patch size and drug blockers. *Neurocomputing*, *422*, 222–234. https://doi.org/10.1016/j.neucom.2020.10.006

325. Patra, M., Shukla, A., & **Maiti, S. K.** (2021). Non-volatile reconfigurable spin logic device: parallel operations. *Journal of Physics D: Applied Physics*, *54*(9), 095001. https://doi.org/10.1088/1361-6463/abc8b7

326. Ray, A., Pal, A., **Ghosh, D.**, Dana, S. K., & Hens, C. (2021). Mitigating long transient time in deterministic systems by resetting. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, *31*(1), 011103. https://doi.org/10.1063/5.0038374

TASU, Tezpur

327. Aithani, D., **Jyethi, D. S.,** Siddiqui, Z., Yadav, A. K., & Khillare, P. S. (2020). Source apportionment, pollution assessment, and ecological and human health risk assessment due to trace metals contaminated groundwater along urban river floodplain. *Groundwater for Sustainable Development,* 11, 100445. https://doi.org/10.1016/j.gsd.2020.100445

328. Choudhury, M., **Jyethi, D. S.,** Dutta, J., Purkayastha, S. P., Deb, D., Das, R.,... & Bhattacharyya, K. G. (2021). Investigation of groundwater and soil quality near to a municipal waste disposal site in Silchar, Assam, India. *International Journal of Energy and Water Resources,* 1-11. https://doi.org/10.1007/s42108-021-00117-5

329. 329. Maitra, S., & Jyethi, D. S. (2020). Particulate matter removal by forest cover in Delhi. Arboricultural Journal, 42(1), 36-49. https://doi.org/10.1080/03071375.2020.1746541

330. Siddiqui, Z., Khillare, P. S., **Jyethi, D. S.,** Aithani, D., & Yadav, A. K. (2020). Pollution characteristics and human health risk from trace metals in roadside soil and road

dust around major urban parks in Delhi city. Air Quality, Atmosphere & Health, 13(11), 1271-1286. https://doi.org/10.1007/s11869-020-00874-y

331. Trivedi, S. & Trotman, D. (2020). Deformation retracts to intersections of Whitney stratifications. Journal of Singularities, 22, 315–320. https://doi.org/10.5427/jsing.2020.22s

332. Yadav, A. K., Sarkar, S., **Jyethi, D. S.,** Rawat, P., Aithani, D., Siddiqui, Z., & Khillare, P. S. (2021). Fine Particulate Matter Bound Polycyclic Aromatic Hydrocarbons and Carbonaceous Species in Delhi's Atmosphere: Seasonal Variation, Sources, and Health Risk Assessment. *Aerosol Science and Engineering*, 5(2), 193-213. https://doi.org/10.1007/s41810-021-00094-6

SOCIAL SCIENCES DIVISION (SSD)

EAU, Bangalore

333. **Chattopadhyay, M.** (2020). Gender Disparity: A Study of Coffee Plantation Workers in South India. *Journal of Rural and Industrial Development*, *8*(2), 1–11.

334. **Swaminathan, M.** (2020). Policies for Food and Nutrition Security. *Bulletin of the Nutrition Foundation of India*, 1–5.

335. **Swaminathan, M.** (2020). Time-Use Survey Report 2019: What Do We Learn About Rural Women? *Review of Agrarian Studies, Foundation for Agrarian Studies*, *10*(2), 93–98. https://doi.org/10.22004/ag.econ.311107

336. Usami, Y. ., Das, A., & **Swaminathan, M.** (2020). Methodology of Data Collection Unsuited to Changing Rural Reality: A Study of Agricultural Wage Data in India. *Review of Agrarian Studies*, *102*(2), 48–74. http://dx.doi.org/10.22004/ag.econ.311105

337. **Banerjee, P**., & Das, T. (2021). Risky decision under laboratory deadline with experience and indirect self-selection. *Journal of Behavioral and Experimental Finance*, *29*, 100445. https://doi.org/10.1016/j.jbef.2020.100445

338. Karmokar, M., **Roy, S.**, & Storcken, T. (2021). Necessary and sufficient conditions for pairwise majority decisions on path-connected domains. *Theory and Decision*, 1–24. https://doi.org/10.1007/s11238-021-09804-5

339. Nagajothi, K., **Rajashekara, H. M.**, & Sagar, B. S. D. (2021). Universal Fractal Scaling Laws for Surface Water Bodies and Their Zones of Influence. *IEEE Geoscience and Remote Sensing Letters*, *18*(5), 781–785. https://doi.org/10.1109/LGRS.2020.2988119

340. Qian, M., Chakraborty, B., **Maiti, R.**, & Cheung, Y. K. (2021). A Sequential Significance Test for Treatment by Covariate Interactions. *Statistica Sinica*, *31*, 1–22. https://doi.org/10.5705/ss.202018.0451

EPU, Delhi

341. **Afridi, F.**, Barooah, B., & Somanathan, R. (2020). Improving learning outcomes through information provision: Experimental evidence from Indian villages. *Journal of Development Economics*, *146*, 102276. https://doi.org/10.1016/j.jdeveco.2018.08.002

342. **Afridi, F.**, Dhillon, A., Li, S. X., & Sharma, S. (2020). Using social connections and financial incentives to solve coordination failure: A quasi-field experiment in India's manufacturing sector. *Journal of Development Economics*, *144*, 102445. https://doi.org/10.1016/j.jdeveco.2020.102445

343. Banerjee, S., Basu, P., & **Ghate, C.** (2020). A monetary business cycle model for India. *Economic Inquiry*, *58*(3), 1362–1386. https://doi.org/10.1111/ecin.12855

344. Bell, C., & **Mukhopadhyay, A.** (2020). Income Guarantees and Borrowing in Risky Environments: Evidence from India's Rural Employment Guarantee Scheme. *Economica*, *87*(347), 763–812. https://doi.org/10.1111/ecca.12325

345. Chowdhury, S., Mallick, D., & **Roy Chowdhury, P.** (2020). Natural shocks and marriage markets: Fluctuations in mehr and dowry in Muslim marriages. *European Economic Review*, *128*, 103510. https://doi.org/10.1016/j.euroecorev.2020.103510

346. Ehlers, L., Majumdar, D., **Mishra, D.**, & **Sen, A.** (2020). Continuity and incentive compatibility in cardinal mechanisms. *Journal of Mathematical Economics*, *88*, 31–41. https://doi.org/10.1016/j.jmateco.2020.02.004

347. **Kapoor M.**, Malani, A., Ravi, S., & Agrawal, A. (2020). Authoritarian Governments Appear to Manipulate COVID Data. *ArXiv*. https://arxiv.org/abs/2007.09566v1

348. Kazumura, T., **Mishra, D.**, & Serizawa, S. (2020). Strategy-proof multi-object mechanism design: Ex-post revenue maximization with non-quasilinear preferences. *Journal of Economic Theory*, *188*, 105036. https://doi.org/10.1016/j.jet.2020.105036

349. Kazumura, T., **Mishra, D.**, & Serizawa, S. (2020). Mechanism design without quasilinearity. *Theoretical Economics*, *15*(2), 511–544. https://doi.org/10.3982/TE2910

350. Kim, R., Liou, L., Xu, Y., Kumar, R., Leckie, G., **Kapoor, M.**, Venkataramanan, R., Kumar, A., Joe, W., & Subramanian, S. V. (2020). Precision-weighted estimates of neonatal, post-neonatal and child mortality for 640 districts in India, National Family Health Survey 2016. *Journal of Global Health*, *10*(2), 020405. https://doi.org/10.7189/jogh.10.020405

351. Kumar, U., Roy, S., **Sen, A.**, Yadav, S., & Zeng, H. (2020). Local global equivalence in voting models: A characterization and applications. *Theoretical Economics*. https://econtheory.org/ojs/index.php/te/article/viewForthcomingFile/4177/29280/1

352. **Ray, T.**, **Roy Chaudhuri, A.**, & Sahai, K. (2020). Whose education matters? An analysis of inter caste marriages in India. *Journal of Economic Behavior & Organization*, *176*, 619–633. https://doi.org/10.1016/j.jebo.2020.02.011

353. Sterner, T., Carson, R. T., Hafstead, M., Howard, P., Carlsson, J. S., Köhlin, G., Parry, I., Rafaty, R., **Somanatan, E.**, Christoph, S. J., Whittington, D., Alpizar, F., Ambec, S., Aravena, C., Bonilla, J., Daniels, R. C., Garcia, J., Harring, N.,

Kacker, K., … Wang, M. (2020). Funding Inclusive Green Transition through Greenhouse Gas Pricing. *IFO DICE Report, IFO Institute - Leibniz Institute for Economic Research at the University of Munich*, *18*(1), 3–8. https://ideas.repec.org/a/ces/ifodic/v18y2020i01p03-08.html

354. **Afridi, F.**, Debnath, S., & **Somanathan, E.** (2021). A breath of fresh air: Raising awareness for clean fuel adoption. *Journal of Development Economics*, *151*, 102674. https://doi.org/10.1016/j.jdeveco.2021.102674

355. Gupta, E., Ramaswami, B., & **Somanathan, E.** (2021). The Distributional Impact of Climate Change: Why Food Prices Matter. *Economics of Disasters and Climate Change*, *5*(2), 249–275. https://doi.org/10.1007/s41885-021-00084-5

356. Malik, K., & **Mishra, D.** (2021). Pareto efficient combinatorial auctions: Dichotomous preferences without quasilinearity. *Journal of Economic Theory*, *191*, 105128. https://doi.org/10.1016/j.jet.2020.105128

357. Singh, P., Roy, A., Bhasin, D., **Kapoor, M.**, Ravi, S., & Dey, S. (2021). Crop Fires and Cardiovascular Health – A Study from North India. *SSM - Population Health*, *14*, 100757. https://doi.org/10.1016/j.ssmph.2021.100757

ERU, Kolkata

358. Bakshi, D., & **Dasgupta, I.** (2020). Identity Conflict with Cross-Border Spillovers. *Defence and Peace Economics*, *31*(7), 786–809. https://doi.org/10.1080/10242694.2019.1614279

359. Banerjee, S., Chakrabarti, B. K., **Mitra, M.**, & Mutuswami, S. (2020). Inequality Measures: The Kolkata Index in Comparison With Other Measures. *Frontiers in Physics*, *8*, 562182. https://doi.org/10.3389/fphy.2020.562182

360. Bhan, A., & **Kabiraj, T.** (2020). Terrorist Inter-Group Cooperation and Terror Activity. *Group Decision and Negotiation*, *29*(6), 1085–1106. https://doi.org/10.1007/s10726-020-09696-w

361. Chakravarty, S. R., **Mitra, M.**, Mutuswami, S., & Pal, R. (2020). On the probability ratio index as a measure of electoral competition. *Palgrave Communications*, *6*(96), 1–6. https://doi.org/10.1057/s41599-020-0466-8

362. Falcó, E., Karmokar, M., **Roy, S.**, & Storcken, T. (2020). On update monotone, continuous, and consistent collective evaluation rules. *Social Choice and Welfare*, *55*(4), 759–776. https://doi.org/10.1007/s00355-020-01263-1

363. Graves, N., **Maiti, R.**, Aloweni, F. A. B., Yuh, A. S., Lo, Z. J., & Harding, K. (2020). Pressure injuries among admissions to a hospital in the tropics. *International Wound Journal*, *17*(6), 1659–1668. https://doi.org/10.1111/iwj.13448

364. **Munshi, S.** (2020). Violence amidst Virus: A Game-Theoretic Exploration of Conflict during a Pandemic. *Theoretical Economics Letters*, *10*(06), 1292–1306. https://doi.org/10.4236/tel.2020.106079

365. **Roy, S.**, & Sadhukhan, S. (2020). A unified characterization of the randomized strategy-proof rules. *Journal of Economic Theory*, *105131*. https://doi.org/10.1016/j.jet.2020.105131

366. **Sharma Biswas, C.** (2020). Quality of life of Women in India. *International Journal of Arts and Social Science*, *3*(4), 348–363.

LRU, Kolkata

367. Aman, A., **Dash, N. S.**, & Gope, A. (2020). A Preliminary Account on the Khortha Speech Prosody. *Palarch's Journal of Archaeology of Egypt/Egyptology*, *17*(6), 6440–6454.

368. Aman, A., **Dash, N. S.**, & Chakraborty, J. (2020). Designing a Linguistic Profile of Khortha: A Less Resourced Language Spoken in Hte State of Jharkhand, India. *Dialectologia: Revista Electrònica*, *25*, 25–43. https://raco.cat/index.php/Dialectologia/article/view/384789

369. **Dash, N. S.** (2020). Documentation of a Dialect through the Use of a Dialect Corpus. *JanajatiDarpan – A Multilingual International Series on Tribals and Dalits of India*, *7*(1), 42–58.

370. **Dash, N. S.** (2020). Developing a News Text Corpus of Indian English for Language Technology, Machine Translation, and Language Teaching. *International Journal of Translation*, *32*(1–2), 31–57.

371. **Dash, N. S.** (2020). Methods Adopted for Teaching English in 19th Century Bengal: A Brief Note. *Indian Journal of Applied Linguistics*, *46*(1–2), 40–49.

372. **Dash, N. S.**, Bhattacharjee, M., & Das, S. (2020). Foods Offered to Deities in Bengal: Tasting Ethnographic Flavours in the Gastronomic Offerings Prevalent in Bengali Culture. *International Journal of Communication*, *17*(1–2), 117–154.

373. **Dash, N. S.**, & Das, S. (2020). Multilingualism and Social Development: Looking into the Claim that Knowledge and Skills in Many Languages are Crucial in Economic Growth of a Society. *Working Papers on Linguistics and Literature*, *13*(2), 451–463.

374. Dhar, A., Mukherjee, H., **Dash, N. S.**, & Roy, K. (2020). Automatic Categorization of Web Text Documents Using Fuzzy Inference Rules. *Sādhanā*, *45*(168).

375. Dhar, A., Mukherjee, H., **Dash, N. S.**, & Roy, K. (2020). CESS-A System to Categorize Bangla Web Text Documents. *ACM Transactions on Asian and Low-Resource Language Information Processing*, *19*(5), 1–18. https://doi.org/10.1145/3398070

376. Dhar, A., Mukherjee, H., **Dash, N. S.**, & Roy, K. (2021). Text categorization: past and present. *Artificial Intelligence Review*, *54*(4), 3007–3054. https://doi.org/10.1007/s10462-020-09919-1

PRU, Kolkata

377. Chattopadhyay, I., & **Dutta Roy, D.** (2020). Face Validation of questionnaire measure attitude towards environmental sensitivity and recycling, in spa. *Journal of Applied and School Psychology*, *2*(1), 44–50.

378. Dey, A., & **Dutta Roy, D.** (2020). Face validity of items measuring environmental safety, perceived control and environmental reductionism attitude among college going students, in spa. *Journal of Applied and School Psychology*, *1*(2), 42–55.

379. Khatua, S., & **Dutta Roy, D.** (2020). Examining financial self efficiencyamonst Indian people and empirical study. *Journal of Psychometry*, *34*(1).

380. Vijayshri, & **Dutta Roy, D.** (2021). Effects of Rabindrik Drama play on self esteem of students with learning disabilities. *International Journal of Indian Psychology*, *9*, 638–645. https://doi.org/10.25215/0902.067

SERU, Tezpur

381. **Chowdhury, K. B.**, Sarkar, K. K., & Kundu, S. (2021). Nonlinear relationships between inflation, output growth and uncertainty in India: New evidence from a bivariate threshold model. *Bulletin of Economic Research*, *73*(3), 469–493. https://doi.org/10.1111/boer.12260

SOSU, Kolkata

382. Bhattacharjee, K., **Mukherjee, D.**, & Sayyad, M. (2020). Fund Managers Adding Values? Measuring Performance without Benchmark – A Study of Indian Mutual Fund Schemes. *Applied Finance Letters*, *9*(SI), 44–62. https://doi.org/10.24135/afl.v9i2.250

383. Biswas, S., Jawaid, S., & **Mukherjee, D.** (2020). Multi-asset portfolio optimization with stochastic sharpe ratio under drawdown constraint. *Annals of Financial Economics*, *15*(01), 2080001. https://doi.org/10.1142/S2010495220800019

384. Biswas, S., & **Mukherjee, D.** (2020). Discrete time portfolio optimisation managing value at risk under heavy tail return distribution. *International Journal of Mathematical Modelling and Numerical Optimisation*, *10*(4), 424–450. https://doi.org/10.1504/IJMMNO.2020.10031727

385. Biswas, S., **Mukherjee, D.**, & SenGupta, I. (2020). Multi-asset generalized variance swaps in Barndorff-Nielsen and Shephard model. *International Journal of Financial Engineering*, *07*(04), 2050051. https://doi.org/10.1142/S2424786320500516

386. Dey, A., **Mukherjee, D.**, & Sen Roy, S. (2020). Modelling the influence of social network with a multiple group latent class analysis. *The Journal of Mathematical Sociology*, 1–21. https://doi.org/10.1080/0022250X.2020.1821199

387. Ghosal, S., Jana, S., Mani, A., **Mitra, S.**, & Roy, S. (2020). Sex Workers, Stigma and Self-Image: Evidence from Kolkata Brothels. *The Review of Economics and Statistics*, 1–45. https://doi.org/10.1162/rest_a_01013

388. Bhattacharjee, K., **Mukherjee, D.,** & Bagchi, S. (2021). Estimating Consumer Price Indices through Engel curve and almost ideal demand system. *Empirical Economics Letters*, *20*(1).

389. Biswas, S., Ghosh, M. K., & **Mukherjee, D.** (2021). Portfolio optimization managing value at risk under heavy tail return, using stochastic maximum principle. *Stochastic Analysis and Applications*, 1–12. https://doi.org/10.1080/07362994.2020.1864405

390. Chatterjee, K., & **Mukherjee, D.** (2021). On the estimation of population size under dependent dual-record system: an adjusted profile-likelihood approach. *Journal of Statistical Computation and Simulation*, 1–24. https://doi.org/10.1080/00949655.2021.1908284

391. Marjit, S., Mishra, S., & **Mitra, S.** (2021). Tax evasion by tax deferment: Sham litigation with an informal credit market. *European Journal of Political Economy*, *102008*. https://doi.org/10.1016/j.ejpoleco.2021.102008

SRU, Giridih

392. **Behera, H. C.** (2021). Traditional Agriculture, Culture and the Indigenous Knowledge (IK) among the Kondhs in Odisha, India. *Journal of Human Ecology*, *73*(1–3), 44–55. https://doi.org/10.31901/24566608.2021/73.1-3.3301

SRU, Kolkata

393. **Chakraborty, S.** (2020). Inequalities in Farm Sector Labour Force in India. *Shanlax International Journal of Arts, Science, and Humanities, 8*(1), 44-56. https://doi.org/10.34293/sijash.v8i1.3247

STATISTICAL QUALITY CONTROL AND OPERATIONS RESEARCH DIVISION (SQC & OR)

SQC&OR, Bangalore

394. Bellairu, P. K., Bhat, S., & **Gijo, E. V.** (2020). Modelling and optimisation of natural fibre reinforced polymer nanocomposite: application of mixture-design technique. *Multidiscipline Modeling in Materials and Structures*, *17*(2), 507–521. https://doi.org/10.1108/MMMS-05-2020-0122

395. Bhat, S., Antony, J., **Gijo, E. V.**, & Cudney, E. A. (2020). Lean Six Sigma for the healthcare sector: a multiple case study analysis from the Indian context. *International Journal of Quality & Reliability Management*, *37*(1), 90–111. https://doi.org/10.1108/IJQRM-07-2018-0193

396. Bhat, S., **Gijo, E. V.**, Rego, A. M., & Bhat, V. S. (2020). Lean Six Sigma competitiveness for micro, small and medium enterprises (MSME): an action research in the Indian context. *The TQM Journal*, *33*(2), 379–406. https://doi.org/10.1108/TQM-04-2020-0079

397. Bhat, V. S., Bhat, S., & **Gijo, E. V.** (2020). Application of Robust Engineering Approach for DC Motor Controller Design. *International Journal of Advanced Science and Technology*, *29*(7), 11275–11282.

398. **John, B.**, & Kadadevaramath, R. S. (2020). Improving the resolution time performance of an application support process using Six Sigma methodology. *International Journal of Lean Six Sigma*, *11*(4), 663–686. https://doi.org/10.1108/IJLSS-10-2018-0108

399. **John, B.**, & Parikh, P. (2020). Improving the insurance claim processing process using Six Sigma methodology. *International Journal of Six Sigma and Competitive Advantage*, *12*(4), 348–368. https://doi.org/10.1504/IJSSCA.2020.112368

400. **John, B.**, & Subhani, S. M. (2020). A modified control chart for monitoring non-normal characteristics. *International Journal of Productivity and Quality Management*, *29*(3), 309–

328. https://doi.org/10.1504/IJPQM.2020.105990

401. Bhat, V. S., Bhat, S., & **Gijo, E. V.** (2021). Simulation-based lean six sigma for Industry 4.0: an action research in the process industry. *International Journal of Quality & Reliability Management*, *38*(5), 1215–1245. https://doi.org/10.1108/IJQRM-05-2020-0167

402. **John, B.**, & Subhani, S. M. (2021). A service level agreement baselining methodology for non-normal characteristics using the Pearson distribution. *International Journal of Industrial and Systems Engineering*, *37*(2), 222–240. https://doi.org/10.1504/IJISE.2021.112883

SQC&OR, Chennai

403. Srinivasa Rao, K., **Ravindran, G.**, & Thiagarajan, S. (2020). A Novel Property of the Dice: New Palindromic Sequences of Numbers. *Journal of Ramanujan Society of Mathematics and Mathematical Sciences*, *8*(1), 53–68.

SQC&OR, Delhi

404. Dubey, D., & **Neogy, S. K.** (2020). On solving a non-convex quadratic programming problem involving resistance distances in graphs. *Annals of Operations Research*, *287*(2), 643–651. https://doi.org/10.1007/s10479-018-3018-5

405. Krishnamurthy, N., & **Neogy, S. K.** (2020). On Lemke processibility of LCP formulations for solving discounted switching control stochastic games. *Annals of Operations Research*, *295*(2), 633–644. https://doi.org/10.1007/s10479-020-03750-1

406. **Neogy, S. K.**, Bapat, R. B., Dubey, D., & Parthasarathy, T. (2020). Preface to The Special Issue on — Operations Research and Game Theory: Modeling and Computation. *International Game Theory Review*, *22*(02). https://doi.org/10.1142/S0219198920020016

SQC&OR, Hyderabad

407. Lalita, T. R., **Manna, D. K.,** & **Murthy, G. S. R.** (2020). Mathematical formulations for large scale check-in counter allocation problem. *Journal of Air Transport Management*, *85*, 101796. https://doi.org/10.1016/j.jairtraman.2020.101796

408. Lalita, T. R., & **Murthy, G. S. R.** (2021). The wind power scheduling problem. *OPSEARCH*. https://doi.org/10.1007/s12597-021-00510-y

SQC&OR, Kolkata

409. **Anis, M. Z.**, & Ahsanullah, M. (2020). The skewed raised-cosine distribution – some characterizations. *Journal of Probability and Statistical Science*, *18*(2), 107–119.

410. **Anis, M. Z.**, & De, D. (2020). An Expository Note on Unit - Gompertz Distribution with Applications. *Statistica*, *80*(4), 469–490. https://doi.org/10.6092/issn.1973-2201/11135

411. Chakraborty, T., & **Chakraborty, A. K**. (2020). Superensemble classifier for improving predictions in imbalanced datasets. *Communications in Statistics: Case Studies, Data Analysis and Applications*, *6*(2), 123–141. https://doi.org/10.1080/23737484.2020.1740065

412. Chakraborty, T., Chattopadhyay, S., & **Chakraborty, A. K.** (2020). Radial basis neural tree model for improving waste recovery process in a paper industry. *Applied Stochastic Models in Business and Industry*, *36*(1), 49–61. https://doi.org/10.1002/asmb.2473

413. **Gauri, S. K.**, & Pal, S. (2020). A note on the generalized indices of process capability. *International Journal of Research in Industrial Engineering*, *9*(3), 286–303. https://doi.org/10.22105/riej.2020.237520.1137

414. Jha, S., **Das, P.**, & Antczak, T. (2020). Exponential type duality for η-approximated variational problems. *Yugoslav Journal of Operations Research*, *30*(1), 19–43. https://doi.org/10.2298/YJOR190415022J

415. Mondal, P., **Neogy, S. K.**, Gupta, A., & Ghorui, D. (2020). A Policy Improvement Algorithm for Solving a Mixture Class of Perfect Information and AR-AT Semi-Markov Games. *International Game Theory Review*, *22*(02). https://doi.org/10.1142/S0219198920400083

416. Pal, S., & **Gauri, S. K.** (2020). Measuring capability of a Poisson process: Relative goodness of the estimates obtained by different approaches. *International Journal of Engineering, Science and Technology*, *12*(4), 1–13. https://doi.org/10.4314/ijest/v12i4.1

417. Pal, S., & **Gauri, S. K.** (2020). Measuring capability of a binomial process. *International Journal of Engineering, Science and Technology*, *12*(1), 25–37. https://doi.org/10.4314/ijest/v12i1.3

418. Roy, S., Bhattacharya, S., & **Das, P.** (2020). Learning clusters, MOOCs, free videos and organization learning: a case study from Indian SMEs. *Development and Learning in Organizations:An International Journal*, *34*(1), 16–20. https://doi.org/10.1108/DLO-03-2019-0057

419. Sen, T., Bhattacharya, R., Tripathi, Y. M., & **Pradhan, B**. (2020). Inference and optimum life testing plans based on Type-II progressive hybrid censored generalized exponential data. *Communications in Statistics - Simulation and Computation*, *49*(12), 3254–3282. https://doi.org/10.1080/03610918.2018.1538456

420. **Chakraborty, A. K.**, & Chatterjee, M. (2021). Distributional and inferential properties of some new multivariate process capability indices for symmetric specification region. *Quality and Reliability Engineering International*, *37*(3), 1099–1115. https://doi.org/10.1002/qre.2783

421. Chakraborty, T., & **Chakraborty, A. K**. (2021). Hellinger Net: A Hybrid Imbalance Learning Model to Improve Software Defect Prediction. *IEEE Transactions on Reliability*, *70*(2), 481–494. https://doi.org/10.1109/TR.2020.3020238

422. Chakraborty, T., **Chakraborty, A. K.**, Biswas, M., Banerjee, S., & Bhattacharya, S. (2021). Unemployment

Rate Forecasting: A Hybrid Approach. *Computational Economics*, *57*(1), 183–201. https://doi.org/10.1007/s10614-020-10040-2

423. Dey, S., Kumar, D., **Anis, M. Z.**, Nadarajah, S., & Okorie, I. (2021). A Review of Transmuted Distributions. *Journal of the Indian Society for Probability and Statistics*, *22*(1), 47–111. https://doi.org/10.1007/s41096-021-00096-0

424. Jana, R., **Das, A. K.**, & Mishra, V. N. (2021). Iterative Descent Method for Generalized Leontief Model. *Proceedings of the National Academy of Sciences, India Section A: Physical Sciences*, *91*(2), 237–244. https://doi.org/10.1007/s40010-020-00714-9

425. Panja, A., Kundu, P., & **Pradhan, B.** (2021). Stochastic comparisons of lifetimes of series and parallel systems with dependent and heterogeneous components. *Operations Research Letters*, *49*(2), 176–183. https://doi.org/10.1016/j.orl.2020.12.009

426. Sen, T., Bhattacharya, R., **Pradhan, B.**, & Tripathi, Y. M. (2021). Statistical inference and Bayesian optimal life-testing plans under Type-II unified hybrid censoring scheme. *Quality and Reliability Engineering International*, *37*(1), 78–89. https://doi.org/10.1002/qre.2721

SQC&OR, Pune

427. **Rath, S., Chakraborty, A. K**., & **Chatterjee, S**. (2021). Development of a Model to Integrate Six Sigma Approaches. *IAPQR Transactions*, *45*(1–2).

THEORETICAL STATISTICS AND MATHEMATICS DIVISION (TSMD)

SMU, Bangalore

428. Athreya, S., & **Yogeshwaran, D.** (2020). Central limit theorem for statistics of subcritical configuration models. *Journal of the Ramanujan Mathematical Society*, *35*(2), 109–119. http://www.mathjournals.org/jrms/2020-035-002/2020-035-002-001.html

429. Barik, S., Das, B. K., & **Sarkar, J.** (2020). Isometric dilations and von Neumann inequality for finite rank commuting contractions. *Bulletin Des Sciences Mathématiques*, *165*, 102915. https://doi.org/10.1016/j.bulsci.2020.102915

430. Bhar, S., **Bhaskaran, R.**, & Sarkar, B. (2020). Solutions of SPDE's Associated with a Stochastic Flow. *Potential Analysis*, *53*(1), 203–221. https://doi.org/10.1007/s11118-019-09764-0

431. Bhar, S., **Bhaskaran, R.**, & Sarkar, B. (2020). Stochastic PDEs in S' for SDEs driven by Lévy noise. *Random Operators and Stochastic Equations*, *28*(3), 217–226. https://doi.org/10.1515/rose-2020-2041

432. Choudhuri, M., & **Raja, C. R. E.** (2020). Nilpotent Lie groups and hyperbolic automorphisms. *Archiv Der Mathematik*, *115*(3), 247–255. https://doi.org/10.1007/s00013-020-01487-8

433. Das, B. K., Gorai, S., & **Sarkar, J.** (2020). On quotient modules of H2(Dn): essential normality and boundary representations. *Proceedings of the Royal Society of Edinburgh: Section A Mathematics*, *150*(3), 1339–1359. https://doi.org/10.1017/prm.2018.124

434. Das, S., & **Kumar, M.** (2020). On the Inertia Conjecture for Alternating group covers. *Journal of Pure and Applied Algebra*, *224*(9), 106363. https://doi.org/10.1016/j.jpaa.2020.106363

435. Makhlouf, A., & **Naolekar, A.** (2020). On n-Hom-Leibniz algebras and cohomology. *Georgian Mathematical Journal*. https://doi.org/10.1515/gmj-2020-2058

436. Mishra, S. K., & **Naolekar, A.** (2020). O-operators on hom-Lie algebras. *Journal of Mathematical Physics*, *61*(12), 121701. https://doi.org/10.1063/5.0026719

437. Mundayadan, A., & **Sarkar, J.** (2020). Linear dynamics in reproducing kernel Hilbert spaces. *Bulletin Des Sciences Mathématiques*, *159*, 102826. https://doi.org/10.1016/j.bulsci.2019.102826

438. **Rajarama Bhat, B. V**., & Osaka, H. (2020). A factorization property of positive maps on C^*-algebras. *International Journal of Quantum Information*, *18*(05), 2050019. https://doi.org/10.1142/S0219749920500197

439. Balodi, M., Banerjee, A., & **Naolekar, A.** (2021). BV-operators and the secondary Hochschild complex. *Comptes Rendus. Mathématique*, *358*(11–12), 1239–1258. https://doi.org/10.5802/crmath.157

440. Ghosh, A., Solund-Kirsebom, M., & **Roy, P.** (2021). Continued fractions, the Chen–Stein method and extreme value theory. *Ergodic Theory and Dynamical Systems*, *41*(2), 461–470. https://doi.org/10.1017/etds.2019.64

441. **Naolekar, A. C.** (2021). Euler classes of vector bundles over manifolds. *Mathematica Slovaca*, *71*(1), 199–210. https://doi.org/10.1515/ms-2017-0461

442. **Nayak, S.** (2021). The Douglas lemma for von Neumann algebras and some applications. *Advances in Operator Theory*, *6*(3), 47. https://doi.org/10.1007/s43036-021-00143-4

443. **Nayak, S.** (2021). On Murray-von Neumann algebras—I: topological, order-theoretic and analytical aspects. *Banach Journal of Mathematical Analysis*, *15*(3), 45. https://doi.org/10.1007/s43037-021-00129-7

444. Panigrahi, S., **Roy, P.**, & Xiao, Y. (2021). Maximal moments and uniform modulus of continuity for stable random fields. *Stochastic Processes and Their Applications*, *136*, 92–124. https://doi.org/10.1016/j.spa.2021.02.002

445. **Rajarama Bhat, B. V**., Ghatak, A., & Pamula, S. K. (2021). Stinespring's theorem for unbounded operator valued local completely positive maps and its applications. *Indagationes Mathematicae*, *32*(2), 547–578. https://doi.org/10.1016/j.indag.2021.01.001

446. **Thakur, M.** (2021). The cyclicity problem for Albert algebras. *Israel Journal of Mathematics*, *241*(1), 139–145. https://doi.org/10.1007/s11856-021-2091-7

SMU, Delhi

447. Ando, T., Davis, C., **Jain, T.**, Kittaneh, F., Moslehian, M. S., & Spitkovsky, I. M. (2020). Rajendra Bhatia and his mathematical achievements. *Advances in Operator Theory*,

5(3), 850–863. https://doi.org/10.1007/s43036-020-00088-0

448. **Bandyopadhyay, A.**, Janson, S., & Thacker, D. (2020). Strong convergence of infinite color balanced urns under uniform ergodicity. *Journal of Applied Probability*, *57*(3), 853–865. https://doi.org/10.1017/jpr.2020.37

449. Bhatia, R., & **Jain, T.** (2020). Variational principles for symplectic eigenvalues. *Canadian Mathematical Bulletin*, 1–7. https://doi.org/10.4153/S0008439520000648

450. Bhatia, R., & **Jain, T.** (2020). A Schur-Horn theorem for symplectic eigenvalues. *Linear Algebra and Its Applications*, *599*, 133–139. https://doi.org/10.1016/j.laa.2020.04.005

451. Bhatia, R., **Jain, T.**, & Sengupta, R. (2020). A Szego type theorem and distribution of symplectic eigenvalues. *Journal of Spectral Theory*. https://arxiv.org/abs/2006.11829

452. **Jain, T.** (2020). Hadamard powers of rank two, doubly nonnegative matrices. *Advances in Operator Theory*, *5*(3), 839–849. https://doi.org/10.1007/s43036-020-00066-6

453. **Jain, T.**, & Mishra, H. K. (2020). Derivatives of symplectic eigenvalues and a Lidskii type theorem. *Canadian Journal of Mathematics*, 1–29. https://doi.org/10.4153/S000841X2000084X

454. **Laishram, S.**, G. Nair, S., & Shorey, T. N. (2020). On the Galois group of Generalised Laguerre polynomials II. *Hardy-Ramanujan Journal*, *42*(Special), 26–30. https://doi.org/10.46298/hrj.2020.6457

455. **Laishram, S.**, Luca, F., & Sias, M. (2020). On members of Lucas sequences which are products of factorials. *Monatshefte Für Mathematik*, *193*(2), 329–359. https://doi.org/10.1007/s00605-020-01455-y

456. Mukhopadhyay, A., Mazumdar, R. R., & **Roy, R.** (2020). Voter and Majority Dynamics with Biased and Stubborn Agents. *Journal of Statistical Physics*, *181*(4), 1239–1265. https://doi.org/10.1007/s10955-020-02625-w

457. Chaubey, Y. P., **Dewan, I.**, & Li, J. (2021). On Some Smooth Estimators of the Quantile Function for a Stationary Associated Process. *Sankhya B*, *83*(S1), 114–139. https://doi.org/10.1007/s13571-020-00242-x

458. Coupier, D., Saha, K., **Sarkar, A.**, & Tran, V. C. (2021). The 2d-directed spanning forest converges to the Brownian web. *The Annals of Probability*, *49*(1), 435–484. https://doi.org/10.1214/20-AOP1478

459. Garg, M., & **Dewan, I.** (2021). Testing for change in mean for associated random variables. *Communications in Statistics - Theory and Methods*, *50*(16), 3834–3850. https://doi.org/10.1080/03610926.2021.1873375

460. Kattumannil, S. K., **Dewan, I.**, & Sreelaksmi, N. (2021). Non-parametric estimation of Gini index with right censored observations. *Statistics & Probability Letters*, *175*, 109113. https://doi.org/10.1016/j.spl.2021.109113

461. Soni, P., **Dewan, I**., & Jain, K. (2021). Tests For Equality Of Hazard Quantile Functions. *Statistics and Applications*, *19*(1), 77–93.

SMU, Kolkata

462. Adhikari, K., & **Bose, A.** (2020). Limiting spectral distribution of the product of truncated Haar unitary matrices. *Random Matrices: Theory and Applications*, *09*(02), 2050002. https://doi.org/10.1142/S2010326320500021

463. **Behera, B.** (2020). Unconditional bases of wavelets in local fields. *Analysis Mathematica*, *46*(2), 173–193. https://doi.org/10.1007/s10476-020-0027-9

464. Bhowmick, J., **Goswami, D.**, & Landi, G. (2020). Levi-Civita connections and vector fields for noncommutative differential calculi. *International Journal of Mathematics*, *31*(08). https://doi.org/10.1142/S0129167X20500652

465. Bhowmick, J., **Goswami, D.**, & Landi, G. (2020). On the Koszul formula in noncommutative geometry. *Reviews in Mathematical Physics*, *32*(10). https://doi.org/10.1142/S0129055X20500324

466. Bhowmik, M., Pusti, S., & **Ray, S. K.** (2020). Theorems of Ingham and Chernoff on Riemannian symmetric spaces of noncompact type. *Journal of Functional Analysis*, *279*(11). https://doi.org/10.1016/j.jfa.2020.108760

467. Biswas, I., & **Biswas, K.** (2020). A Torelli type theorem for exp-algebraic curves. *Annales de La Faculté Des Sciences de Toulouse : Mathématiques*, *29*(2), 357–370. https://doi.org/10.5802/afst.1634

468. **Bose, A.**, & Dey, A. (2020). U-statistics CLT using cumulants and a free version. *Statistics and Applications*, *18*(2), 275–286. https://www.ssca.org.in/media/18_2_2020_SA_Sinhas_Special_Issue_Combined_Complete.pdf#page=31 1

469. **Bose, A.**, & Hachem, W. (2020). Smallest singular value and limit eigenvalue distribution of a class of non-Hermitian random matrices with statistical application. *Journal of Multivariate Analysis*, *178*, 104623. https://doi.org/10.1016/j.jmva.2020.104623

470. **Bose, A.**, Maurya, S. N., & Saha, K. (2020). Process convergence of fluctuations of linear eigenvalue statistics of random circulant matrices. *Random Matrices: Theory and Applications*, *2150032*. https://doi.org/10.1142/S2010326321500325

471. **Bose, A.**, Saha, K., & Sen, P. (2020). Some patterned matrices with independent entries. *Random Matrices: Theory and Applications*, *2150030*. https://doi.org/10.1142/S2010326321500301

472. Chirvasitu, A., & **Goswami, D.** (2020). Existence and Rigidity of Quantum Isometry Groups for Compact Metric Spaces. *Communications in Mathematical Physics*, *380*(2), 723–754. https://doi.org/10.1007/s00220-020-03849-3

473. **Dutta, A. K.**, **Gupta, N**., & Lahiri, A. (2020). On separable A^2 and A^3-forms. *Nagoya Mathematical Journal*, *239*, 346–354. https://doi.org/10.1017/nmj.2018.45

474. **Goswami, D.** (2020). Non-existence of genuine (compact) quantum symmetries of compact, connected smooth manifolds. *Advances in Mathematics*, *369*, 107181. https://doi.org/10.1016/j.aim.2020.107181

475. Naik, M., **Ray, S. K.**, & **Sarkar, R. P.** (2020). Mean value property in limit for eigenfunctions of the Laplace–Beltrami operator. *Transactions of the American Mathematical Society*, *373*(7), 4735–4756. https://doi.org/10.1090/tran/8078

476. Bhattacharjee, M., **Bose, A.**, & Srivastava, R. (2021). A white noise test under weak conditions. *Journal of Statistical Planning and Inference*, *211*, 362–390. https://doi.org/10.1016/j.jspi.2020.07.004

477. **Biswas, K.** (2021). Loewner evolution of hedgehogs and 2-conformal measures of circle maps. *Ergodic Theory and Dynamical Systems*, *41*(9), 2734–2753. https://doi.org/10.1017/etds.2020.84

478. **Biswas, K.**, Knieper, G., & Peyerimhoff, N. (2021). The Fourier Transform on Harmonic Manifolds of Purely Exponential Volume Growth. *The Journal of Geometric Analysis*, *31*(1), 126–163. https://doi.org/10.1007/s12220-019-00253-9

479. **Bose, A.**, & Bhattacharjee, M. (2021). Kernel Density Estimates in a Non-standard Situation. *Journal of Statistical Theory and Practice*, *15*(1). https://doi.org/10.1007/s42519-020-00161-0

480. **Bose, A.**, & Mukherjee, S. S. (2021). Bulk behaviour of skew-symmetric patterned random matrices. *Statistics and Applications (New Series)*, *19*(1), Special issue, 41–60. https://www.ssca.org.in/media/3_19_1_2021_SA_Arup_Bose.pdf

481. **Bose, A.**, Pal, D., & Sappington, D. (2021). Welfare effects of limiting bank loans. *Journal of Financial Economic Policy*, *13*(4), 442–461. https://doi.org/10.1108/JFEP-06-2020-0122

482. **Bose, A.**, Pal, D., & Sappington, D. E. M. (2021). The political economy of voluntary public service. *Public Choice*, *186*(1–2), 29–61. https://doi.org/10.1007/s11127-019-00752-x

483. Chakraborty, S., Dasgupta, N., **Dutta, A. K.**, & Gupta, N. (2021). Some results on retracts of polynomial rings. *Journal of Algebra*, *567*, 243–268. https://doi.org/10.1016/j.jalgebra.2020.08.030

484. **Munshi, R.** (2021). On a shifted convolution sum problem. *Journal of Number Theory*. https://doi.org/10.1016/j.jnt.2020.12.011

485. Naik, M., **Ray, S. K.**, & Sarkar, R. P. (2021). Large time behaviour of heat propagator. *Bulletin Des Sciences Mathématiques*, *167*, 102955. https://doi.org/10.1016/j.bulsci.2021.102955

ACADEMIC CENTRES

CECFEE, Delhi

486. Alpizar, F., Carlsson, F., Lanza, G., Carney, B., Daniels, R. C., Jaime, M., Ho, T., Nie, Z., Salazar, C., Tibesigwa, B., & **Wahdera, S.** (2020). A framework for selecting and designing policies to reduce marine plastic pollution in developing countries. *Environmental Science & Policy*, *109*, 25–35. https://doi.org/10.1016/j.envsci.2020.04.007

487. **Dhamija, G.**, & **Roychowdhury, P.** (2020). Age at Marriage and Women's Labour Market Outcomes in India. *Journal of International Development*, *32*(3), 342–374. https://doi.org/10.1002/jid.3456

488. Nepal, M., Rai, R. K., Khadayat, M. S., & **Somanathan, E.** (2020). Value of cleaner neighborhoods: Application of hedonic price model in low income context. *World Development*, *131*, 104965. https://doi.org/10.1016/j.worlddev.2020.104965

489. Bhatt, T., Chowdhury, V., & **Somanathan, E.** (2021). Report on the 14th Annual Meeting of the Environment for Development (EfD) Initiative. *Ecology, Economy and Society–the INSEE Journal*, *4*(1), 157–160. https://doi.org/10.37773/ees.v4i1.373

490. Das, S., Dutta, S., & **Sarkar, A.** (2021). Political economy of third party interventions. *Journal of Public Economics*, *195*, 104331. https://doi.org/10.1016/j.jpubeco.2020.104331

CSCR, Kolkata

491. Garg, A., Das, S., Maiti, J., & **Pal, S. K.** (2020). Granulized Z-VIKOR model for failure mode and effect analysis. *IEEE Transactions on Fuzzy Systems*. https://doi.org/10.1109/TFUZZ.2020.3037933

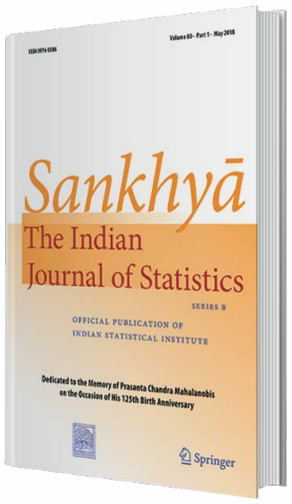
492. Maddalena, L., Gori, M., & **Pal, S. K.** (2020). Pattern recognition and beyond: Alfredo Petrosino's scientific results. *Pattern Recognition Letters*, *138*, 659–669. https://doi.org/10.1016/j.patrec.2020.07.032

493. Chakraborty, D. B., & **Pal, S. K.** (2021). Rough video conceptualization for real-time event precognition with motion entropy. *Information Sciences*, *543*, 488–503. https://doi.org/10.1016/j.ins.2020.09.021

ADMINISTRATIVE SERVICE DIVISION

494. **Pal, J. K.** (2021). Legislative ban on child labour: A harsh question in India. *International Journal of Creative Research Thoughts*, *9*(3), 783–787. https://ijcrt.org/papers/IJCRT2103101.pdf

5.4 The Official Publication of ISI, Sankhyā



1. A Brief Overview

The internationally renowned journal Sankhyā was founded by Professor P. C. Mahalanobis in 1932. This quarterly journal, with ISSN 0976-8378, is devoted to original research articles in Applied Statistics, Mathematical Statistics and Probability. Reviews and discussion articles on current research activity in the above areas are also published. A rigorous peer review process is followed for acceptance of articles submitted for publication in Sankhyā. Many seminal articles in Probability, Theoretical Statistics and Applied Statistics have appeared in Sankhyā.

The journal is published in two separate series – Series A and Series B.

Series A, with 2 issues per year (February and August) covers Probability & Theoretical Statistics.

Series B, with 2 issues per year (May and November) covers Applied and Interdisciplinary Statistics.

The Institute has been collaborating with Springer for printing and marketing the international edition of Sankhyā, in both prints and electronic editions. The editorial system is completely electronic, starting from submission to editorial processing and ending in final editorial decision for articles. Free access to articles of every edition of Sankhyā is available through the Sankhyā website.

2. Editorial Board (as on 31 March 2021)

Editor in-Chief	:	Dipak K. Dey, University of Connecticut, USA
Series A Editors	:	Krishna Athreya, Iowa State University, Ames, USA
		Soumendra Nath Lahiri, Washington University in St. Louis, USA
		Abhay G Bhatt, Indian Statistical Institute, Delhi, India
		Francisco Louzada, University of Sao Paulo, Sao Paulo, Brazil
Series B Editors	:	Sujit Ghosh, North Carolina State University, Raleigh, USA
		Bertrand Clarke, University of Nebraska, Lincoln, USA
		Saurabh Ghosh, Indian Statistical Institute, Kolkata, India
Technical Editors	:	Biswaranjan Behera, Indian Statistical Institute, Kolkata, India
		Abhik Ghosh, Indian Statistical Institute, Kolkata, India
Technical Support	:	Urmichhanda Bhattacharya, Indian Statistical Institute, Kolkata, India
Editorial Office Support	:	Sarvagnan Subramanian, Springer Journal's Editorial Office, Chennai, India

This journal is abstracted/ indexed in Current Index to Statistics, EBSCO Discovery Service, Emerging Sources Citation Index, Google Scholar, JSTOR, Japanese Science and Technology Agency (JST), Mathematical Reviews, OCLC WorldCat Discovery Service, ProQuest-ExLibris Primo, ProQuest-ExLibris Summon, Research Papers in Economics (RePEc), SCImago, SCOPUS and zbMATH.

3. Issues Published

Regular Issues	:	**Series A:** February 2021 (Volume 83 Issue 1)
		Series B: November 2020 (Volume 82 Issue 2)
Special Issues (if any) with short description	:	**Series A:** August 2020 (Volume 82 Issue 2: **Special issue on J.K. Ghosh memorial**, edited by Subhasis Ghoshal)
		Series B: May 2021 (Volume 83 Issue 1: **Special issue on JK Ghosh memorial**, edited by Bertrand Clarke, Gauri Datta); May 2021 (Volume 83 Supplement Issue 1: **Special issue on C.R. Rao**, edited by Satish Iyengar, Shyamal Peddada)

4. Exchange of journal *Sankhyā - The Indian Journal of Statistics:*

ISI Library maintains **Journal Exchange Program** (JEP) against Sankhyā with 39 scholarly journals from 31 international and 8 national institutions across the countries like Japan (13), France (3), UK(3), Poland (2), USA(1), Italy(1), Romania (1), Croatia (1), Bangladesh (1), Hungary(1) and India (8).

CHAPTER 06 OTHER ACADEMIC ACTIVITIES

No. of Patents - 8

Filed -4 (National - 1, International - 3)
Granted -4 (International - 4)

No. of MoUs - 47

New -9 (National - 8, International - 1)
Existing -38 (National - 26, International - 12)

No. of Visiting Scientists - 68

National - 56
International - 12

6.1 Patents

IPRs Filed

Sl no.	Title of Patent	Application No./ Date of filing	Name of the Inventor(s)*	Status	Country name where filed
1	Fine-Grained Classification of Retail Products	202021044605 dated 26-Mar-2021	Avishek Kumar Shaw, Shilpa Yadukumar Rao, Pranoy Hari, **Dipti Prasad Mukherjee (ECSU)**, Bikash Santra	Filed	India
2	Method and System for Region Proposal based Object Recognition for Estimating Planogram Compliance	2020205301 dated 16-Jul-2020	Avishek Kumar Shaw, Rajashree Ramakrishnan, Shilpa Yadukumar Rao, Pranoy Hari, **Dipti Prasad Mukherjee (ECSU)**, Bikash Santra	Examination Requested	Australia
3	Method and System for Region Proposal based Object Recognition for Estimating Planogram Compliance	20185690 dated 14-Jul-2020	Avishek Kumar Shaw, Rajashree Ramakrishnan, Shilpa Yadukumar Rao, Pranoy Hari, **Dipti Prasad Mukherjee (ECSU)**, Bikash Santra	Filed	Europe
4	Method and System for Region Proposal based Object Recognition for Estimating Planogram Compliance	16/928,682 dated 14-Jul-2020	Avishek Kumar Shaw, Rajashree Ramakrishnan, Shilpa Yadukumar Rao, Pranoy Hari, **Dipti Prasad Mukherjee (ECSU)**, Bikash Santra	Ready for examination	United States of America

* Name in bold denotes ISI faculty

IPRs Granted

Sr. no.	Title of Patent	IPR No.	Grant Date	Name of the Inventor(s)*	Country name where filed
1	Continuous Authentication System and Method Based on BioAura	US10652237B2	**12- May-2020**	Arsalan Mosenia, **Susmita Sur-Kolay (ACMU)**, Anand Raghunathan, Niraj K Jha	United States of America
2	System and Method for Object Recognition based Estimation of Planogram Compliance	US10748030B2	**18- Aug-2020**	Pranoy Hari, Shilpa Yadukumar Rao, Rajashree Ramakrishnan, Avishek Kumar Shaw, Archan Ray, Nishant Kumar, **Dipti Prasad Mukherjee (ECSU)**	United States of America
3	Systems and methods for obtaining optimal mother wavelets for facilitating machine learning tasks	AU2018271286B2	**05- Nov-2020**	Ishan Sahu, Snehasis Banerjee, Tanushyam Chattopadhyay, Arpan Pal, and **Utpal Garain (CVPR)**	Australia
4	Systems and methods for obtaining optimal mother wavelets for facilitating machine learning tasks	JP6787981B2	**18- Nov-2020**	Ishan Sahu, Snehasis Banerjee, Tanushyam Chattopadhyay, Arpan Pal, and **Utpal Garain (CVPR)**	Japan

* Name in bold denotes ISI faculty

6.2 Memorandum of Understanding-MoUs

Over the last several years, the Institute has been very actively pursuing institution-level collaboration in fields of mutual interest that has led to Memoranda of Understanding (MoUs) with a number of universities/academic institutions as well as industrial organisations. These MoUs range from collaborative research to research grants for students/faculty as well as student/faculty exchange programmes. At present, the Institute has new MoUs signed and some ongoing ones (both national and international) with the following institutions/ organisations:

1. New MoUs signed

Sl. no.	University/Institution/Organization	Country	Effective from	Duration
1	**Tata Consultancy Services Limited**	India	01-04-20	1 year
2	**EfD agreement at University of Gothenberg**	Sweden	09-04-20	1 year
3	**Tata Consultancy Services Limited**	India	01-05-20	1 year
4	**Tata Consultancy Services Limited** (addendum to Consultancy Services agreement)	India	26-05-20	1 year
5	**Contract agreement with Tata Steel**	India	01-06-20	1 year
6	**Contract extension between IFMR & ISI**	India	28-07-20	1 year
7	**Agreement for ISI-IEG Research project under EfD agreement**	India	25-08-20	2 years
8	**IIT, Kanpur, IIT, Kharagpur & ABB Power Technology Services Private Limited**	India	31-08-20	1 year
9	**Defence Research & Development Organization (DRDO)**	India	08-10-20	5 years

2. Continuing MoUs

Sl. No.	University/Institution/Organization	Country	Valid until
1	**University of Groningen**	Netherlands	Feb-25
2	**University of Reading**	England	Jun-24
3	**Networks Specified/University of Amsterdam, Netherlands**	Netherlands	May-24
4	**Tata Consultancy Services Foundation**	India	Jan-24
5	**Springer (India) Pvt. Ltd.**	India	Nov-23
6	**Universita degli Studi di Trieste, Italy**	Italy	Nov-23
7	**MIT-Skills, Pune, India**	India	Oct-23
8	**Basque Centre for Applied Mathematics (BCAM), Spain**	Spain	May-23
9	**University of Auckland, New Zealand**	New Zealand	May-23
10	**AXISCADES Engineering Technologies Limited**	India	Nov-22
11	**WISeKey India Private Limited**	India	Oct-22
12	**Geological Survey of India, Ministry of Mines**	India	Oct-22
13	**National Technical Research Organisation (NTRO)**	India	Aug-22
14	**Tata Consultancy Services Limited**	India	May-22
15	**Ramakrishna Mission Vidyamandira**	India	Apr-22
16	**University of Technology, Sydney**	Australia	Mar-22
17	**Kidney Care Society**	India	Feb-22
18	**CSIR National Metallurgical Laboratory, Government of India**	India	Nov-21
19	**Dauphine Université Paris, France**	France	Nov-21
20	**School of Electrical Engineering, Kyungpook National University, South Korea**	South Korea	Nov-21
21	**Larsen & Tubro Infotech Limited**	India	Sep-21
22	**Cognizant Technology Solutions India Pvt. Ltd.**	India	Aug-21

Sl. No.	University/Institution/Organization	Country	Valid until
23	**Defense Research and Development Organisation (DRDO)**	India	Jun-21
24	**Institute of Economic Growth**	India	Jun-21
25	**Ericsson India Pvt. Ltd**	India	May-21
26	**Tata Institute of Fundamental Research**	India	May-21
27	**Airport Authority of India**	India	May-21
28	**Institute for Financial Management and Research, Chennai**	India	Apr-21
29	**International Centre for Integrated Mountain Development (ICIMOD)**	Nepal	Mar-21
30	**Wipro Limited**	India	Feb-21
31	**SyMec Project under Dept. of Biotech (NIBGM, ISSERK, TMC, BI, ISI, IICB)**	India	Jan-21
32	**Dhirubhai Ambani, DA-IICT, Gandhinagar**	India	Jan-21
33	**Tata Steel Limited**	India	Dec-20
34	**IIT, Madras**	India	Nov-20
35	**Springer Nature Singapore Private Limited**	Singapore	Jul-20
36	**Erasmus Programme/Technical University of Košice, Slovakia**	Slovakia	Jun-20
37	**Lal Bahadur Shastri National Academy of Administration, (LBSNAA), Mussoorie**	India	Jun-20
38	**Hitachi India Pvt. Ltd.**	India	Jun-20

6.3 MUSEUMS

6.3.1 GEOLOGY MUSEUM

GENERAL INFORMATION

Name of In-charge	:	Dhurjati Prasad Sengupta, Shiladri Sekhar Das, Debarati Mukherjee
Physical Address	:	Ground floor, Platinum Jubilee Building, ISI, Kolkata-700 108
Founded in	:	1962
Founded by	:	Pamela L. Robinson along with Sohan Lal Jain and Tapan Roy Chowdhury
Maintained by	:	Geological Studies Unit, Kolkata

Brief Overview

The Museum of the Geological Studies Unit has nearly 60 new taxa of fossil vertebrates ranging from Permian (~255 My) to Cretaceous (65 My) Period and is a unique repository of terrestrial Mesozoic vertebrates. Complete and partial skeletons of several vertebrate fossils including the oldest Permian reptile of India, Triassic terrestrial vertebrates, Jurassic and Cretaceous dinosaurs, dinosaur eggs and several Jurassic fishes are exhibited in this Museum apart from several holotype and paratype specimens kept in the repository. The museum also contains mega-invertebrate fossils, stromatolites, fossil plants among others.

Mounted skeleton of Barapasaurus tagorei, a Jurassic dinosaur

Endothiodon mahalanobisi -only Permian reptile from India

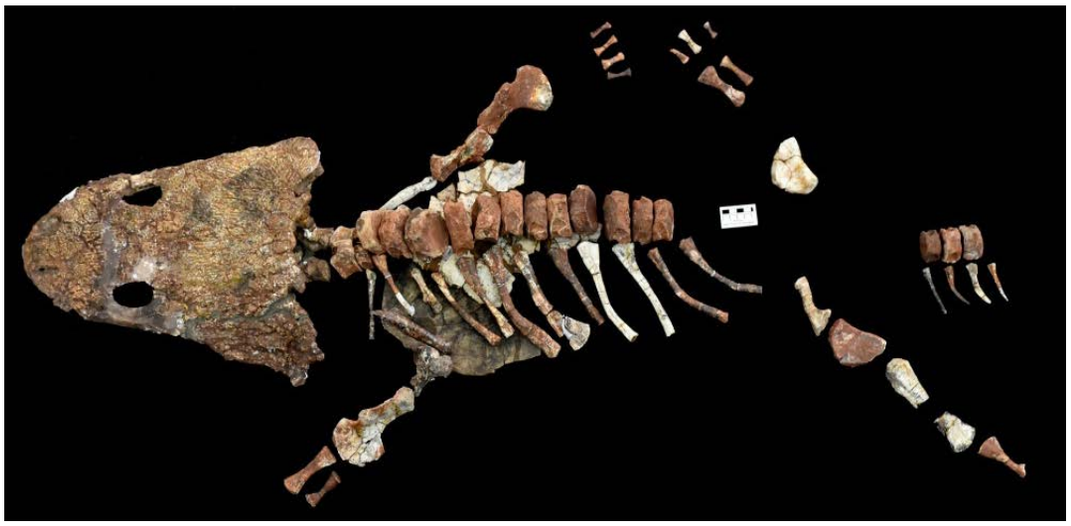
Hip bone of Isisarus colbertia

Major Collections

Sl. No.	Name of Collection	Brief Overview of Collection
1	Mounted skeleton of *Barapasaurus tagoeri*	*Barapasaurus* is a genus of basal sauropod dinosaur from Early Jurassic rocks of India.
2	Mounted skeleton of *Isisaurus colberti*	*Isisaurus* is a genus of titanosaurian dinosaur from the Late Cretaceous period from India.
3	Skeletal elements of prosauropods and abelisaurids	Prosauropods were large herbivorous dinosaurs of the Triassic and Early Jurassic. Abelisaurids were carnivorous biped theropod dinosaurs. Rahiolisaurus is an abelisaurid which existed in India during the Late Cretaceous period.
4	Mounted skeleton of *Hypardepedon huxlei*	Rhynchosaurs are a group of extinct herbivorous Triassicarchos auromorph reptiles with a unique dentition pattern.
5	Numerous skeletal elements of *Parasuchus hislopi*	Phytosaurs are an extinct group of large, mostly semiaquatic Late Triassic archosauriform reptiles having superficial similarity with the crocodiles.
6	Numerous skeletal elements of *Wadiasaurus indicus* and *Reschnisaurus cristarhynchus*	kannemeyeriid dicynodont (non-mammalian synapsid) from the Middle Triassic (Yerrapalli Formation of India.
7	*Endothiodon mahalanobisi* and related fauna	Various medium and small dicynodonts are known from Late Permian Kundaram Formation of India that includes Endothiodon.
8	*Pamelaria dolichotrachela* and *Yerrasuchus deccanensis*	*Pamelaria* is an extinct allokotosaurian archosauromorph reptile and *Yarasuchus* is an extinct genus of avemetatarsalian archosaur known from Middle Triassic of India.
9	Numerous skeletal elements of *Shringasaurus indicus*	*Shringasaurus* (meaning «horned lizard») is an extinct genus of allokotosaurian archosauromorph from the Middle Triassic (Anisian) of India.
10	Numerous skeletal elements of *Cherninia denwai, Paracyclotosaurs crookshanki, Eryosuchus rajareddyi, Compsocerops cosgriffi* and *Panthasaurus maleriensis*	All temnospondyl amphibians known from various Triassic Formations of India.

New Initiatives

- A loose mounting of *Panthasaurus maleriensis*, as shown below, was done in February – March 2021. (Scale bar = 4 cm)



- A digitised catalogue of fossils kept in the museum as well as a guide book is under preparation
- Sanjukta Chakravorti, Research Fellow, GSU, received an engagement grant from the Paleontological Association, UK, during early 2021, to carry out outreach activity based on fossils of India, which will start soon. The project is based on the motto – **"If you cannot go to a museum, the museum will come to you!"**

Visitors

Many international and national experts as well as students of vertebrate palaeontology visit the Museum regularly to study the rare collections. However, during 2020 -2021 the Museum was mostly closed for Covid 19 pandemic and lockdowns.

6.3.2 PRASANTA CHANDRA MAHALANOBIS MEMORIAL MUSEUM AND ARCHIVES

GENERAL INFORMATION

Name of In-charge : Dr. Kishor Chandra Satpathy
Physical Address : Amrapali, ISI, 204 B T Road, Kolkata-700 108
Founded in : 29th June, 1993
Founded by : Indian Statistical Institute

Brief Overview of the Museum and Archives

The Prasanta Chandra Mahalanobis Memorial Museum & Archives (PCMMM&A) was established in 1993 on the occasion of the birth centenary celebration of Professor Prasanta Chandra Mahalanobis (PCM), a pioneering statistician and the founder of the Indian Statistical Institute. Its major objective is the collection, preservation, restoration, display, communication and documentation of personalia, memorabilia as well as rare source materials connected with the life and legacy of Mahalanobis, which also encompass the historical growth of the Institute and of statistical science in India.

The Museum

It is housed in Amrapali, the erstwhile residence of Mahalanobis, located on the campus of the Institute at Kolkata. The ground floor, on the eastern side, has a permanent exhibition on his life and work through photographic displays, spread over five galleries. There are 921 exhibits through 101 panels and a collection of artifacts related to PCM on display in these galleries. An open lounge called the Chatal, his study room and personal areas of residence have been preserved for viewing on the first floor. In 2016, a new gallery (Gallery-VI) on the special relationship of Prasanta Chandra Mahalanobis and his wife, Nirmal Kumari Mahalanobis, with Rabindranath Tagore was inaugurated on the 1st floor.

Archives

The archival materials trace the history of the development of statistics in the Indian sub-continent during his lifetime and beyond, with special reference to his outstanding contributions in this area. They include official and personal documents, files, correspondence, scientific and literary papers, photographs, newspaper cuttings, diaries, and manuscripts related to Mahalanobis and Nirmal Kumari. Audio-visual materials like sound recordings and film footage, negatives and slides, also form a part of this collection. There are roughly 3 lakh documents, of which around 1.9 lakh have been treated. Digitization of the documents commenced in 2007. To date around 25,000 documents have been digitized and metadata of approximately 20,000 documents have been saved on a customized server, while around 2000 documents have been uploaded to the D-space server.

Presently the Museum & Archives has been shifted to the third floor of the library building temporarily for the renovation work of the museum. The Museum (building) has been closed for the time being for visitors.

P C Mahalanobis Memorial Museum and Archives: Major Collections

Name of Collection	Brief Overview of Collection
Manuscripts	3,00,000 Manuscripts (Typescript/ Handwritten)
Books	550 approx
Audio-video [Spool, Record, Cassettes]	93 nos., 89 nos.,101 nos.
Photographs	4000 approx
Negatives	5000 approx
Slides	1236 slides approx
Artifacts	1330 approx

Major Activities

- Conservation and Documentation for the preservation of the collection to ensure availability to present and future researchers. During this financial year, 4290 nos. of archival documentation were treated.
- Reference Services for researchers and scholars desiring to avail the archival collection for reference purposes were provided. Due to pandemic research work was hampetred and online reference services were provided to userslike Krishna Kumar T, Former Professor of ISI, Bangalore, Robert Yee, Mirko Schwagmann, Kollegiat Albert-Ludwigs-Universität Freiburg and Sakshi Mourya, IIT, Mumbai etc. From the month of January users were allowed to consult the archival document. Argha Manna, Heidelberg Centre for Transcultural Studies visited our archives in January
- Guided tours for visitors were organised.

Works Completed during 2020-2021:

1. Digitization of archival documents (2150+).
2. Classified by call number according to the subject of the books of PCM's study (350+).
3. Accessioning of books belongs to PCM's study (293+).
4. Digital accession register prepared and entered books in excel (200+).
5. Identify and sort the damaged book of PCM's study (65+) for conservation.
6. Data of recorded files entered in the digital catalogue in excel format (200+).

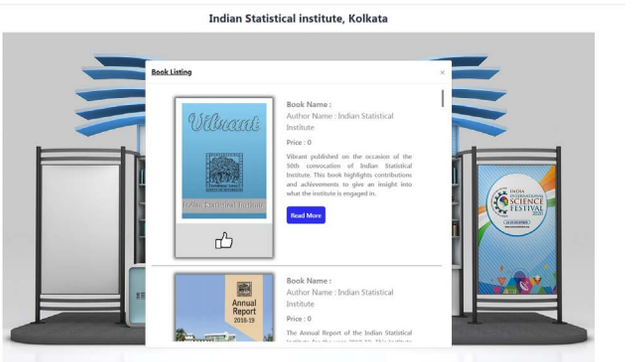
Participation in events

1. Prasanta Chandra Mahalanobis Memorial Museum & Archives acted as a co-host and participated in International Archives Week (8-14 June 2020), IAW Empowering Knowledge Societies. The event was organized by Milli, a consortium of individuals and communities interested in nurturing archives.

2. Prasanta Chandra Mahalanobis Memorial Museum & Archives, Indian Statistical Institute acted as a co-host & participated in the international webinar 'Resurgence' - on the return of audience to museums in collaboration with ICOM India, Bankim Bhavan Gaveshana Kendra, Gurusaday Museum, Kolkata Centre for Creativity & Raja Dinkar Kelkar Museum on 25 July, 2020.

3. Prasanta Chandra Mahalanobis Memorial Museum & Archives participated in the book fair of India International Science Festival (IISF) 2020 in the digital platform from 22nd to 25th December 2020.

4. Prasanta Chandra Mahalanobis Memorial Museum and Archives acted as an outreach partner in the Annual International Conference of Kolkata Centre for Creativity - Vasudhaiva Kutumbakam III, 6-7 March 2021.



6.4 Scientific Assignments

A.L. N. MURTHY, SQC & OR Unit, Hyderabad

– Chief guest and Invited speaker, on the occasion of 'Statistics Day" celebrations, ITC Limited, PSPD, Bhadrachalam (Virtual) (Jun 29, 2020)

ANISUR RAHAMAN MOLLA, CSRU, Kolkata

– Paper presentation, 16th International Symposium on Algorithms and Experiments for Wireless Sensor Networks (ALGOSENSORS), Pisa, Italy (Virtual) (Sep 09-10, 2020)

ARUNAVA SEN, EPU, Delhi

– Research Seminar, Singapore Management University, Singapore (Virtual) (Nov 19, 2020)
– Invited Speaker, ReLax Game Theory Workshop, Chennai Mathematical Institute (Feb 01, 2021)

ARUP BOSE, Stat-Math Unit, Kolkata

– Invited lecture, Relevant and Quality Data for Agricultural Research and Policy Planning (3rd World Statistics Day), IASRI, New Delhi, (Virtual) (Oct 20, 2020)
– Member, 28th International workshop in Matrices and Statistics (IWMS), Center for Advanced Research in Applied Mathematics and Statistics, Manipal Academy of Higher Education, India (Virtual) (Dec 15-17, 2020)
– Member, National Organizing Committee, International Conference on Linear Algebra and its Application (ICLAA) (Virtual) (Dec 17-19, 2020)
– Invited lecture, International Conference on Applied Linear Algebra, Probability and Statistics, Manipal Academy of Higher Education (Virtual) (Dec 17-19, 2020)
– Invited lecture, Department of Statistics, Michigan State University (Virtual) (Feb 09, 2021)
– Invited lecture, 23rd Annual Conference of Society of Statistics, Computers and Applications, Visionary Innovations in Statistical Theory and Applications (VISTA-2021), ICAR-National Academy of Agricultural Research Management, Hyderabad (Virtual) (Feb 24-28, 2021)
– Invited lecture, National Science Day Celebration, University of Mumbai, Dept. of Statistics (Virtual) (Mar 15, 2021)

ASHISH GHOSH, MIU, Kolkata

– Invited Speaker, Workshop, Machine Learning, King Monkut's University of Technology Thonburi, Bangkok, Thailand (Apr 20, 2020)
– Invited Speaker, Workshop, , Deep Learning for Visual Computing and Communication, NIT, Silchar (Oct 15, 2020)
– Webinar, Deep Learning, PSG Tech University, Coimbatore (Oct 17, 2020)
– Invited Speaker, Short Term Training Program, Machine Learning, Lendi Institute of Engineering and Technology (Nov 24, 2020)
– Invited Speaker, International Webinar, Computational Advances for Biomedical Engineering, Indian Institute of Engineering Science and Technology, Shibpur (Nov 26, 2020)
– Invited Speaker, Master Class, Data Science, Subudh Foundation (Nov 29, 2020)
– Keynote lecture, Refresher Program, Deep Learning, BIT, Meshra (Dec 14, 2020)
– Invited Speaker, Short term Course, Machine Learning Techniques for Cross-domain Applications, IIT, Indore (Dec 26, 2020)
– Invited Speaker, Faculty Development Program, Optimization and Deep learning, Amity University (Jan 18, 2021)
– Invited Speaker, Faculty Development Program, AI and ML in Computation, Optimization and Communication, CVR College of Engineering (Jan 18, 2021)
– Invited Speaker, Faculty Development Program, Mathematics for Machine Learning, SJ College of Engineering (Jan 22, 2021)
– Invited Speaker, Nature Inspired Technique for Medical Image Analysis, PSNA College, Dindigul, India (Feb 23, 2021)
– Keynote lecture, International Workshop, Multimedia Applications, LNM Institute of Information Technology, Jaipur (Mar 02, 2021)
– Invited Speaker, Webinar, Machine Learning and its Applications, Silicon Institute of Technology, Bhubaneswar (Mar 06, 2021)
– Invited Speaker, Nature Inspired Technique for Medical Image Analysis, PSNA College, Dindigul (Mar 09, 2021)

B. S. DAYA SAGAR, SSIU, Bangalore

– Full-day Tutorial Speaker, Symposium IGARSS – 2020, USA (Virtual) (Sep 26-27, 2020)
– Session Chair, Symposium IGARSS – 2020, USA (Virtual) (Sep 26 - Oct 02, 2020)

– Tutorial Chair, InGARSSS Conference – 2020, Ahmedabad (Virtual) (Dec 02-05, 2020)

BHABATOSH CHANDA, ECSU, Kolkata

– Joint Webinar Series 2020, BITS APPCAIR, IEEE CS Bangalore Chapter (Jul 24, 2020)

– Research fellow evaluation, IIEST, Shibpur (Aug 18, 2020)

– Doctoral Committee meeting, IIEST, Shibpur (Sep 02, 2020)

– Vaibhav Summit Participation in Computer Vision panel (Oct 14, 2020)

– Research fellow evaluation, IIEST, Shibpur (Oct 16, 2020)

– Delivered lecture, TEQIP-III Sponsored Short Term Course on "Applications of Machine Learning and Deep Learning in Engineering Problems", NIT, Srinagar (Oct 30, 2020)

– Delivered lecture, AICTE sponsored Short Term Course on "Machine Learning (ML), Pattern Recognition (PR) and their Applications", St Thomas' College of Engineering & Technology, Kolkata (Nov 02, 2020)

– PhD viva examiner, IIT, Kharagpur (Nov 18, 2020)

– Delivered lecture, AICTE sponsored Short Term Course, Machine Learning (ML), Pattern Recognition (PR) and their Applications, St Thomas' College of Engineering & Technology, Kolkata (Nov 23, 2020)

– Keynote lecture, 5th IAPR International Conference, Computer Vision and Image Processing (CVIP), IIIT, Allahabad (Dec 06, 2020)

– Delivered lecture, AICTE sponsored Short Term Course, Machine Learning (ML), Pattern Recognition (PR) and their Applications, St Thomas' College of Engineering & Technology, Kolkata (Dec 15, 2020)

BISWANATH DUTTA, DRTC, Bangalore

– Delivered lecture, University Visvesvaraya College of Engineering (UVCE), Bangalore University, Bangalore (Virtual) (Aug 27, 2020)

– Delivered lecture, Workshop, Learning Content Management System, PG Department of Geography & English, Cooch Behar College (Virtual) (Sep 02, 2020)

– Delivered lecture. National Webinar, Teaching in Pandemic Environment, Jadavpur University in collaboration with Universal Briefing, Kolkata (Virtual) (Sep 19, 2020)

– Delivered lecture, Department of Information Engineering and Computer Science (DISI), University of Trento, Italy (Virtual) (Sep 23, 2020)

– Delivered lecture, Workshop, COVID-19 Ontologies 2020 (WCO 2020), Ann Arbor, MI, United States, (Virtual) (Oct 23, 2020)

– Paper presentation, 12th International Conference on Knowledge Engineering and Ontology Development (KEOD 2020), Lisboa, Portugal (Virtual) (Nov 04, 2020)

– Presentations and demonstrations (four), Workshop, Ontology, Karnataka State Women's University, Vijayapura, Karnataka (Virtual) (Jan 04-08, 2021)

– Presentations (seven), International Workshop, Semantic Techniques and Technologies for Data and Knowledge Representation (SemTech2020), Bangalore (Virtual) (Feb 22 – 26, 2021)

BOBY JOHN, SQC & OR Unit, Bangalore

– Invited lecture, Data Handling using R, Faculty Development Program on Data Science, Hindustan College of Engineering & Technology, Coimbatore (Nov 04, 2020)

– Invited lecture, Support Vector Machines, Faculty Development Program on Machine Learning, RMK College of Engineering & Technology, Coimbatore (Dec 09, 2020)

– Invited lecture, Unsupervised Learning Techniques, Two-Day National Conference on Theoretical and Applied Statistics, Kristu Jayanti College, Bangalore (Feb 10, 2021)

– Invited lecture, Exploratory Data Analysis, Faculty Development Program on Data Science, Institute of Aeronautical Engineering, Hyderabad (Feb 17, 2021)

B.V. RAJARAMA BHAT, Stat-Math Unit, BANGALORE

– PhD Thesis Evaluation and Viva, NISER, Bhubaneswar (Virtual)(Jun, 2020)

– PhD Thesis Evaluation, CMI, Chennai (Virtual) (Jul, 2020)

– Invited lecture, Conference, Entangling Non Commutative Functional Analysis and Geometry of Banach Space, CIRM, Marseille, France (Virtual) (Oct 12-16, 2020)

– UGC-SAP Meeting, Alagappa University (Virtual) (Nov 4, 2020)

– Invited lecture, Ashoka University (Virtual) (Nov 17, 2020)

- Faculty Selection Committee Member, IIIT, Delhi (Virtual) (Nov 25, 2020)
- PAC Meeting, SERB, New Delhi (Virtual) (Dec 10-11, 2020)
- Invited lecture, Kerala School of Math. Calicut (Virtual) (Dec 18-22, 2020)
- Faculty Selection Committee Meeting, IISER, Pune (Virtual) (Feb 08, 2021)
- UGC-SAP Meeting, Alagappa University (Virtual) (Feb 12, 2021)
- Invited lecture, 41st International conference on Quantum Probability and Related Topics, United Arab Emirates University, UAE (Virtual) (Mar 28 - Apr 01, 2021)

CHAITI SHARMA BISWAS, ERU, Kolkata

- Paper presentation, Conference on Intercontinental Meet on Gender and Sexuality Studies, ERU, Indian Statistical Institute, Kolkata (Virtual) (Sep 05, 2020)

DEBASIS MISHRA, EPU, Delhi

- Research Seminar, Pennsylvania State University, USA (Virtual) (May 15 2020)
- Research Seminar, Stony Brook University, USA (Virtual) (Oct 05, 2020)
- Research Seminar, University of Toronto, USA(Virtual) (Oct 06, 2020)
- Research Seminar, University of Michigan, USA (Virtual) (Oct 16, 2020)

DEBDULAL DUTTA ROY, PRU, Kolkata

- Invited lecture, International Peace & Rabindrik Psychotherapy, MAGEZI, First Digital International Research Conference, Greece (Jun 28-29, 2020)
- Invited lecture, 'Psychometrics in India' used, disused and misused, Bangladesh Psychometric Society(BPS) (Jul 11, 2020)
- Invited lecture, Life Skills: Self-awareness and empathy for personal development, Directorate of School Education, Govt. of Mizoram (Aug 18-19, 2020)
- Invited Keynote Speech, Behaviour therapy, Provat Kumar College, Contai (Aug 19, 2020)
- Invited lecture, Effects of Tagore music composition on rehabilitation of persons with Disabilities, Training programme on Music therapy for children with disabilities, National Institute the Empowerment of persons with intellectual disabilities under Ministry of Social Justice and Empowerment, Govt of India (Jan 11-12, 2021)
- Invited, Conduct Training, Quantitative Methods in Psychology, Center of Phenomenology & Cognitive Science, Punjab University, Chandigarh (Jan 27, 2021)

DHURJATI PRASAD SENGUPTA, GSU, Kolkata

- Delivered lecture, vertebrate palaeontology and evolution in the programme "Fundamentals of Palaeontology" (for Professionals/Research Scholars/PG & Post PG Students belonging to SC & ST category), Geological Survey of India, Regional Training Division, Eastern Region, Kolkata (Virtual) (Sep 10-12, 2020)

DILIP SAHA, GSU, Kolkata

- E-Lecture Series, Refresher Course in Metamorphic Petrology, Geological Survey of India Training Institute, Hyderabad (Sep 19, 2020)
- E-Lecture Series, Refresher Course in Characterization of Shear Zones, Geological Survey of India, Training Institute, Eastern Region, Kolkata (Sep 28, 2020)

DIPTI PRASAD MUKHERJEE, ECSU, Kolkata

- Invited Speaker, Machine Learning Applications, ATAL Faculty Development Programme, KIIT, Bhubaneswar (Virtual) (Oct, 2020)
- Invited Speaker, Recent Advancements in Machine Learning, Faculty Development Programme at SRM University AP (Virtual) (Nov 02, 2020)
- Keynote lecture, CSI Regional Student Convention, Assam University, Silchar (Virtual) (Dec 04, 2020)

E. V. GIJO, SQC & OR Unit, Bangalore

- Invited lecture, Research Methodology and Data Analysis, Karnataka Science and Technology Academy, Bangalore (Jun 18, 2020)
- Invited lecture, National level web based Seminar, Recent Trends in Statistical Theory and Applications (NSSTA 2020), University of Kerala (Jun 29–Jul 01, 2020)
- Invited lecture, Statistics for Business and Industry, Baselious College, Kottayam (Oct 12, 2020)
- Invited lecture (on World Statistics Day), St. Peters College, Kolenchery, Kerala (Oct 20, 2020)

- Paper presentation, Sixth International Conference, Statistics for Twenty-first Century-2020 (ICSTC-2020), Department of Statistics, University of Kerala in association with American Statistical Association (ASA) and Kerala Statistical Association (KSA), Trivandrum (Dec 16-19, 2020)
- Invited lecture, National Webinar Series, Introduction to Statistical Science and its Applications, Vimala College, Thrissur, Kerala (Dec 29-31, 2020)

FARZANA AFRIDI, EPU, Delhi

- Invitation for Lectures/Pannels, Prof. K. Vasanthi Devi Endowment Lecture (Ethiraj College for Women, Chennai), Keynote "Women's work, production technology and the environment" (EfD Annual conference); NCAER-CSF panel on "Private schooling in India"; IGC Panel on "Covid-19 and informal employment in India" (co-panelists Jean Dreze and Purnima Menon) (2020)
- Invited seminar/ conference, Centre for the Advanced Study of India (CASI), EfD annual conference, NUS (econ), UPenn, UT-Austin (econ) (2020)
- Invitation for Lectures/Pannels, Accelerating gender equality in India post Covid (LSE Festival), Women's labor force participation: Research and policy priorities (IWWAGE-ISI workshop); State of Working India' Report release; IGC-India (Covid-19 Impact and Pathways to Recovery), Azim Premji University (2021)
- Invited seminar/ conference, STEG-CEPR Annual Conference, IIM-Lucknow, Annual Economics Conference, SMU-NUS Development Economics workshop, HKUST (econ), Ahmedabad University (2021)

G. RAVINDRAN, SQC & OR Unit, Chennai

- Delivered Lecture, Phaffians and Bimatrix Games, Optimization Seminar Series, Department of Mathematics, UMBC, USA (Virtual) (Jul 09, 2020)
- Symposium Coordinator & Delivered Invited lecture, Completely Mixed Bimatrix Games, 28th International Conference'FIM28: SCMSPS 2020' and Session Chair, Game Theory, Stella Maris College & Sivasubramaniya Nadar College of Engineering (Virtual) (Nov 23-27, 2020)

GURUPRASAD KAR, PAMU, Kolkata

- Invited lecture, Symposium, Quantum information and Computation (QUANTUM TALKS), IIIT, Hyderabad (Virtual) (Jun 29 -Jul 03, 2020)
- Invited lecture, Webinar, Harnessing Quantum Weirdness: Towards New-Age Technologies, Sushil Kar College, West Bengal (Sep 26, 2020)
- Invited lecture, Quantum Foundations, Technologies and Applications (QFTA-2020), IISER, Mohali (Virtual) (Dec 04-09, 2020)
- Invited lecture, Webinar series, Diving Deep into Physics – 2021, IIT, Jodhpur (Feb 07-13, 2021)
- Invited lecture, Refresher Course in Mathematical Science for college and university teachers, UGC-Human Resource Development Centre (HRDC), University of Calcutta (Mar 15 – 27, 2021)

HARI CHARAN BEHERA, SRU, Giridih

- Reviewer, Factors affecting the Management of Public Agricultural land fund in Gia Lam District, Hanoi City, Vietnam, Land Use Policy, Elsevier (2020)
- Reviewer, The Effect of Uncertainty on the Formulation of Strategies: A Study of Selected Indian Organizations, S N Business and Economics, Springer (2020)
- Resource Person, Gandhian Approach to community Development and Its contemporary Relevance, International Webinar on Gandhian Thoughts in Human Welfare, Department of Anthropology, University of Delhi, Delhi (Aug 25, 2020)
- Resource Person, Strategies for development of Particularly Vulnerable Tribal Groups (PVTGs) in Scheduled areas, Livelihood challenges and opportunities among the PVTGs of Odisha and Jharkhand, National Institute of Rural Development & Panchayati Raj (NIRD&PR), Ministry of Rural Development, Government of India (Virtual)(Sep 02, 2020)
- Resource Person, Training Programme, Strategies for Development of Particularly 7 Vulnerable Tribal Groups (PVTGs) in Scheduled areas, Ownership and subsistence land use practices among PVTGs, National Institute of Rural Development & Panchayati Raj (NIRD&PR), Ministry of Rural Development, Government of India (Nov 12, 2020)
- Resource Person, E-Training programme on Indigenous knowledge system sharing and capacity building of rural/tribal development professionals, Traditional agriculture and indigenous knowledge system with special reference to tribes of Odisha, National Institute of Rural Development & Panchayati Raj (NIRD&PR), Ministry of Rural Development, Government of India (Mar 22, 2021)
- Reviewer, Impact of urbanization on land complaints in Vinh city, Nghe An Province, Land Use Policy, Elsevier (2021)
- Reviewer, Factors Affecting Community-Based Forest Land Management in Muong Communities, Hoa Binh Province, Vietnam, Land Use Policy, Elsevier (2021)
- Contributed, Unit 10 Market Economy, Agrarian Crises and Migration Crisis and Migration, IGNOU, http://www.egyankosh.ac.in/bitstream /123456789/71409/1/Unit-10.pdf (2021)

ISHA DEWAN, Stat-Math Unit, Delhi

- Arranged a session, Inference on Quantiles, Nonparametric estimation of quantile function for associated sequences, International Society for Business and Industrial Statistics, Cochin (Dec 28-30, 2020)
- Invited Lecture, Estimation of quantile function for associated random variables, Aloke Dey Memorials Session, Visionary Innovations in Statistical Theory and Applications (VISTA-2021) (Feb 25-27, 2021)

KANISHKA KACKER, EPU, Delhi

- Conference, Association of Environmental and Resource Economics 2020 (Virtual) (Jun 04, 2020)
- Western Economic Association International 95th Annual Conference (Virtual) (Jun 29, 2020)
- Seminar, Applied Microeconomics Virtual Assembly and Discussion (Virtual) (Oct 17, 2020)
- Conference, 2nd Population, Poverty and Inequality Research, (Virtual) (Dec 09, 2020)
- "Social Transfers and the Labor Supply Response: Revisiting the South African Old Age Pension"
- "Measuring the Impact of Coal Fired Power Plants on Ambient PM2.5"

KINGSHOOK BISWAS, Stat-Math Unit, Kolkata

- Invited lecture, Symposium on Mathematics and Computer Science, Indian Association for Cultivation of Sciences (Mar 18, 2021)
- Invited lecture, Mathematics Symposium, IISER, Bhopal (Mar 25-26, 2021)

KISHOR CHANDRA SATPATHY, Library, Kolkata

- Delivered Lecture, Webinar, How to use ProQuest during Lockdown, ProQuest (May 09, 2020)
- Delivered Lecture, Disaster Management in Libraries, 8th Webinar,, Information generation, dissemination and use during Covid-19 lockdown, Department of Library & Information Science, Punjab University (May 18, 2020)
- Delivered Lecture, International Webinar, Covid-19 as an opportunity from crisis management to future-proofing Library, ProQuest (May 21, 2020)
- Delivered Lecture, Webinar, Information Dissemination During and After Covid-19 Pandemic: A case study of Indian Statistical Institute, Information Dissemination During and After Covid-19 Pandemic: Perspective from India and Sri Lanka, Sir Guru Gobind Singh College (Jun 04, 2020)
- Delivered Lecture, Modern Transition & Library Spaces, Odisha Library Academy, Bhubaneshwar (Jul 04, 2020)
- Delivered Lecture, Panel Discussion, Views of Librarians on Print Journals Vs. Online Journals, Print books Vs E-books, Asiatic Society Kolkata (Jul 23, 2020)
- Delivered Lecture, Webinar, Role of Digital Library in Research, Role of Digital Library and Its impact on Professional & Researchers during Covid-19, McGraw Hill Publishing & Resource Update (Jul 25, 2020)
- Delivered Lecture (Guest of Honor), International Webinar, Resurgence - The Return of Audience to Museums, KCC, Kolkata & ICOM (Jul 25, 2020)
- Chaired a session and Delivered Lecture, Public Library Development in Madhya Pradesh, International Seminar, Visualising the changes in Public Library System: Issues and Challenges after the lockdown, Department of Library and Information Science, Maharaja Bir Bikram University in collaboration with Department of Library and Information Science Tripura University, Tripura (Virtual) (Aug 06, 2020)
- Delivered Lecture, Different Variants of Five Laws of Library Science, Webinar, Research Methodology and Emerging Technologies in Managing Libraries, Online Teaching Learning and Research, Department of Library and Information Science, Rabindra Library, Assam University, Silchar (Aug 08-14, 2020)
- Delivered Lecture, Webinar, Relevance Ranganathan's 5 Laws in Modern Context, National Librarian's Day-2020, SVKM'S NMIMS, Shirpur Campus Maharashtra (Aug 12, 2020)
- Delivered Lecture, Impact factor, h-index i10-index and Scopus citation index: Google scholar citations and Searching Open Access Journal in different disciplines, National Workshop, Improving Scientific Research Writing and Publication Skill, Research and Publication Cell, IQAC, S.S College, Hailakandi, Assam and Indian Council of Social Science Research, Shillong (Oct 12, 2020)
- Delivered Lecture, Associate's Program of Mortenson Center for International Library Programs, UIUC, USA (Oct 13, 2020)
- Delivered Lecture, Webinar, How to preserve Library Material during pandemic situation, DLIS & Central Library, Jadavpur University (Oct 16, 2020)
- Delivered Lecture, National Level Webinar, Library Services for all in the Digital Era: Post-Lockdown-Scenario, Government College of Engineering & Textile Technology, Berhampore (Oct 20, 2020)
- Delivered Lecture, Role and Response of Library & Information Centers in COVID Pandemic: A case Study of SAARC Libraries, School of Information Science, Dr. B.R Ambedkar University of Social Sciences, Mhow, MP, (Oct 28, 2020)

- Panelist, 25Th MPLA Webinar, One nation One Subscription, MPLA (Oct 30, 2020)
- Delivered Lecture, Training Programme, Human Resource Development in Libraries, Mahatma Gandhi State Institute of Public Administration, Punjab (Virtual) (Dec 11, 2020)
- Chaired a session, Information Technology and Libraries in International Conference, Digital Convergence and Innovation in Library Services, Chandigarh Librarians Association in Collaboration with Post Graduate Government College for Girls, Chandigarh and Goswami Ganesh Dutta Sanatan Dharma College, Chandigarh (Dec 12, 2020)
- Showcased, ISI Publications, Mega Science Technology and Industry Expo-the Largest Virtual Science Expo, India International Science Festival, (Dec 22-25, 2020)
- Resource Person, 7th Refresher Course, Library & Information Science, and Delivered Lecture, Innovative Library Space, UGC-Human Resource Development Centre, Gauhati University (Dec 28, 2020)
- Delivered Lecture, Effective Exploration of Online Resources, Webinar, Effective exploration of online resources and knowledge management, Budge Budge Institute of Technology, Jagannath Gupta Institute of Medical Sciences and Hospital and Jagannath Gupta Institute of Nursing Sciences (Jan 20, 2021)
- Delivered Lecture, MOOCs, UGC-HRDC Inter/Multidisplinay Refresher Course, Jadavpur University (Feb 27, 2021)
- Delivered Lecture, UGC-HRDC Inter/ Multidisplinay Refresher Course, Advances in Digital Education, University of Calcutta (Mar 15, 2021)
- Chaired a session, National Level Webinar, Virtual Teaching/ Learning process focusing on open-source, Digital Library and Content Development, Rabindrik Psychotherapy Research Institute Trust, Kolkata (Mar 21, 2021)

KUNTAL GHOSH, MIU, Kolkata

- Invited lecture, Brahmananda Kesabchandra College (Sep 05, 2020)
- Invited lecture, CDAC Kolkata (Nov 23, 2020)
- Invited lecture, Gauhati University (Feb 18, 2021)

M. KRISHNAMURTHY, DRTC, Bangalore

- Faculty Development Program, E-Learning: a multi campus community of Practice, Jindal First Grade College for Women (Virtual) (May 11-12, 2020)
- Workshop, Open Access Publishing, Dayanand Sagar University, School of Engineering and Management, Bangalore (Aug 05-06, 2020)
- Delivered lecture, Digital Library and Universal Access of Information, Department of Library and Information Science, Bangalore University (Aug 08, 2020)
- Delivered lecture, Changing and Expanding Libraries in the context of S R Ranganathan View (on the occasion of 128th Birthday of SR Ranganathan), Bangalore North University, Kolar, Karnataka (Aug 24, 2020)
- Delivered lecture, Ethics: An Overview, PES Diploma College, Bangalore (Sep 10, 2020)
- Delivered lecture, E-Resources and Publishing, Ten Day Faculty Development Program, Braine University, Kolkata (Virtual) (Dec 06, 2020)

MADHURA SWAMINATHAN, EAU, Bangalore

- Delivered lecture (Suseela Gopalan Memorial), Crisis of Employment among Rural Women, New Delhi (Dec 19, 2020)

MANDAR MITRA, CVPRU, Kolkata

- Lectures, Information Retrieval ACM Winter School for Women in Natural Language Processing (Jan 07, 2021)

MATHEW C. FRANCIS, CSU, Chennai

- Doctoral Committee Member, (i) for three students in IIT, Palakkad (Since Jul 2018) and (ii) one student in IIT, Dharwad (Since Jul 2020)

MONALI MITRA PALADHI, Library, Kolkata

- Moderated, Webinar, Introduction to RFID Technology & Integration with ILMS, RapidRadio Solutions Private Limited and Library, Documentation and Information Science Division, ISI, Kolkata and (May 19, 2020)
- Coordinated, Webinar, IEEE Xplore: Search vs. Research, IEEE and Central Library, ISI, Kolkata (Jul 14, 2020)
- Resource Person, Webinar, Event Management for Libraries: The Essentials, the Society for the Advancement of Library and Information Science (SALIS) (Aug 29, 2020)
- Completed, Web of Science Certification program 2020(Certificate ID No. 70708931 29 and 7073114767), Basic series and Advance series (Sep 07 and Oct 01, 2020)

- Resource Person, International Webinar, Preparing libraries for the new normal situation, Department of Central Library, Pingla Thana Mahavidyalaya (Sep 18, 2020)
- Resource Person, 3 Months Online Short-Term Certificate Course, Museum, Heritage and Conservation, from September 2020 and Delivered Lecture, Archives and Archival Record Management, Paschimbanga Sangrahalaya Samity (Oct 03, 2020)
- 5-Week Online Course, Research Data Management and Sharing, The University of North Carolina at Chapel Hill and The University of Edinburgh and offered through Coursera (Oct 08, 2020)
- Chaired, SALIS 2020: International Virtual Conference, Challenges and Opportunities to Libraries and LIS Professionals in the Changing Global Scenario (Dec 28-30, 2020)

NABANITA DAS, ACMU, Kolkata

- Delivered lecture, Faculty Development Program on Internet of Things, St. Thomas Engineering College, Kolkata (Dec 01-05, 2020)
- Delivered lecture, Interdisciplinary Refresher course on Engineering and Technology, UGC and Mizoram University (Dec 01-14, 2020)
- Examined PhD theses of (i) IIT, BHU (Oct 2020- Feb 2021), (ii) NIT, Patna (Jan 2020 - Mar 2021) & (iii) JNU, Delhi (Jun - Sep 2020)

NILADRI SEKHAR DASH, LRU, Kolkata

- Course Content Writer, LT Course, New Syllabus for PGELT, School of Humanities, Netaji Subhas Open University (NSOU), Kolkata (Jul 2019-Jun 2021)
- Course Content Writer, Polygenetic Theories of Folklore, Concepts of Evolution and Devolution, MA in Folklore & Culture Studies, IGNOU, New Delhi (Apr-Jun, 2021)
- Developing Syllabus, PG Certificate Course in Corpus Linguistics for Language Technology, Department of Linguistics, Bharathiar University, Coimbatore, Tamil Nadu (Apr –Jul, 2020)
- Webinar Plenary Lecture, International Webinar on E-Workshop on EduTech in Classroom, CAS in Linguistics, Annamalai University, Tamil Nadu (Jun 08, 2020)
- Webinar Plenary Lecture, International Webinar (Lecture Series) on Linguistics, Dept. of Linguistics, Banaras Hindu University, Varanasi (Jun 13, 2020)
- Webinar Plenary Lecture, Webinar of 5-days Faculty Development Programme on Looking Beyond the Boundary: Practices in Literature and Language Studies, Amity Institute of English Studies and Research, Amity University, Kolkata (Jul 01, 2020)
- Webinar Plenary Lecture International Webinar on Online Field Methods, Linguistic Empowerment Cell, School of Language, Literature and Culture Studies, Jawaharlal Nehru University, New Delhi (Jul 11, 2020)
- Webinar Plenary Lecture, 7-day Online International Workshop on Text and Music Digitization, Rabindra Mahavidyalaya, Chanpadanga, Hooghly (Jul 14, 2020)
- Webinar Plenary Lecture, 7-day online Faculty Development Programme on Contemporary research methods in Linguistics and Literature: Sampling and Analytical Methods of Scientific Perspective, Dept. of Linguistics, Bharathiar University, Coimbatore (Jul 16, 2020)
- Webinar Plenary Lecture, The 44th Faculty Induction Programme, UGC-Human Resource Development Centre, Punjabi University, Patiala, Punjab (Aug 10, 2020)
- Webinar Plenary Lecture, The 84th Refresher Course in Information Communication Technology (ICT) UGC-Human Resource Development Centre, Punjabi University, Patiala, Punjab (Aug 12, 2020)
- Webinar Plenary Lecture, Web-Talk Series on Linguistics, Department of Linguistics, Aligarh Muslim University, Aligarh, UP (Sep 29, 2020)
- Webinar Plenary Lecture, Webinar Series on Amalgamation of Man, Machine and Language in Contemporary Translation Activities: Approaches on Bilingual and Multilingual Perspectives, Department of Linguistics, Bharathiar University, Coimbatore, Tamil Nadu (Sep 29, 2020)
- Webinar Plenary Lecture, Webinar Series on Linguistics and Culture, Dept. of Linguistics, Central University, Kasargod, Kerala (Oct 27, 2020)
- Session Chair, (Day 3, Session 12A), 42 International Conference of the Linguistic Society of India (ICOLSI-42), GLA University, Mathura (Dec 12, 2020)
- Webinar Plenary Lecture, Odia Language and Technology on the 12th Edition of Bande Utkala Janani: A Way towards National Integration, organized by Sarala Language Literature and Indigenous Research Foundation, Odisha (Dec 13, 2020)
- Webinar Plenary Lecture, Online Refresher Course in Computational Social Sciences, UGC-HRDC, Osmania University, Hyderabad (Dec 17, 2020)

- Webinar Plenary Lecture, 1st International Research Symposium Contextualizing Research in Challenging Times, TESOL (Teaching English to Speakers of Other Languages) Society of Bangladesh (Virtual) (Dec 18, 2020)
- Webinar Plenary Lecture, Week-long skill-oriented training programme, Techniques and Strategies of Documenting Tribal Languages: Skill Oriented Training for Students of Linguistics, Department of Linguistics, Bharathiar University, Coimbatore, Tamil Nadu (Jan 20, 2021)
- Webinar Plenary Lecture, UGC-Refresher Course for Linguistics, HRDC, Ranchi University, Jharkhand (Feb 12-13, 2021)
- Webinar Plenary Lecture, Monthly Lecture Series, Folklore Foundation, Odisha (Mar 21, 2021)

PARTHA SARATHI MUKHERJEE, ISRU, Kolkata

- Member, 2020 Wilcoxon and Youden Prize Committee for the journal Technometrics, (Mar-Jun, 2021)

PARTHASARATHI GHOSH, GSU, Kolkata

- Taught, one module (GIS-RS), coursework of research fellows (Jun 03 – Nov 15, 2020)

RITUPARNA SEN, ASU, Bangalore

- Delivered Lecture, Shri Madhwa Vadiraja Institute of Technology and Management, Virtual (Dec 12, 2020)
- Paper presentation, International Virtual Conference on Advanced Statistical Techniques in Business and Industry, Virtual (Dec 28-30, 2020)
- Paper presentation, Annual meeting of Society of Statistics, Computer and Applications, Virtual (Feb 24-28, 2021)
- Member, Tinbergen Award Committee, International Statistical Institute (2021)

S.M. SUBHANI, SQC & OR Unit, Hyderabad

- Appointed, Editor of the course "Design of Experiments" (3rd year UG course) and 'Book chapter' & 'Laboratory manual' of 'Design of Experiments', Dr. B R Ambedkar Open University (Dec, 2020)

SABYASACHI KARATI, CSRU, Kolkata

- Program Committee Member, The 14th International Conference on Provable and Practical Security - ProvSec (2020)

SAMIR KUMAR NEOGY, SQC & OR Unit, Delhi

- Delivered two invited Lectures, Lemke's Algorithm in Convex Optimization and Karmarkar's Algorithm and Its Various Extensions Revisited, Workshop on Recent Trends in Convex Optimization: Theory, Algorithms and Applications (RTCOTAA-2020), Indian Institute of Technology Patna, Department of Mathematics (Virtual) (Oct 29-31, 2020)
- Delivered invited Lectures, Stochastic Games and Semi-Markov Games and Degree Theory in Linear Complementarity problem, in the Refresher course in applied mathematics and statistics, HRDC centre of Devi Ahilya University, MP (Virtual) (Nov 29, 2020)
- Delivered invited Lecture, Charecterizations of Special Matrix Classes using Degree Theory International Conference on Applied Linear Algebra, Probability and Statistics (ALAPS 2020) (in honour of Prof. C. R. Rao), CARAMS, Manipal Academy of Higher Education, Manipal, Karnataka (Virtual) (Dec 17-18, 2020)
- Delivered invited Lecture, Linear Complementarity Problem: A Framework and State-of-the-Art Survey, National Symposium on Mathematics and Applications (NSMA 2020) (Commemorating Srinivasa Ramanujan's Birthday), IIT, Madras (Virtual) (Dec 22, 2020)
- Delivered plenary Lecture, Max Plus Algebra and its application in Optimization Problem & Game Theory, International Conference on Soft Computing, Optimization Theory and Applications, Birla Institute of Technology, Mesra, Ranchi (Virtual) (Mar 26-27, 2021)

SANDIP DE, Library, Kolkata

- Coordinated and Participated, Exhibition of Fifteen Board Materials, The Glimpses of life and works of Prasanta Chandra Mahalanobis, the great founder of the Institute, India International Science Festival, 2020 (Virtual) (Dec 22-25, 2020)

SANKAR KUMAR PAL, CSCR, Kolkata

- Inaugural Lecture, International Webinar Series, Machine Intelligence, MIR Lab (Jul 20, 2020)
- Special Public Lecture, Webinars, The National Academy of Sciences India (NASI), Delhi Chapter and MHRD, Institution Innovation Council, Deen Dayal Upadhyaya College, University of Delhi, Golden Jubilee Celebration of DST, Govt. of India (Sep 26, 2020)
- Keynote Address, SoCProS 2020: International Conference, Soft Computing for Problem Solving, IIT, Indore (Dec 18, 2020)
- Keynote Lecture, SoCTA 2020: 5th International Conference, Soft Computing: Theories and Applications, Dedicated to Covid-19 Warriors (Dec 25-27, 2020)

- Plenary Lecture, International Conference, Rough set theory and Mathematical Applications (ICRSMA2021), SSN College of Engineering, Chennai (Jan 08-09, 2021)
- Keynote Lecture (Chief Guest), First live event of the Artificial Intelligence and Machine Learning Club (AIML C), IIT, Delhi (Feb 01, 2021)
- National Science Day Lecture, NIT, Sikkim (Feb 28, 2021)
- Chief Guest Speech, Students' Research Convention (SRC), IIT, Kanpur (Mar 27, 2021)
- Distinguished Lecture, Central South University, Changsha, Hunan, China (Mar 31, 2021)

SANGHAMITRA BANDYOPADHYAY, MIU, Kolkata

- Fireside Chat, Women in Data Science (WiDS) Conference, Intuit, Bangalore (Jul, 2020)
- Special Lecture, Building Institutions for Research Excellence: Gender Diversity and Beyond, MHRD-LEAP Initiative, IIT, Kanpur, held at New Delhi (Feb 24, 2021)
- Address as Sectional President (Physical Sciences), Interface between Computer Science and Biology: A Symbiotic Relationship, National Academy of Sciences India (NASI) (Feb 26, 2021)
- Plenary Lecture, Machine Learning in Computational Biology - Three Problems from Three Perspectives, UK-India Royal Society Yusuf Hamied Workshop (Mar 04, 2021)

SARBANI PALIT, CVPRU, Kolkata

- Delivered lecture, National Webinar Series, Some current issues and techniques on restoration of degraded images, Computer Science Department, Behala Science College (Aug 20, 2020)

SAROJ K. MEHER, SSIU, Bangalore

- Session Chair, IEEE Conecct – 2020, Bangalore (Jul 02-04, 2020)
- Session Chair, InGARSSS Conference – 2020, Ahmedabad (Virtual) (Dec 02-05, 2020)

SAURABH GHOSH, HGU, KOLKATA

- Chair, Special session, COVID-19 and SARS-CoV-2, International Genetic Epidemiology Society Meeting (Virtual) (Jul 01-03, 2020)
- Research Collaboration visit, NIMHANS, Bangalore (Mar 23-24, 2021)

SOUMYANETRA MUNSHI, ERU, Kolkata

- Paper presented, 4th International Conference on The Political Economy of Democracy and Dictatorship, Münster, Germany (Virtual) (Feb 27-29, 2021)
- Referee, Arthaniti- Journal of Economic Theory and Practice (2020)
- Article "Dancing on the Heads of Snakes: A Glimpse into Yemen" in Countercurrents. Link: https://countercurrents.org/2020/12/dancing-on-the-heads-of-snakes-a-glimpse-into-yemen/ (Dec 24, 2020)
- Podcast on the economics related to arranged marriage, education and dowry has been released on Spotify and other major podcast platforms by Economics Society, Hindu College, University of Delhi (Jan 21, 2021)

SUJATA GHOSH, CSU, Chennai

- Member, E.W. Beth Dissertation Prize Committee (2020)
- Oral Presentation, Tsinghua Logic Online Seminar, Tsinghua University, China (Virtual) (Apr 08, 2020)
- Program Committee Member, Fifth Asian Workshop on Philosophical Logic, Hangzhou, China, (Virtual) (Oct 26, 28 and Nov 02, 2020)
- Oral Presentation, Strategies for Uncertainty, FSTTCS 2020 pre-conference workshop, (Virtual) (Dec 13-14, 2020)
- Oral Presentation, "RELAX" Workshop on Games, Chennai Mathematical Institute, (Virtual) (Feb 01-04, 2021)
- Doctoral Committee Member, for one student in Institute of Mathematical Sciences, Chennai (Jan 2018 onwards)

SUPRATIK PAL, PAMU, Kolkata

- Invited lecture, National Webinar, Specialized topics in Physics, AKPC Mahavidyalaya & APC College, West Bengal (Jul 27, 2020)
- Invited lecture, International Webinar, Basic and Advanced Physics, Bankura University, West Bengal (Aug 24-27, 2020)
- Session Chair, International Workshop, Physics of the Early Universe - An Online Precursor, ICTS- TIFR, Bangalore (Virtual) (Aug 31 – Sep 03, 2020)
- Invited lecture, Webinar, Jadavpur University, Kolkata (Sep 08, 2020)
- Invited Lecture, Webinar, Pabna University of Science and Technology, Bangladesh (Sep 23, 2020)

- Invited Lecture, International Web Conference, Mathematical Methods and Models in Applied Sciences, Amity University, Kolkata and Calcutta Mathematical Society (Nov 06-08, 2020)
- Session Chair, International Workshop, Less Travelled Path of Dark Matter: Axions and Primordial Black Holes, ICTS-TIFR, Bangalore (Virtual) (Nov 09-13, 2020)
- External Expert, Postdoctoral Fellow Selection Committee, Indian Association for the Cultivation of Science, Kolkata (2020-21)
- External Expert, Postdoctoral Fellow Selection Committee, S.N Bose National Centre for Basic Sciences, Kolkata (2020-21)
- External Expert Committee Member, MSc/PhD thesis and viva-voce, Central University of Himachal Pradesh (2020-till date)

SUSMITA SUR KOLAY, ACMU, Kolkata

- Delivered lecture and conducted evaluation, Faculty Development Programme on Internet of Things (IoT), St. Thomas' College of Engineering and Technology, Kolkata (Dec 01-05, 2020)
- Lecture session, Data Privacy issues with Medical wearables and AI/ML Solutions, TCS Analytics and Insights (Dec 17, 2020)
- Faculty Selection Committee, Dept. of Mathematics and Computer Science, Mizoram University (Mar 09, 2021)
- Faculty Promotion Committee, Dept. of Mathematics and Computer Science, Mizoram University (Mar 09, 2021)
- Examiner, Ph.D Theses from (i) IIT, Kharagpur & (ii) University of Melbourne, Australia

SUSOVANA CHATTERJEE, Library, Kolkata

- Coordinated and Participated, Exhibition of Fifteen Board Materials, The Glimpses of life and works of Prasanta Chandra Mahalanobis, the great founder of the Institute, India International Science Festival, 2020 (Virtual) (Dec 22-25, 2020)

SWAGATA NANDI, Stat-Math Unit, Delhi

- Organizer, Special Invited Session, Statistical Signal Processing and Time Series and Invited Speaker, Random Amplitude Chirp Model, Conference on Statistical Techniques in Business and Industry, A regional conference of International Society for Business and Industrial Statistics (Virtual) (Dec 28-30, 2020)
- Invited Speaker, Estimating nearly periodic signals, Annual Conference 2020-21, Indian Women and Mathematics (Virtual)(Mar 27-28, 2021)

SWAGATAM DAS, ECSU, Kolkata

- Keynote lecture, 1st Congress on Intelligent Systems (CIS 2020), World Conference in Virtual Format, Soft Computing Research Society, India (Sep 05-06, 2020)
- Invited Speaker, Artificial Intelligence & Machine Learning, SRM IST, Delhi-NCR Campus, Ghaziabad ATAL FDP (Oct 19 – 23, 2020)
- Keynote Lecture, 2nd International Conference on Frontiers of Mathematics and Artificial Intelligence (CFMAI 2020), Kuala Lumpur, Malaysia(Virtual) (Nov 20 - 22, 2020)
- Invited Speaker, Emerging Research Trends in Computational Intelligence – Theory and Applications, IEEE Computational Intelligence Society (CIS) Summer School, IIT, Indore (Virtual) (Nov 26-29, 2020)
- Keynote Lecture, 14th International Symposium on Intelligent Systems (INTELS'20), Moscow, Russia (Dec 14 – 16, 2020)
- Invited Speaker, Second International Conference, Sustainable and Innovative Solutions for Current Challenges in Engineering & Technology (ICSISCET-2020), MITS Gwalior (Dec 18-19, 2020)
- Keynote Lecture, 10th International Conference, Soft Computing for Problem Solving (SoCProS 2020), IIT, Indore (Dec 18 – 20, 2020)
- Invited Speaker, AICTE Sponsored FDP, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar (Jan 21 – 25, 2021)
- Keynote Address, webinar on "The Career Opportunities in Decision Sciences and Statistical Mathematics", by Mathematics Division, Chandigarh University, India.

T. KARTHICK, CSU, Chennai

- Doctoral Committee Member, (i) one student in VIT University, Chennai (Mar 2018 onwards) and (ii) three students in SRM University, Chennai (Mar 2021 onwards)

TANVI JAIN, Stat-Math Unit, Delhi

- Webinar, Open Book Examination: Challenges and Opportunities to the college students and teacher, Dr. Bhim Rao Ambedkar College, University of Delhi (Jun 02, 2020)
- STC, Matrix Analysis and its Applications, NIT, Jalandhar (Sep 23-27, 2020)

TAPAN CHAKRABORTY, GSU, Kolkata

- Delivered lecture, Geology of South East Asia, China Geological Survey & Qingdao National Laboratory of Marine Sciences, (Virtual) (Jul 31, 2020)

TAPAN KUMAR MANDAL, Library, Kolkata

- Delivered Lecture, State Level Webinar, Managing e-resources through off-campus: challenges and issues, Central Library, Prabhu Jagatbandhu College, Jhorehat, Andul-Mouri, Howrah (Jul 24, 2020)
- Delivered Lecture, Webinar, MOOC: Online Teaching, Learning and Evaluation-content Creation, Organization and Management, INFOLIB ACADEMIA in collaboration with Bhairab Ganguly College, Belghoria (Aug 24, 2020)
- Delivered Lecture, Webinar, E-content creation, Organization and Management: Challenges and Ways, INFOLIB ACADEMIA in collaboration with Bhairab Ganguly College, Belghoria (Aug 29, 2020)

TAPAS BASU, Library, Kolkata

- Delivered Lecture, Digital photo editing, Entrepreneurship Skill Development Programme on Photography, MSME Development Institute, Govt. of India (Mar 12, 15, 17 & 19, 2021)

TRIDIP RAY, EPU, Delhi

- Invited seminar presentation, Presidency University, Kolkata(Virtual) (Oct 16, 2020)
- Meeting, Advisory Committee, Department of Educational Finance, National Institute of Educational Planning and Administration (NIEPA), New Delhi (Virtual) (Mar 03, 2021)
- Keynote address, Research Scholars' Workshop on Institutions and Development, Department of Economics, University of Calcutta (Virtual) (Mar 25-26, 2021)

UJJWAL BHATTACHARYA, CVPRU, Kolkata

- Delivered lecture (as an Expert), Machine Learning in Multimedia Applications, AICTE Sponsored 6-Days STTP entitled "Machine Learning, Pattern Recognition and Their Applications" (Phase-I), Department of Information Technology, St. Thomas' College of Engineering & Technology, Kolkata (Virtual) (Nov 02-07, 2020)
- Delivered lecture (as an Expert), Machine Learning in Multimedia Applications, AICTE Sponsored 6-Days STTP entitled "Machine Learning, Pattern Recognition and Their Applications" (Phase-II), Department of Information Technology, St. Thomas' College of Engineering & Technology, Kolkata, West Bengal (Virtual) (Nov 23-28, 2020)
- Delivered Inaugural lecture and Lectures (as a Resource Person - Forenoon and afternoon sessions), Introduction to Machine Learning AICTE Sponsored Faculty Development Programme, Machine Learning & Deep Learning: A Hands-On Approach, School of Engineering, Cochin University of Science and Technology (Virtual) (Dec 07-19, 2020)
- Delivered lecture (as an Expert), Machine Learning in Multimedia Applications, AICTE Sponsored 6-Days STTP entitled "Machine Learning, Pattern Recognition and Their Applications" (Phase-II), Department of Information Technology, St. Thomas' College of Engineering & Technology, Kolkata, West Bengal (Virtual) (Dec 14-19, 2020)

UMAPADA PAL, CVPRU, Kolkata

- Paper presentation, IEEE Conference on Computer Vision and Pattern Recognition (CVPR-2020), USA (Jun 14 -19, 2020)
- Delivered invited lecture, International workshop, BNMIT, Karnataka (Jun 25, 2020)
- Paper presentation, International Workshop on Document Analysis Systems, China (Jul 26-29, 2020)
- Delivered lecture, UGC Refresher Course in Emerging Trends in Science (Sep 10, 2020) and Technology, Burdwan University (Sep 08–21, 2020)
- Delivered Keynote lecture, Second International Conference on Pattern Recognition and Artificial Intelligence (ICPRAI 2020), China (Oct 19-23, 2020)
- Delivered Keynote lecture, 5th International Conference on Computer Vision and Image Processing, (CVIP 2020), Prayagraj (Dec 06, 2020)
- Invited Speaker, IIT, Roorkee, AICTE Sponsored Faculty Development Programme (Dec18, 2020)
- Invited Speaker, AICTE Sponsored Faculty Development Programme, BIT, Mesra (Dec19, 2020)
- Paper presentation, International Conference on Pattern Recognition, Italy (Jan 10-15, 2021)
- Delivered Research Lecture, Pattern Recognition and its Applications, Department of Computer Science & Engineering, Institute of Engineering & Management, Kolkata (Feb 19, 2021)
- PhD Thesis examiner, NIT, Durgapur (Jun 05, 2020)

UTPAL GARAIN, CVPRU, Kolkata

- Panelist (Technical Session), Technology: a saviour in disruptions, Project Management Regional Conference (PMRC20), Project Management Institute (PMI) (Jun 20, 2020)
- Delivered lecture, AI and its application in Forensic, eForensics 2020, Govt. Institute of Forensic Science, India (Jul 23, 2020)
- Moderator for the panel discussion, Reengineering of organizations: technological insights, HR Conclave 2020-21, IIT, Dharwad (Oct 31, 2020)

– Invited Speaker, Neural NLP and its application for Indian Languages and Industry, Faculty Development Programme, Dept. of CSE, Punjab University (Dec 22, 2020)

– PhD Thesis examiner, (i) Dept. of CSE, IIT-BHU (Jun – Oct 2020) and (ii) Dept. of CSE, Jadavpur University (Jul 2020)

YOGESHWARAN DHANDAPANI, Stat-Math Unit, Bangalore

– Invited lecture, Workshop, High dimensional spatial random systems, Hausdorff Center for Mathematics (Virtual) (Feb 22-26, 2021)

– Invited lecture, Set Estimation: a Bridge between Spatial Statistics and Stochastic Geometry, CIRM, Luminy, France (Virtual) (Mar 11, 2021)

– Invited lecture, Level-II of National Workshop, Data Science and Advanced Computing, VIT, AP University (Virtual) (Mar 21, 2021)

6.5 Visiting Scientists

The following Visiting Scientists**,** Post-doctoral and Faculty Fellows were associated with the various Divisions in the Institute during 2020-2021

Applied Statistics Division (ASD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1	Krishnendu Chandra	AOSU, Tezpur	Apr 01, 2020 – Mar 31, 2021	AOSU, Tezpur
2.	Soumyarup Sadhukhan	Indira Gandhi Institute of Development Research	Jan 01, 2021-March 31, 2021	ASU, Kolkata
3.	Soumendu Sundar Mukherjee	Inspire Faculty Fellow	Jun 3, 2019 for five years	ISRU, Kolkata

Biological Sciences Division (BSD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1	Nilabja Sikdar	Ramalingaswamy Faculty Fellow	Aug, 2013 - Jul, 2022	HGU, Kolkata
2.	Shalini Datta	Ramanujan Faculty Fellow	Nov, 2016 – Nov, 2021	HGU, Kolkata

Computer and Communications Sciences Division (CCSD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1.	ARD Prasad	Retired Professor & Head, ISIBC	Mar 29, 2021- till date	DRTC, Bangalore
2.	Arun Prasad	Founder & CEO of 1-Enterprise A' Internet of Things' Big Data Analytics Company	Jan 25, 2021- till date	DRTC, Bangalore
3.	Saiful Amin	Director, Semantic Consulting Services Pvt. Ltd.	Jan 25, 2021-till date	DRTC, Bangalore

Physics and Earth Sciences Division (PESD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1.	Abhik Mukherjee	Postdoctoral Fellow, National University of Science and Technology, MISiS, Moscow, Russia	Dec 01, 2020 – Mar 31, 2021	PAMU, Kolkata
2.	Gopal Chandra Sardar	Department of Physical Sciences, IIT, Jodhpur	Mar 13, 2020 – Jun 12, 2020	PAMU, Kolkata

Social Sciences Division (SSD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1.	Aardra Surendran	IIT, Hyderabad	Mar, 2020	EAU, Bangalore
2.	Sanchari Roy	Kings College, London	Jul –Sep, 2020	EAU, Bangalore
3.	Dyotona Dasgupta	ISI, Delhi	Dec 01, 2020 – Mar 31, 2021	EPU, Delhi
4.	Gurbachan Singh	ISI, Delhi	Feb 10, 2021 – Jun 10, 2021	EPU, Delhi
5.	Lokendra Kumawat	Department of Economics, University of Delhi	Sep 07, 2020 – Jan 07, 2021	EPU, Delhi
6.	Sneha Bakshi	Ashoka University	Mar 15, 2021 – Jul 31, 2021	EPU, Delhi
7.	Sonal Yadav	Department of Economics, Umea University Sweden	Dec 01, 2020 – Feb 28, 2021	EPU, Delhi
8.	Bikas K. Chakraborty	Centre for Applied Mathematics & Computational Science, Saha Institute of Nuclear Physics, Kolkata	Aug 01, 2020 – Jul 31, 2021	ERU, Kolkata
9.	Satya Ranjan Chakravarty	Retired Professor & Head, ERU	Jun 01, 2020 – May 31, 2021	ERU, Kolkata
10.	Suman Guha	Department of Statistics, Presidency University, Kolkata	Aug 03, 2020	PRU, Kolkata
11.	Sumona Datta	Adamas University, Kolkata	Aug 03, 2020	PRU, Kolkata
12.	Sravani Biswas	Research Associate, Earth Observatory of Singapore, Nanyang Technological University, Singapore	Aug, 2020 – Jul, 2021	PSU & SRU, Kolkata
13.	Prasenjit Banerjee	University of Manchester, UK	Dec 21, 2020 – till date	SOSU, Kolkata

Statistical Quality Control and Operations Research Division (SQCORD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1.	Anirban Kundu	Delhivery, Kolkata	Jan 01 - Mar 31, 2021	SQC & OR Unit, Bangalore
2.	Neetu Gupta	Post-Doctoral Fellow, Aligarh Muslim University	Jan 01 - Mar 31, 2021	SQC & OR Unit, Delhi
3.	Vatsalkumar Nandkishor Mer	Post-Doctoral Fellow, IISER, Thiruva-nanthapuram	Jan 01 - Mar 31, 2021	SQC & OR Unit, Delhi
4.	Firoz Ahmad	Aligarh Muslim University	Jan – Mar, 2021	SQC & OR Unit, Kolkata
5.	Sanjay Goswami	Jadavpur University	Jan – Mar, 2021	SQC & OR Unit, Kolkata
6.	Vandana	Post-Doctoral Fellow, IIT, Chennai	Apr – Jun, 2020	SQC & OR Unit, Kolkata

Theoretical Statistics and Mathematics Division (TSMD)

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
1.	Akshay Goel	Kyushu University	Nov 15, 2019 - Sep 30, 2020	SMU, Bangalore
2.	Animesh Bhandari	National Institute of Technology, Meghalaya	Feb 06, 2020 - Mar 02, 2021	SMU, Bangalore
3.	Anindya Ghatak	NISER Bhubaneshwar	Jan 01, 2019 – Mar 31, 2021	SMU, Bangalore
4.	Apratim Chakraborty	Stony Brook University	Sep 09, 2019 - Jun 30, 2020	SMU, Bangalore
5.	Arunava Mandal	ISI, Delhi	Dec 02, 2019 – Mar 31, 2021	SMU, Bangalore
6.	Aryaman Sensarma	NBHM post-doctoral Fellow	Jul 01, 2020 - for two years	SMU, Bangalore

Sl. no.	Name of Visiting Scientist	Affiliation/Fellow	Duration	Unit Attached
7.	Barun Sarkar	TIFR, Bangalore (Visiting Scientist under CRG Grant)	Feb 01, 2021 – for one year	SMU, Bangalore
8.	Chaitanya G.K.	NIT, Surathkal (Visiting Scientist under J.C. Bose Fellowship)	Oct 05, 2020 - Mar 31, 2021	SMU, Bangalore
9.	Deepak Kumar Pradhan	NBHM Post-doctoral Fellow	Jul 01, 2019 – for two years	SMU, Bangalore
10.	Eshita Mazumdar	NBHM Post-doctoral Fellow	Aug 01, 2020 – for two years	SMU, Bangalore
11.	Gunjan Sapra	Graduate School of science, Kyoto	Feb 15, 2019 – Oct 31, 2020	SMU, Bangalore
12.	Himalaya Senapati	IIT, Madras	Mar 01-31, 2021	SMU, Bangalore
13.	Kajal Das	IMPAN, Warsaw (Visiting Scientist under J.C. Bose Fellowship)	Oct 01, 2020 - Mar 31, 2021	SMU, Bangalore
14.	Kousik Dhara	IIT, Madras (Visiting Scientist under CRG Grant)	Oct 01, 2019 - Mar 31, 2021	SMU, Bangalore
15.	Lavy Koilpitchai	NBHM Post-doctoral Fellow	Jul 01, 2019 – for two years	SMU, Bangalore
16.	Muthukumar P.	NBHM Post-doctoral Fellow	Apr 01, 2019 – for two years	SMU, Bangalore
17.	Narayan Rakshit	NBHM Post-doctoral Fellow	Apr 01, 2019 – for two years	SMU, Bangalore
18.	Neeru Bala	IIT, Hyderabad	Oct 19, 2020 - Dec 23, 2020	SMU, Bangalore
19.	Nirupam Ghosh	NBHM Post-doctoral Fellow	Mar 01, 2021 – for two years	SMU, Bangalore
20.	Pradeep Das	HRI, Allahabad	Jan 20, 2020 - Aug 31, 2020	SMU, Bangalore
21.	Rahul Rajan	CUSAT, Cochin	Feb 15 – Mar 31, 2021	SMU, Bangalore
22.	Rajesh Sundaresan	IISC, Bangalore	Feb 01, 2021 - for 6 months	SMU, Bangalore
23.	S. Nanda Kishore Reddy	INSPIRE Faculty Fellow	Apr 02, 2018 – for 5 years	SMU, Bangalore
24.	Sanjoy Kumar Jhawar	IISC, Bangalore	Jan 20, 2020 - Mar 31, 2021	SMU, Bangalore
25.	Santhosh Kumar P.	NBHM Post-doctoral Fellow	Apr 02, 2018 – Jan 31, 2021	SMU, Bangalore
26.	Satyendra Kumar Mishra	NBHM post-doctoral Fellow	Jul 01, 2020 – for two years	SMU, Bangalore
27.	Selva Kumar A.	IIT, Madras	Sep 23, 2020 - Mar 31, 2021	SMU, Bangalore
28.	Shankar P.	NBHM Post-doctoral Fellow	Jul 01, 2019 - Jan 18, 2021	SMU, Bangalore
29.	Snehasish Bose	NBHM Post-doctoral Fellow	Feb 01, 2019 - for two years	SMU, Bangalore
30.	Suparna Biswas	ISI, Chennai	Feb 11, 2020 - Jun 30, 2020	SMU, Bangalore
31.	Tiju Cherian John	ISI, Delhi	Jan 07, 2021 – Feb 04, 2021	SMU, Bangalore
32.	U.N. Bhosle	INSA Senior Scientist	Jan 01, 2019 - for three years	SMU, Bangalore
33.	Ankita Jindal	IIT, Delhi	Nov 01, 2020 - Oct 31, 2021	SMU, Delhi
34.	Deepak Prajapati	The Chinese University of Hong Kong	Nov 01, 2020 - Oct 31, 2021	SMU, Delhi
35.	Gunjan Sapra	ISI, Bangalore	Nov 09, 2020 – Nov 08, 2021	SMU, Delhi
36.	Pranabesh Das	University of Waterloo, Canada	Feb 22 – 26, 2021	SMU, Delhi
37.	Rhythm Grover	IIT, Kanpur	Nov 01, 2020 –Oct 31, 2021	SMU, Delhi
38.	Tania Biswas	University of Pavia, Italy	Feb 01 – Mar 31, 2021	SMU, Delhi
39.	Tiju Cherian John	ISI, Bangalore	Mar 05, 2019 – Mar 04, 2021	SMU, Delhi

CHAPTER 07 EVENTS

No. of Conferences, Symposiums, Workshops, Training Programme Organised:- 62

No of Lectures:- 166

No of Outreach Activities:- 6

7.1 CONVOCATION

The 55th Convocation of the Indian Statistical Institute was held on 27th January, 2021, at 12:00 noon. It started with a Vedic Hymn by the ISI Club, followed by a welcome address by Shri Bibek Debroy, President, ISI, address by Dr. Ashok Kumar Lahiri, Chairman, ISI Council and annual review by Prof. Sanghamitra Bandyopadhyay, Director, ISI. Convocation Address by Dr. Soumya Swaminathan, Chief Scientist, World Health Organization (Chief Guest) and the address of Prof. Peter J. Bickel, Professor, University of California, Berkeley (Guest of Honour), were delivered virtually. Degrees and Diplomas were awarded to students by Shri Bibek Debroy. A vote of thanks was given by Prof. Debasis Sengupta, Dean of Studies, ISI. The Convocation was closed by Shri Bibek Debroy, followed by the National Anthem by the ISI Club.

Address by Shri Bibek Debroy, President of ISI

Address by the Director, Prof. Sanghamitra Bandopadhyay

Dr. Ashok Kumar Lahiri, Chairman, ISI Council

Academic Procession

Academic Procession

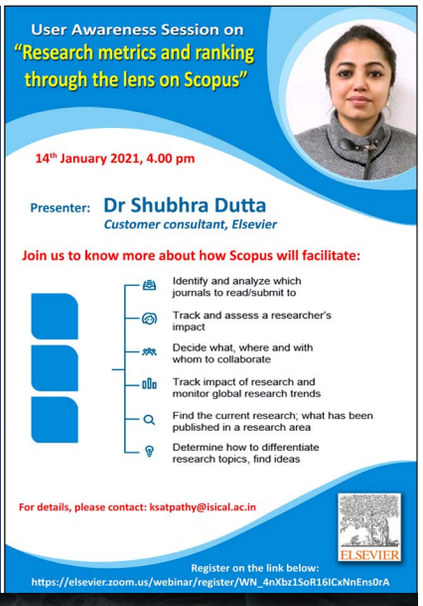
The outgoing batch of students of all degree and diploma programmes were next felicitated. The meritorious students were awarded their medals and prizes for outstanding performance in the programmes by Shri Bibek Debroy and Dr. Ashok Kumar Lahiri after which the students were individually presented with their degrees and diplomas. Prof. Debasis Sengupta, Dean of Studies, ISI offered the vote of thanks

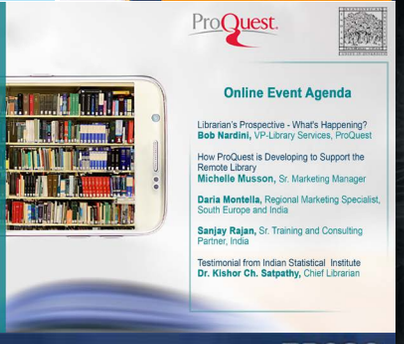
7.2 CONFERENCES, SYMPOSIUMS, WORKSHOPS & TRAINING PROGRAMMS

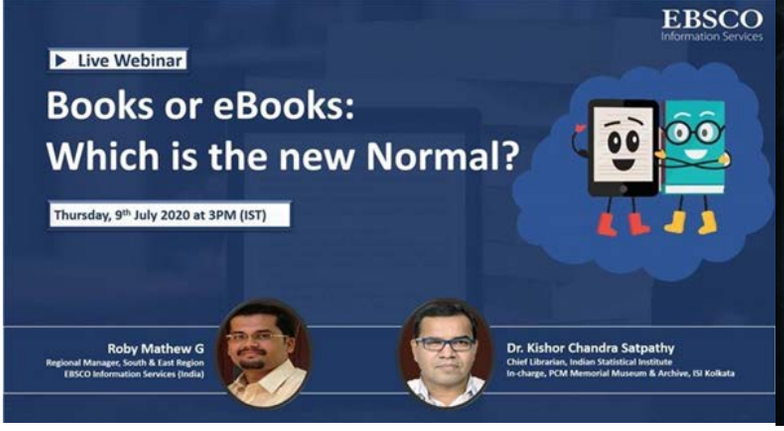
1. Conferences, Symposia and Workshops

Sl. no.	Dates	Conferences and Symposia and Workshops Conducted	Organizing Unit	Venue
1	Apr 13, 2020	**Workshop on HPC in Remote Sensing** [in collaboration with IEEE, Hyderabad]	SSIU, Bangalore	ISI, Bangalore (Virtual)
2	May- Jul, 2020	**Seminar Series on Number theory** (https:// researchseminars.org/seminar/NTdL)	Stat-Math Unit, Kolkata	Virtual
3	May 9, 2020	**Webinar on How to use ProQuest during Lockdown** [in collaboration with ProQuest]	Library, Kolkata	Virtual
4	May 19, 2020	**Webinar on Introduction to RFID Technology & Integration** [in collaboration with Rapid Radio Solutions Pvt. Ltd.]	Library Division	Virtual
5	May 21, 2020	**International Webinar on Covid-19 as opportunity from crisis management to future-proofing Library** [in collaboration with ProQuest]	Library Division	Virtual
6	Jun 8-14, 2020	**International Archives Week - Empowering Knowledge Societies, Session- Archives in India: Present & Future** / starting up an Archive in Milli, a consortium of individuals and communities interested in the nurturing archives	PCMMM&A, Kolkata, Library Division	Virtual
7	Jun 22, 2020	**Webinar on Grammarly** [in collaboration with Bridge People Technology Solutions Pvt Ltd]	Library Division	Virtual
8	Jul 9, 2020	**Webinar on Books or ebooks- which is new normal** [in collaboration with EBSCO]	Library Division	Virtual
9	Jul 14, 2020	**Webinar on Search vs. Research** [in collaboration with IEEE Explore]	Library Division	Virtual
10	Jul 25, 2020	**International Webinar, 'Resurgence' - on the return of audience to museums** [in collaborated with ICOM India and Bankim Bhavan Gaveshana Kendra, Gurusaday Museum, Kolkata Centre for Creativity, Raja Dinkar Kelkar Museum]	PCMMM&A , Kolkata, Library Division	Virtual
11	Sep 11, 2020 & Sep 25, 2020	**Workshop On Geospatial Startups - Academia: Opportunities And Challenges** [in collaboration with IIST, Trivendrum]	SSIU, Bangalore	ISI, Bangalore
12	Sep 23, 2020	**Webinar on OA-Read & Publish Model** [in collaboration with CUP UK]	Library Division	Virtual
13	Jan 14-17, 2021	**Lectures in Statistics; Indo-French Workshop** (In honour of Professor C.R. Rao who turned 100) [in collaboration with Indo-French Centre for Applied Mathematics]	Stat-Math Unit, Kolkata	Virtual
14	Jan 14, 2021	**Workshop on Research Metrics and Ranking through the lenses of Scopus**	Library Division	Virtual
15	Jan 19-21, 2021	**Workshop on Data collection, Analysis & Validation for Water Quality**, sponsored by Central Pollution Control Board, Ministry of Environment, Forest and Climate change, Govt. of India	SQC & OR Unit, Delhi	ISI, Delhi
16	Feb 8-12, 2021	**Workshop on Environmental Data Interpretation, Compilation and Reporting**, sponsored by Central Pollution Control Board, Ministry of Environment, Forest and Climate change, Govt. of India	SQC & OR Unit, Delhi	ISI, Delhi
17	Feb 9-10, 2021	**Workshops on Violence Against Women and Children in India**	ERU, Kolkata	ISI, Kolkata
18	Feb 22-25, 2021	**Chowdhury Lecture Series**	SQC & OR Unit, Bangalore	ISI, Bangalore (Virtual)
19	Feb 26-28, 2021	**Workshop on Artificial Intelligence (AI) based Smart Agriculture for Sustainable Development**	CAIML & AERU, Kolkata	ISI, Kolkata (Virtual)
20	Mar 3-10, 2021	**Research Methodology and Statistical Package for Social Science (SPSS)**	BAU, Kolkata	ISI, Kolkata

Sl. no.	Dates	Conferences and Symposia and Workshops Conducted	Organizing Unit	Venue
21.	Mar 6-7, 2021	Annual International Conference of Kolkata Centre for Creativity - **Vasudhaiva Kutumbakam III**, organized by Kolkata Centre for Creativity (KCC)[in collaboration with PCMMM&A, Library Division, Kolkata]	KCC in collaboration with PCMMM & A, Library Division, Kolkata	Kolkata Centre for Creativity
22	Mar 7-10, 2021	**Workshop on Statistics** (In honour of Professor C.R. Rao who turned 100- for students in Statistics from the North Eastern Region)	Stat-Math Unit, Kolkata & TASU, Tezpur	ISI, North-East Centre (Virtual)
23	Mar 15-Apr 15, 2021	**Correlates of Pro-Environmental Attitude**	PRU, Kolkata	Virtual
24	Mar 23-24, 2021	**Workshop on Game Theory - Efficiency, matching, fairness and manipulation: some enduring issues in cooperation and aggregation**	SERU, Tezpur	Virtual
25	Mar 29-31, 2021	**International Symposium on Computational Operations Research and Algorithmic game theory**	SQC& OR, Delhi	Delhi (Virtual)
26	Mar 30, 2021	**Annual Workshop on Machine Intelligence and Application**	MIU, Kolkata	ISI, Kolkata







2. Training Programmes*

Sl. no.	Dates	Training Programmes conducted	Organizing Unit
1	Jun 28 - 29, 2020	First Digital International Research Conference by MAGEZI	PRU, Kolkata
2	Jul 11, 2020	Psychometrics in India :use, disuse and misuse	PRU, Kolkata
3	Jul 12 – 15, 2020	6th ISI - IGC Summer School in Development Economics	EPU, Delhli
4	Jul 13-18, 2020	Black Belt Training	SQC & OR Unit, Mumbai
5	Aug, 2020	Training Program on Statistical Process Control	SQC & OR Unit, Mumbai
6	Aug 03 - 04, 2020	Orientation Training Programme on Dummy Variable Models in Regression with Special Emphasis to Logit and Probit Models (Dummy 2020)	PRU, Kolkata
7	Sep 01-11, 2020	Training Program on Data Management & Analytics approved for capacity building of MCA personnel	DRTC, Kolkata
8	Sep 02 -22, 2020	Course on Data Processing using R (DP-01)	SQC & OR Unit, Bangalore
9	Sep 05-20, 2020	Six Sigma Green Belt Training & Certification	SQC & OR Unit, Mumbai
10	Sep 14 -17, Oct 05-08, Nov 09 - 10, 2020	Analytical Techniques for Process Modelling	SQC & OR Unit, Mumbai
11	Sep 23- 25, 2020	Training program on six sigma black belt, 1st module	SQC & OR Unit, Delhi
12	Oct 05 - 09, 2020	Training program on six sigma master black belt 2nd Module	SQC & OR Unit, Delhi
13	Oct 13- 16, 2020	Training program on six sigma black belt, 2nd Module	SQC & OR Unit, Delhi.
14	Oct 13 – 16, Nov 23 – 27, Dec 14 - 18, 2020	Six Sigma BLACK BELT Training & Certification	SQC & OR Unit, Mumbai
15	Nov 02 – 04, 2020	Training program on six sigma green belt	SQC & OR Unit, Delhi.
16	Nov 11-12, 2020	Consultancy on FMEA and Project review	SQC & OR Unit, Mumbai
17	Nov 17- 20, 2020	Training program on Six sigma black belt, 3rd Module	SQC & OR Unit, Delhi
18	Nov 18, 2020 - Jan 16, 2021	Course on Business Analytics using R (BA-08)	SQC & OR Unit, Bangalore
19	Nov 28 - Dec 13, 2020	Six sigma Green Belt Training & Certification	SQC & OR Unit, Mumbai
20	Dec 21- 24, 2020	Training program on business Analytics, Data Mining and Operations research, 1st module	SQC & OR Unit, Delhi
21	Dec 04, 2020 – Feb 07, 2021	Certification Program on Business Analytics & Data Mining	SQC & OR Unit, Mumbai
22	Dec 08- 10, 2020	Training program on six sigma black belt 4th Module	SQC & OR Unit, Delhi
23	Jan 13 -15, 2021	Training program on six sigma green belt	SQC & OR Unit, Delhi
24	Jan 18, 20 – 21, Feb 01 – 04 & 15 - 17, 2021	Statistics with MINITAB - C-TEA Program	SQC & OR Unit, Mumbai
25	Jan 18 - Feb 02, 2021	Certification program on Six Sigma Black Belt (BB-33)	SQC & OR Unit, Bangalore
26	Jan 25 & Jan 27-29, 2021	Training program on business Analytics, Data Mining and Operations research, 2nd module	SQC & OR Unit, Delhi
27	Feb 08 – Mar 06, 2021	Master Black Belt Program	SQC & OR Unit, Mumbai
28	Feb 10 – Mar 25, 2021	Course on Machine Learning using Python (ML-02)	SQC & OR Unit, Bangalore

Sl. no.	Dates	Training Programmes conducted	Organizing Unit
29	Feb 16 - 19, 2021	Training program on business Analytics, Data Mining and Operations research, 3rd module	SQC & OR Unit, Delhi
30	Feb 16-Mar 25, 2021	Data Analytics Program	SQC & OR Unit, Mumbai
31	Feb 17-18, 2021	Sigma Green Belt Training & Certification & Project Review	SQC & OR Unit, Mumbai
32	Feb 22-26, 2021	Training Programme on SPSS for officials of Directorate of Economics, Statistics & Monitoring and Evaluation, Government of Sikkim	TASU, Tezpur
33	Feb 22-26, 2021	Workshop on semantic techniques and technologies for data and knowledge representation	DRTC, Bangalore
34	Mar 06 – 21, 2021	Six sigma Green Belt Training & Certification	SQC & OR Unit, Mumbai
35	Mar 17 - 19, 2021	Training program on six sigma green belt	SQC & OR Unit, Delhi
36	Mar 22 - 25, 2021	Training program on business Analytics, Data Mining and Operations research, 4th Module	SQC & OR Unit, Delhi

* (all programmes were held in virtual mode due to the prevailing pandemic situation)

7.3 Lectures

Applied Statistics Division (ASD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Organizing Unit
1	October 13, 2020	Use of Additional Information for Current Status Data with Two Competing Risks and missing Failure TYPES.	Anup Dewanji	ASU, ISI, Kolkata	ASU, Kolkata
2	October 20, 2020	Some Security Aspects of Contact tracing Protocol for COVID-19	Mridul Nandi	ASU, ISI, Kolkata	ASU, Kolkata
3	November 03, 2020	Some spectral properties of random graphs	Rajat S Hazra	SMU, ISI, Kolkata	ASU, Kolkata
4	November 10, 2020	Measurements of Social Mobility	Nachiketa Chattopadhyay	SOSU, ISI, Kolkata	ASU, Kolkata
5	November 17, 2020	Understanding Social and Occupational Mobility through Decomposition of Transition Matrix	Debasis Sengupta	ASU, ISI, Kolkata	ASU, Kolkata
6	November 24, 2020	Privacy issues in digital contact tracing systems	Pranab Chakraborty	Learning and Development, Wipro Limited	ASU, Kolkata
7	December 01, 2020	A Bayesian Quintile Regression Approach to Multivariate Semi-Continuous Longitudinal Data with an Application to the Health and Retirement Study	Kiranmoy Das	ISRU, ISI, Kolkata	ASU, Kolkata
8	December 08, 2020	Secret Sharing and its Variants, Metroid's, Combinatorics	Shion Samadder Chaudhury	RF, ASU, ISI, Kolkata	ASU, Kolkata
9	December 15, 2020	Measuring Association on Topological Spaces Using Kernels and Geometric Graphs	Bodhisattva Sen	Columbia University, USA	ASU, Kolkata
10	January 5, 2021	Metroid's and Secret Sharing	Bimal Kr. Roy	ASU, ISI, Kolkata	ASU, Kolkata
11	January 12, 2021	How to tell a tale of two tails?	Parthanil Roy	SMU, ISI, Bangalore	ASU, Kolkata
12	January 25, 2021	Optimal eavesdropping in quantum cryptography	Atanu Acharyya	SRF, ASU, ISI, Kolkata	ASU, Kolkata
13	February 02, 2021	Circuit Optimization in IBMQ systems – The case study of Dicke States	Chandrasekhar Mukherjee	ISI, Kolkata	ASU, Kolkata

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Organizing Unit
14	February 04, 2021	NExUS: Bayesian simultaneous network estimation across unequal sample sizes	Priyam Das	Research Fellow, Biomedical Informatics, Harvard Medical School	ISRU, Kolkata
15	February 09, 2021	Some clustering-based change-point detection methods for high dimensional data	Anil K. Ghosh	SMU, ISI, Kolkata	ASU, Kolkata
16	February 18, 2021	Secret Sharing and its variants, Metroid's, Combinatorics	Shion Samadder Chaudhury	RF, ISI, Kolkata	ASU, Kolkata
17	February 23, 2021	Security analysis of symmetric ciphers against Grover's algorithm	Ravi Anand	IIT, Kharagpur	ASU, Kolkata
18	March 02, 2021	Exact Tests for Offline Change Detection in Multichannel Binary and Count Data	Shyamal Krishna De	ASU, ISI, Kolkata	ASU, Kolkata
19	March 09, 2021	Two-stage circular-circular regression with zero-inflation: application to medical sciences	Jayant Jha	Institut de Neurosciences des Systèmes, Aix-Marseille University	ASU, Kolkata
20	March 10, 2021	Zero-knowledge Proof, Deniability and Their Applications in Block Chains, E-Voting and Deniable Secret Handshake Protocols (PhD Thesis Viva cum Seminar)	Somnath Panja	RF, ASU, ISI, Kolkata	ASU, Kolkata
21	March 15, 2021	Constructions and Analyses of Efficient Symmetric-Key Primitives for Authentication and Encryption	Sebati Ghosh	RF, ASU, ISI, Kolkata	ASU, Kolkata
22	March 16, 2021	Statistics in Finance	Rituparna Sen	ASU, ISI, Bangalore	ASU, Kolkata
23	March 22, 2021	Secure and Efficient Computation of the Diffie-Hellman Protocol using Montgomery Curves over Prime Order Fields (Pre-submission Seminar)	Kaushik Nath	RF, ASU, ISI, Kolkata	ASU, Kolkata
24	March 23, 2021	Unanimous and strategy-proof probabilistic rules for single-peaked preference profiles on graphs	Soumyarup Sadhukhan	Visiting Fellow, ASU, ISI, Kolkata	ASU, Kolkata
25	March 30, 2021	Image denoising and image deblurring using jump regression analysis	Partha Sarathi Mukherjee	ESRU, ISI, Kolkata	ASU, Kolkata

Computer and Communications Sciences Division (CCSD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
1	July 10, 2020	Earth Observation and Geospatial Applications – Indian Experience	P. G. Diwakar	Director, Earth Observation Applications & Disaster Management; and Distinguished Scientist, ISRO	SSIU, Bangalore
2	August 14, 2020	Understanding and Predicting the Monsoons	Ravi Nanjundiah	Director, Indian Institute of Tropical Meteorology, Pune (IITM Pune);	SSIU, Bangalore
3	September 11, 2020	Earth Engine for Planetary Scale Decision Support	Ujaval Gandhi	Spatial Thoughts., India	SSIU, Bangalore
4	October 16, 2020	Patterns in Past Settlements: Geospatial Analysis of Imprints of Cultural Heritage on Landscapes	Rajani M. B.	Associate Professor, NIAS, Bangalore	SSIU, Bangalore
5	January 22, 2021	Remote Sensing of Urban Dynamics in India	T.V. Ramachandra	Center for Ecological Sciences (CES), Indian Institute of Science	SSIU, Bangalore
6	February 12, 2021	Underwater Domain Awareness (UDA) Framework: A New Perspective for the Indian Ocean Region	(Cdr.) Arnab Das	Founder & Director, Maritime Research Centre (MRC), Pune	SSIU, Bangalore

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
7	March 30, 2021	Embracing big data algorithms in single-cell transcriptomics	Debarka Sengupta	Associate Professor, Indraprastha Institute of Information Technology, Delhi and Adjust Associate Professor, Queensland University of Technology, Brisbane	MIU, Kolkata
8	March 30, 2021	Symbolic Representations and Reinforcement Learning	Balaraman Ravindran	Mindtree Faculty Fellow and Professor, Indian Institute of Technology Madras	MIU, Kolkata
9	March 30, 2021	Shallow and Deep Representations for Domain Adaptation	Rama Chellappa	Bloomberg Distinguished Professor, Johns Hopkins University, USA	MIU, Kolkata

Physics and Earth Sciences Division (PESD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
1	December12, 2020	Aspects of Field Theory on a Cone	Sudipta Mukherji	Institute of Physics, Bhubaneswar	PAMU, Kolkata
2	March 12, 2021	Towards a Quantitative Understanding of Wildlife Conservation Needs in Dynamic Heterogeneous Landscapes	Varun R. Goswami & Divya Vasudev	Conservation Initiatives	TASU, Tezpur
3	March 19, 2021	Complementarity in Quantum Theory: From Foundational Revolution to Practical Implications	Manik Banik	IISER, Thiruvananthapuram	PAMU, Kolkata
4	March 19, 2021	Introduction to Quantum Machine Learning	Sourav Chakraborty	ACMU, ISI, Kolkata	PAMU, Kolkata

Social Sciences Division (SSD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
1	June 04, 2020	Can waste management policies stimulate the economy? The South African case	Reza C. Daniels	University of Cape Town	EPU, Delhi
2	June 05, 2020	Essays on the Economics of Conflict	Ranajoy Guha Neogi	RBI, Mumbai	ERU, Kolkata
3	June 12, 2020	Irrigation and culture: gender roles and rights	Satyendra Kumar Gupta	O. P. Jindal Global University	EPU, Delhi
4	June 24, 2020	Fiscal and monetary policy coordination	Arjun Jayadev	Azim Premji University	EPU, Delhi
5	June 28 & 29, 2020	International Peace & Rabindrik Psychotheorapy at the First Digital International Research Conference by MAGEZI	D. Dutta Roy	ISI, Kolkata	PRU, Kolkata
6	July 11, 2020	'Psychometrics in India' used, disused and misused	D. Dutta Roy	ISI, Kolkata	PRU, Kolkata
7	July 03, 2020	Parental Absence in Childhood and Adult Criminal Behaviour: Evidence from Survey and Experimental Data from Prison Inmates in China	Xin Meng	Australian National University	EPU, Delhi
8	July 10, 2020	The Glasses are Tinted: Self-Confidence and Poverty Trap	Anuradha Saha	Ashoka University	EPU, Delhi
9	July 17, 2020	Matching platforms	Seung Han Yoo	Korea University	EPU, Delhi
10	July 24, 2020	When Is Debt Odious? A Theory of Repression and Growth Traps	Viral Acharya,	New York University	EPU, Delhi
11	July 31, 2020	A theory of simplicity in games and mechanism design	Marek Pycia	University of Zurich	EPU, Delhi
12	August 04, 2020	Dimentionality & Measurement Invariance in text construction & adaptation	D. Dutta Roy	ISI, Kolkata	PRU, Kolkata

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
13	August 04, 2020	Qualitative explanatory variables & Logit and Probit Models (theory & practical)	Monoranjan Pal	Retired Professor, Economic Research Unit, ISI, Kolkata	PRU, Kolkata
14	August 04, 2020	Sustainability of Micro Enterprises: Application of Logit Model	Susmita Chatterjee	Dept. of Economics, Maharaja Monindra Chandra College, Kolkata	PRU, Kolkata
15	August 06, 07 & 08, 2020	Behaviour theorapy	D. Dutta Roy	ISI, Kolkata	PRU, Kolkata
16	August 07, 2020	The Vigilant Eating Rule: A general approach for probabilistic economic design with constraints	Haris Aziz	University of New South Wales	EPU, Delhi
17	August 14, 2020	An Economic Model of the Last-Mile Internet	Rakesh Chaturvedi	Indraprastha Institute of Information Technology, Delhi	EPU, Delhi
18	August 18 & 19, 2020	Life Skills: Self-awareness and empathy for personal development	D. Dutta Roy	ISI, Kolkata	PRU, Kolkata
19	August 21, 2020	Imperfect Information, Learning and Endogenous Persistence	Bo Yang	Swansea University	EPU, Delhi
20	August 28, 2020	Why Do People Stay Poor? Evidence from an Asset Transfer Programme in Rural Bangladesh	Maitreesh Ghatak	London School of Economics	EPU, Delhi
21	September 04, 2020	Blood allocation with replacement donors	Utku Unver	Boston College	EPU, Delhi
22	September 11, 2020	The Political Competition over Life and Death - Evidence from Infant Mortality in India	Lore Vandewalle	Graduate Institute Geneva	EPU, Delhi
23	September 18, 2020	Maternal Mortality and Women's Political Participation	Joseph Flavian Gomes	Economics of School of Louvain	EPU, Delhi
24	September 25, 2020	The Future in Mind: Long-Run Impact of an Aspirations Intervention in Rural Ethiopia	Stefan Dercon	University of Oxford, UK	EPU, Delhi
25	October 02, 2020	Monopolistic Screening with Single-Peaked Preferences	Rene Saran	University of Cincinnati, USA	EPU, Delhi
26	October 16, 2020	A Subsidy Inversely Related to the Product Price	Takahiko Kiso	University of Aberdeen	EPU, Delhi
27	October 22, 2020	Contributions of Paul Milgrom and Robert Wilson to Auction Theory	Sushil Bikhchandani	University of California, Los Angeles, USA	EPU, Delhi
28	October 23, 2020	Are Simple Mechanisms Optimal when Agents are Unsophisticated?	Jiangtao Li	Singapore Management University	EPU, Delhi
29	October 30, 2020	A Structural Framework For Regional Macroeconomic Analysis	Jordan Norris	New York University Abu Dhabi	EPU, Delhi
30	November 06, 2020	Did Railways affect Literacy? Evidence from India	James Fenske	University of Warwick, UK	EPU, Delhi
31	November 20, 2020	The effect of climate policy on productivity and cost pass-through in the German manufacturing sector	Beat Hintermann	University of Basel	EPU, Delhi
32	December 04, 2020	Bombs, Broadcasts and Resistance: Allied Intervention and Domestic Opposition to the Nazi Regime during World War II	Joachim Voth	University of Zurich	EPU, Delhi
33	December15, 2020	COVID19 vaccines: An update on progress and the challenges ahead	Harish Iyer	Bill & Melinda Gates Foundation	EPU, Delhi
34	December18, 2020	Demographic Transitions across Time and Space	Nezih Guner	Center for Monetary and Financial Studies, Spain	EPU, Delhi
35	January 11 - 12, 2021	Effects of Tagore music composition on rehabilitation of persons with Disabilities: Two days training programme on Music theoraphy for children with disabilities	D. Dutta Roy	Psychology Research Unit, ISI, Kolkata	PRU, Kolkata

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
36	January 22, 2021	Fair Cake Division Under Monotone Likelihood Ratios	Siddharth Barman	Indian Institute of Science, Bangalore	EPU, Delhi
37	January 29, 2021	Attack and Interdiction on Networks	Bhaskar Dutta	Ashoka University	EPU, Delhi
38	February 05, 2021	Effects of productivity growth on domestic savings across countries	Abhishek Kumar	Indira Gandhi Institute of Development Research	EPU, Delhi
39	February 09, 2021	Challenges of Evidence Based Studies on Violence Against Women	Ishita Mukhopadhyay	Department of Economics, University of Calcutta and President of Indian Association of Women's Studies, Kolkata	ERU, Kolkata
40	February 09, 2021	Style Question Matters: An Experiment with Questions on Gender Violence	Manoranjan Pal	Retired Professor, ISI, Kolkata & Professor, Techno India University	ERU, Kolkata
41	February 09, 2021	Gender de-equalization via Labour Codes	Ritu Dewan	Retired Professor, University of Mumbai	ERU, Kolkata
42	February 09, 2021	Domestic Violence: Fact Pathways and Impacts	Aparajita Chattopadhyay	International Institute for Population Sciences, Mumbai	ERU, Kolkata
43	February 09, 2021	Violence Against Women in North-East India: Urban-Rural Differences	Suman Chakraborty	Mirinalini Datta Mahavidyapith & Guest Faculty, Department of Anthropology, West Bengal State University, Barasat	ERU, Kolkata
44	February 10, 2021	Violence against Women: Critical Relations among Culture, Education Economy and Law	Kanchan Sarker	Sociology Department, Okanagan, Canada	ERU, Kolkata
45	February 10, 2021	Violence against Children in India: Need for a Paradigm Shift	Amit Mitra	Retired faculty, Centre for Social Studies, Surat & the Centre for Science and Environment, New Delhi	ERU, Kolkata
46	February 10, 2021	Relationship Quality and Partner Violence during Covid 19 Pandemic	Wah Yun Low	Faculty of Medicine Dean/'s Office, Head Coordinator, University Malaya, Malaysia	ERU, Kolkata
47	February 10, 2021	Reading the NCRB Reports: Do the Police and the Judicial Systems Recognize Violence Against Women?	Rajni Palriwala	Retired Professor, Former Head, Department of Sociology, University of Delhi	ERU, Kolkata
48	February 10, 2021	Femicide in India	Nishi Mitra	Centre for Study of Developing Societies, School of Development Studies, TISS, Mumbai	ERU, Kolkata
49	February 10, 2021	Reported Cases (IPC) of Crime against Children from 2006 to 2017 in West Bengal in India	Sreeparna Banerjee	West Bengal State University, Barasat, West Bengal	ERU, Kolkata
50	February 12, 2021	Gender and leadership in organizations: Promotions, demotions and angry workers	Danila Serra	Texas A&M	EPU, Delhi
51	February 19, 2021	Female labor supply and jobless recovery	Pubali Chakraborty	Ashoka University	EPU, Delhi

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
52	February 26, 2021	Expanding Financial Access Via Credit Cards: Evidence from Mexico	Aprajit Mahajan	University of California, Berkeley	EPU, Delhi
53	March 05, 2021	The effects of India's BITs termination on FDI inflows	Elena Kotyrlo and Hryhorii M. Kalachyhin	Higher School of Economics	EPU, Delhi
54	March 12, 2021	Short- and Long-Run Consumption and Non-Payment Responses to Retail Electricity Prices in India	Shefali Khanna	Harvard University, USA	EPU, Delhi
55	March 15, 2021	Generating a POS Tagged Text Corpus for Bengali: Issues, Challenges, and Outcomes	Niladri Dash	ISI, Kolkata	EPU, Delhi
56	March 19, 2021	Delegation in veto bargaining	Andreas Kleiner	Arizona State University, USA	EPU, Delhi
57	March 26, 2021	The Social Costs of Keystone Species Collapse: Evidence From The Decline of Vultures in India	Anant Sudarshan	University of Chicago, USA	EPU, Delhi

SQC & OR Division (SQC&ORD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
1	October 29 - 31, 2020	Lemkes Algorithm in Convex Optimization	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
2	October 29 - 31, 2020	Karmakar's Algorithm and its various Extensions Revisited	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
3	November 29, 2020	Stochastic Games and Semi-Markov Games	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
4	November 29, 2020	Degree theory in linear complementarity problem	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
5	December 17 - 18, 2020	Characterization of Special Matrix classes using degree theory	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
6	December 2020	Linear Complementarity Problem: A framework and state of the Art survey	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi
7	February 22, 2021	Penalized Likelihood based Variable Selection	Asokan Mulayath Variyath	Memorial University of Newfoundland, Canada	SQC & OR Unit, Bangalore
8	February 23, 2021	Statistical Process Control in Big Data Era	Peihua Qiu	University of Florida, USA	SQC & OR Unit, Bangalore
9	February 24, 2021	Sequential Learning of Deformation Models in Additive Manufacturing	Tirthankar Dasgupta	Rutgers University, New Jersey, USA	SQC & OR Unit, Bangalore
10	February 25, 2021	Some Research and Publishing Experience in Statistical Reliability and Quality Control	Min Xie	City University of Hong Kong, Hong Kong	SQC & OR Unit, Bangalore
11	March 26 – 27, 2021	Max Plus Algebra and its applications in Optimization Problem and game theory	S.K. Neogy	ISI, Delhi	SQC & OR Unit, Delhi

Theoretical Statistics and Mathematics Division (TSMD)

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
1	July 29, 2020	Moderate deviation estimates in stationary last passage percolation	Manan Bhatia	IISc Bangalore	SMU, Bangalore
2	July 29, 2020	Fenchel subdifferentials and first-order directional derivatives of symplectic eigenvalues	Hemant Kumar Mishra	ISI Delhi	SMU, Delhi

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
3	August 05, 2020	Group measure space construction, ergodicity and W⊠-rigidity for stable random fields	Parthanil Roy	ISI, Delhi	SMU, Delhi
4	August 12, 2020	A Last Progeny Modified Branching Random Walk	Antar Bandyopadhyay	ISI, Delhi	SMU, Bangalore
5	August 12, 2020	Group measure space construction, ergodicity and -rigidity for stable random fields	Parthanil Roy	ISI, Bangalore	SMU, Bangalore
6	August 12, 2020	Torus quotients of Schubert varieties in the Grassmannian	Sarjick Bakshi	ISI, Delhi	SMU, Delhi
7	August 19, 2020	Large Deviations for the Right-Most Position of a Last Progeny Modified Branching Random Walk	Partha Pratim Ghosh	ISI, Delhi	SMU, Delhi
8	August 20, 2020	A Fourier-analytic solution to the Buseman-Petty problem	Soumya shant Nayak	ISI, Bangalore	SMU, Bangalore
9	August 26, 2020	Crossing Probabilities in 2D Critical Lattice Models	Hao Wu	Yau Mathematical Science Center, Tsinghua University	SMU, Bangalore
10	August 26, 2020	q-deformations of compact Lie groups as Compact Quantum Groups	Manabendra Giri	ISI, Delhi	SMU, Delhi
11	September 02, 2020	Verifying the Riemann hypothesis to a new height	Timothy Trudgian	The University of New South Wales (UNSW) Canberra at ADFA, Australia	SMU, Delhi
12	September 03, 2020	Self maps of varieties over finite fields	K V Shuddhodan	Purdue University	SMU, Bangalore
13	September 09, 2020	Collision times of random walks & its application to convergence to the Brownian web	Anish Sarkar	ISI, Delhi	SMU, Delhi
14	September 10, 2020	Maximum likelihood estimation and invariant theory for tensors	Viswambhara Makam	University of Melbourne	SMU, Bangalore
15	September 16, 2020	Quantitative measure equivalence	Romain Tessera	University of Paris	SMU, Delhi
16	September 23, 2020	Open book decomposition and embedding of smooth manifolds	Kuldeep Saha	IISER Bhopal	SMU, Delhi
17	September 29, 2020	Leavitt Path Algebras and some generalisations	R. Mohan	ISI, Bangalore	SMU, Bangalore
18	September 30, 2020	C⊠-extreme points of positive operator valued measures and unital completely positive maps	B. V. Rajarama Bhat	ISI Bangalore	SMU, Delhi
19	October 07, 2020	How large is the Riemann zeta function?	Ritabrata Munshi	ISI, Kolkata	SMU, Delhi
20	October 14, 2020:	Quantum Lattice Wave Guides	Krishna Maddaly	Ashoka University	SMU, Delhi
21	October 21, 2020	Two proofs of the KMT theorems	Manjunath Krishnapur	IISc Bangalore	SMU, Bangalore
22	October 21, 2020	On Ramanujan's lattice point problem	K Srinivas	IMSc Chennai	SMU, Delhi
23	October 28, 2020	X-coordinates of Pell equations in various sequences	Florian Luca	University of the Witwatersrand, Max Planck Institute for Software Systems	SMU, Delhi
24	November 04, 2020	Annealed random walk conditioned on survival among Bernoulli obstacles	Ryoki Fukushima	Univ. Tsukuba, Japan	SMU, Bangalore
25	November 04, 2020	Bivariate Distributions with Singular Components	Debasis Kundu	IIT, Kanpur	SMU, Delhi

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
26	November 11, 2020	On a dense universal Hilbert set	Michael Filaseta	University of South Carolina	SMU, Delhi
27	November 12, 2020	The dimensional Brunn-Minkowski inequality in Gauss space	Alexandros Eskenazis	Sorbonne University, Paris	SMU, Bangalore
28	November 16, 2020	Levi-Civita connections in noncommutative geometry	Sugato Mukhopadhyay	ISI, Kolkata	SMU, Kolkata
29	November 18, 2020	High transitive groups among groups acting on trees	Pierre Fima	Université Paris	SMU, Delhi
30	November 19, 2020	A talented monoid associated to a graph	RoozbehHazrat	Western Sydney University	SMU, Bangalore
31	November 25, 2020	Sharp phase transition and noise sensitivity in continuum percolation via continuous time decision trees.	D. Yogeshwaran	ISI, Bangalore	SMU, Bangalore
32	November 25, 2020	Estimating densities with nonlinear support using Fisher-Gaussian kernels	Minerva Mukhopadhyay	IIT, Kanpur	SMU, Delhi
33	November 26, 2020	Prescribing Ricci curvature on a product of spheres	Anusha Krishnan	Syracuse University, Syracuse, New York, USA	SMU, Bangalore
34	December 02, 2020	Functional inequalities and moment estimates	Radoslaw Adamczak	University of Warsaw, Poland	SMU, Bangalore
35	December 02, 2020	Resistance matrices of balanced directed graphs	R. B. Bapat	ISI, Delhi	SMU, Delhi
36	December 09, 2020	Sero-Survey in Karnataka State: Summary, Design, and Statistical Methodology	Siva Athreya	ISI, Bangalore	SMU, Bangalore
37	December 09, 2020	Sero-Survey in Karnataka State: Summary, Design, and Statistical Methodology	Rajesh Sundaresan	IISc Bangalore	SMU, Bangalore
38	December 09, 2020	rivial eigen-component of local units modulo elliptic units over certain Zp-extensions	Chandrakant Aribam	IISER Mohali	SMU, Delhi
39	December 10, 2020	E_0-semigroups - the multiparameter context	Anbu Arjunan	IMSc, Chennai	SMU, Bangalore
40	December 17, 2020	How random are the fractional parts of powers of integers?	Jens Marklof	University of Bristol, U.K.	SMU, Bangalore
41	December 23, 2020	Seemingly injective von Neumann algebras	Gilles Pisier	Texas A&M University and Sorbonne Université	SMU, Delhi
42	January 13, 2021	On mod-p congruences for Drinfeld modular forms of level pm	Narasimha Kumar	IIT, Hyderabad	SMU, Delhi
43	January 07, 2021	Doodles on surfaces and related groups	Mahender Singh	IISER, Mohali	SMU, Bangalore
44	January 20, 2021	Moments in positivity: metric geometry, covariance estimation, and a novel graph invarian	Apoorva Khare	IISc, Bangalore	SMU, Delhi
45	January 21, 2021	The shape of data	Ulrike Tillmann	Oxford Univ. U.K.	SMU, Bangalore
46	January 27, 2021& January 29, 2021	PCM Memorial Lectures : Bayesian Modelling and Analysis of Challenging Data	Kerrie Mengersen	Queensland Univ. of Technology, Australia	SMU, Bangalore
47	February 01, 2021	Gaussian complex zeros: conditional distribution on rare events	Alon Nishry	Tel-Aviv University, Israel	SMU, Bangalore
48	February 01, 2021	The forbidden region for random zeros: appearance of quadrature domains	Aron Wenmann	Tel-Aviv University, Israel	SMU, Bangalore
49	February 03, 2021	Bayesian Sampling Plans under Different Censoring Schemes	Deepak Prajapati	ISI, Delhi	SMU, Delhi
50	February 04, 2021	A model structure for singular foliations	Yael Fregier	Artois University, France	SMU, Bangalore

Sl. No.	Date	Title of Lecture	Name of Speaker	Affiliation of Speaker	Unit Attached
51	February 10, 2021	Isometric dilations and von Neumann inequality for a class of n-tuple of commuting contractions	Sibaprasad Barik	ISI, Delhi	SMU, Delhi
52	February 18, 2021	Universality principle for random polynomials	Turgay Bayraktar	Sabanci University, Turkey	SMU, Bangalore
53	February 24, 2021	Some recent results on the Diophantine equations with power sums	G. Soydan	Bursa Uludag University, TURKEY	SMU, Delhi
54	March 03, 2021	Exponential Diophantine equations and Skolem's conjecture	Lajos Hajdu	University of Debrecen, Hungary	SMU, Delhi
55	March 10, 2021	A novel model and its parameter estimation	Rhythm Grover	ISI, Delhi	SMU, Delhi
56	March 15, 2021 & March 19, 2021	PCM Memorial Lectures : Martingales in the foundations of statistics	Vladimir Vovk	University of London, U.K.	SMU, Bangalore
57	March 16, 2021 & March 18, 2021	Ashok Maitra Memorial Lectures : Harnack inequalities - from PDE to random graphs	Martin Barlow	University of British Columbia, Canada	SMU, Bangalore
58	March 24, 2021	Opinion Dynamics with Biased and Stubborn Agents	Rahul Roy	ISI, Delhi	SMU, Delhi
59	March 25, 2021	A geometrical approach to the three-body problem	Himalaya Senapati	IIT, Madras	SMU, Bangalore
60	March 31, 2021	Decomposability of Multi parameter CAR flows over a closed convex cone	Anbu Arjunan	IMSc, Chennai	SMU, Delhi

7.4 OUTREACH ACTIVITIES

The Institute organized the following outreach activities-

Oct 17, 2020: **Webinar on synergising Six Sigma in Data Science**, conducted by SQC & OR Unit, Pune. No of participants who attended the session: 120.

Nov 17, 2020: **Webinar on HR Analytics** conducted by SQC & OR Unit, Pune in collaboration with Utkarsh Academy of Learning. No of participants who attended the session: 136.

Dec 22-25, 2020: The Library, Documentation and Information Science Division participated in the **Book fair, India International Science Festival (IISF)** 2020, which was held virtually. The fair is jointly organized by CSIR, DST, DBT, MoES, DHF and VIBHA.

Feb 15, 2021: The 2nd round of **Madhava Mathematics Competition** for the Bangalore region was conducted at ISI, Bangalore. Regional co-ordinator: Dr. Jaydeb Sarkar, SMU, Bangalore.

Mar 03, 2021: **Seminar on application of statistics on behavioural/experimental economics** organized by SOSU, Kolkata. Speaker: Dr. Prasenjit Banerjee, Faculty of the University of Manchester, UK.

Mar 07, 2021: The **Indian National Mathematical Olympiad (INMO-2021)**, which leads to participation of Indian students in the International Mathematical Olympiad (IMO), was held in ISI, Kolkata and Bangalore respectively. The Indian Statistical Institute (ISI) has been organizing the Regional Mathematical Olympiad (RMO) for West Bengal and Karnataka followed by the Indian National Mathematical Olympiad (INMO) for several years. The RMO 2020 could not be held this year due to the prevailing pandemic situation.

Bangalore Centre: Regional Co-ordinator Dr. B. Sury, SMU, Bangalore and number of participants for INMO 62

Kolkata Centre: Regional Co-ordinator Dr. Mridul Nandi, ASU, Kolkata and number of participants for INMO 52

CHAPTER 08 ADMINISTRATION

327 No. of Scientific and Technical Workers

380 No of Non-Scientific Workers

604 No. of Male Workers

103 No. of Female Workers

8.1 Administrative Services Division

The Administrative Services Division at the Headquarters caters to the various needs of the Scientific Workers in all the Scientific Units of the Institute engaged in various scientific, research and academic activities and provides them with necessary infrastructural facilities in their pursuit of excellence. The centres at Delhi, Bangalore, Chennai and Tezpur, each having a number of scientific units, by and large are getting administrative support from the administrative units/sections there. The Administrative Services Divisions of the Institute has the following units at the Headquarters in Kolkata:

Sl. No.	Name of the Unit	Sl. No.	Name of the Unit
1.	Accounts Section	17.	Import & Travel Cell
2.	Audio-Visual Unit	18.	Internal Audit Cell
3.	Canteen Unit	19.	Legal Cell
4.	Cash Unit	20.	Medical Expenses Reimbursement Unit
5.	CE (A & F)'s Office	21.	Medical Welfare Unit
6.	Despatch Unit	22.	Personnel Unit
7.	Central Stores	23.	Provident Fund Unit
8.	Council Section	24.	Public Relations Unit
9.	Director's Office	25.	Printing and Publication Unit
10.	Electrical Maintenance Unit	26.	Official Language Cell
11.	Engineering Unit	27.	Retirement Benefit Cell
12.	Estate Office	28.	RTI, Grievance, Complaints and Vigilance Cell
13.	Guest House	29.	Security Unit
14.	Hostels	30.	SC / ST / OBC Liaison Cell
15.	House Building Advance Cell	31.	Telephone Unit
16.	Human Resource Development Unit	32.	Transport Unit

Apart from the above mentioned Units, there are few cells dealing with Budget, and other issues to take care of the specific needs of the Institute. The Administrative Services Division also looks after the running of Hostels for Students, Research Scholars and International Statistical Education Centre (ISEC) Trainees and also the running of Canteens for the workers and students of the Institute. The other outlying Units are controlled directly by the Headquarters at Kolkata. The Administrative Services Division takes the responsibility for all new constructional activities of the Institute at its Headquarters and also at outlying centres/ branches. A brief report on the construction and other activities during the year is narrated in the subsequent paragraphs.

The Administrative activities in the four Centres, namely Delhi, Bangalore, Chennai and North East Centre at Tezpur and in other outlying branches of the Institute and Giridih Office, are more or less similar to the Headquarters but on a much smaller scale.

8.2 Office Bearers of the Institute Administration during the year:

		1st April 2020 – 31st July 2020 & 29th Sept. 2020 (AN) – 31st March 2021	1st August 2020 - 29th Sept. 2020 (FN)
Director		Prof. Sanghamitra Bandyopadhyay	Prof. Dipti Prasad Mukherjee, Officiating Director
		1st April 2020 – 17th Sept. 2020	**18th Sept. 2020 - 31st March 2021**
Professors-in-Charge	Applied Statistics Division	Prof. Sumitra Purkayastha	Prof. Mridul Nandi
	Biological Sciences Division	Prof. Susmita Mukhopadhyay	Dr. Raghunath Chatterjee
	Computer and Communication Sciences Division	Prof. Bhabatosh Chanda	Prof. Krishnendu Mukhopadhyaya
	Physics and Earth Sciences Division	Prof. Parthasarathi Ghosh	Prof. Preeti Parashar
	Social Sciences Division	Prof. E. Somanathan	Prof. Manipushpak Mitra
	Theoretical Statistics and Mathematics Division	Prof. B. V. Rajarama Bhat	Prof. Antar Bandyopadhyay

	1st April 2020 – 17th Sept. 2020	18th Sept. 2020 - 31st March 2021
Head, Statistical Quality Control and Operations Research Division	Dr. Ashis Kr. Chakraborty	Dr. Arup Ranjan Mukhopadhyay
Head, Delhi Centre	Prof. Samir Kr. Neogy	Prof. Samir Kr. Neogy
Head, Bangalore Centre	Prof. C.R.E. Raja	Prof. C.R.E. Raja
Acting Head, Chennai Centre	Dr. D. Sampangi Raman	Dr. D. Sampangi Raman
Dean of Studies	Prof. Goutam Mukherjee	Prof. Debasis Sengupta
Chief Executive (A & F)	Brig J N Pandey (Retd)	Brig J N Pandey (Retd)
	1st April 2020 – 30th Nov. 2020	**1st Dec. 2020 – 31st March 2021**
Head, North-East Centre, Tezpur	Dr. Tapan Chakraborty	Prof. Dipti Prasad Mukherjee, In-Charge, North East Centre

8.3 List of workers joined/ retired/ voluntarily retired/ resigned/ terminated/ died during the year

A. Appointments

(i) Scientific / Technical Workers

Sl. No.	Name
1	Dr. Kanishka Kacker
2	Dr. Issan Patri
3	Dr. Soumyashant Nayak
4	Dr. Naqueeb Ahmad Warsi
5	Dr. Swapan Rana
6	Dr. Tridib Kumar Mondal
7	Dr. Anuj Bhowmik
8	Dr. Debarati Mukherjee
9	Dr. Shyamal Krishna De
10	Dr. Sabyasachi Karati
11	Dr. Ramij Rahaman

(ii) Non-Scientific Workers

Sl. No.	Name
1	Panchanand Verma

B. Retirement/Voluntary Retirement:

(i) Scientific / Technical Workers

Sl. No.	Name
1.	Dr. Dilip Saha
2.	Shri Bibhuti Bhusan Chakraborty
3.	Dr. Bidyut Roy
4.	Shri A. Rajagopal
5.	Dr. Abhirup Sarkar
6.	Dr. Kumar Sankar Roy
7,	Shri Debashis Roy
8.	Dr. Buddhadeb Ghosh
9.	Dr. Susmita Bharati
10.	Dr. Saswati Bandyopadhyay
11.	Dr. Barnana Roy
12.	Dr. Amitava Datta
13.	Dr. V.R. Padmawar
14.	Dr. Samarendra Barik
15.	Dr. Chandan Chakraborty
16.	Dr. Sonali Chakraborty
17	Shri Dibyendu Bose
18.	Shri Prem Chand Pandey
19	Sm. Bhabani Das
20.	Shri Susavan Singha Roy
21.	Shri Kalyan Kumar Chowdhury
22.	Shri Ashim Roy Chowdhury
23.	Sm. Nilam Devi
24.	Dr. Sujit Adhikari

(ii) Non-Scientific Workers

Sl. No.	Name
1	Shri A. Krishnaiah
2	Sm. Lata A. Nawa
3	Shri Asoke Karmakar

Sl. No.	Name
4	Shri Nripen Halder
5	Shri Swapan Kumar Das
6	Shri Heera Munda
7	Shri Sambhu Dey
8	Shri Dilip Das
9	Sm. Sipra Roy Burman
10	Shri Madan Naskar
11	Shri Nand Lal Mahato
12	Shri Lalan Pandey
13	Shri Prabir Kr. Gaunia
14	Shri Debabrata Ghosh
15	Shri Pradip Ghosh
16	Shri Gopal Das
17	Shri Padma Lochan Baskey
18	Shri Eman Singh Thapa
19	Shri Nakul Behera
20	Shri Ajoy Kr. Paul

Sl. No.	Name
21	Shri Madan Lal Routh
22	Shri Jawaharlal Thakur
23	Shri Dipak Acharya
24	Shri Ambika Singh
25	Sm. N.A. Rao
26	Shri Nanda Gopal Chakraborty
27	Shri Debasis Das
28	Sm. Rama Bhattacharya
29	Shri Tapas Mondal
30	Shri Pinaki Ghosh
31	Md. Shahzad
32	Shri Chittaranjan Majumdar
33	Shri Nani Kanta Bain
34	Shri Pradip Kumar Behara
35	Shri Tarun Kr. Kundu
36	Shri Budhu Oraon

C. Death

(i) Scientific Worker

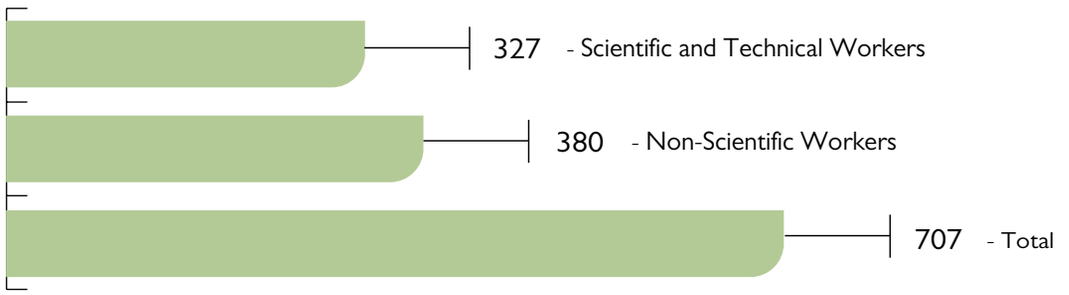
Sl. No.	Name
1	Shri Rajeswar Prasad Shaw

(ii) Non-Scientific Workers

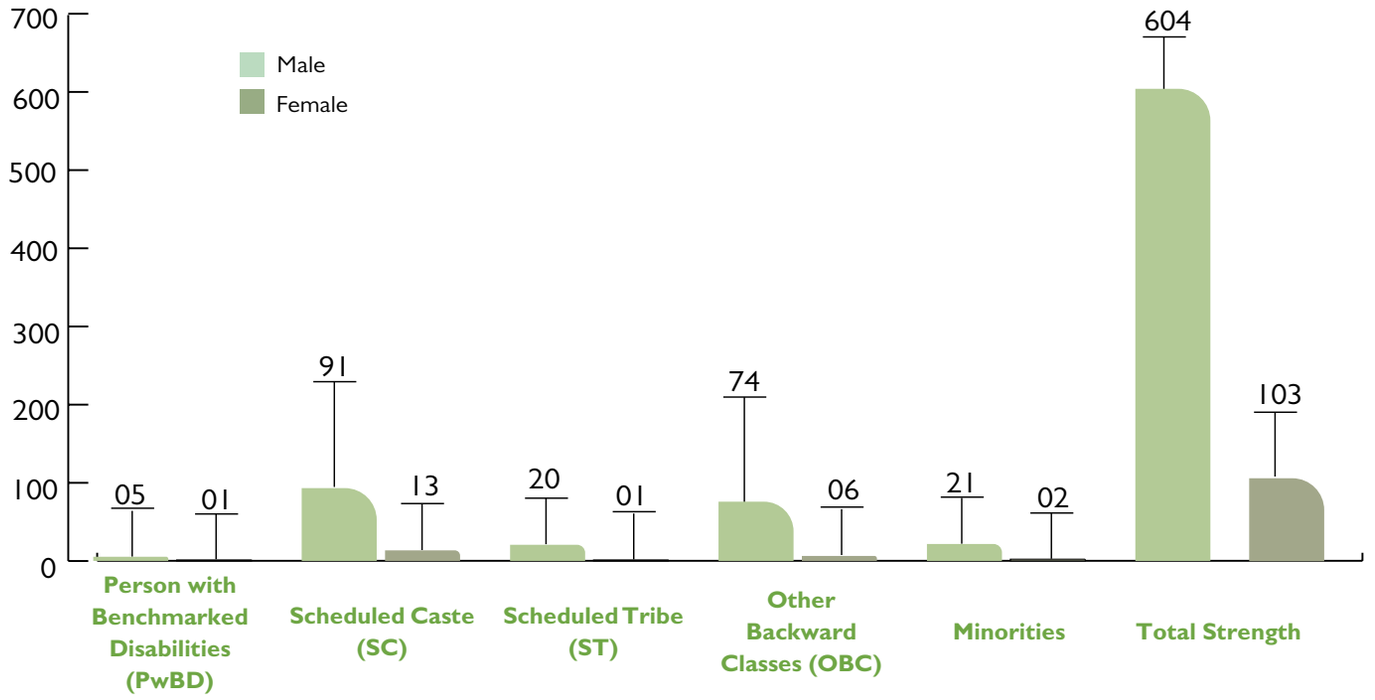
Sl. No.	Name
1.	Shri Dilip Hela
2.	Sm. Sarasamma B. Nair
3.	Sm. Ranjani Krishnamoorthy
4.	Sm. Khuku Rani Paul
5.	Shri Sanjay Shaw

8.4 Manpower by Gender, Social Category and Disability Group

A. Number of workers in the Institute as on 31st March 2021:



B. Breakup of manpower by Gender, Social Category and Disability group as on 31st March 2021



8.5 Annual Return on Cases of Sexual Harassment

1.	Number of complaints of sexual harassment received in the year	Nil
2.	Number of complaints disposed off during the year	Headquarters - 1
3.	Number of cases pending for more than 90 days	Nil
4.	Number of workshops on awareness programmers against sexual harassment conducted during the year	Giridih Branch-1
5.	Nature of action	Headquarter – *Suitable action taken as per Standing Service Order of the Institute*

8.6 Applications received and action taken by the Institute under RTI Act, 2005

Name of the Appellate Authority:

1. Prof. Sanghamitra Bandyopadhyay, Director, ISI, Kolkata.
2. Brig. Jagdish Narayan Pandey (Retd.), CE(A&F), ISI, Kolkata.
3. Dean of Studies.
4. Head, Delhi Centre.
5. Head, Bangalore Centre.
6. Head, North-East Centre.
7. Head, Chennai Centre.

Name of Central Public Information Officer:

1. Shri Samapan Padhi, Dy. CE (Admn.), ISI, Kolkata.
2. Shri Pratyush Banerjee, Dy. CE (Admn.), Delhi Centre.
3. Ms. Ashwini Ganesh Tambe, Dy. C.E (Admn.), Delhi Centre
4. Shri Anjan Mookherjee, Sr. AO, ISI, Kolkata.
5. Shri Durgam Giri, Sr. AO, ISI, Kolkata.
6. Shri Biju Mathew, Sr. AO, North-East Centre.
7. Shri R. Sridharan, AO, Chennai Centre.

The summary statement in this regard is given below: -

No. of Appli-cations received	No. of cases accepted	Decisions where requests were fully or partially rejected		No. of decisions from Appe-llate Authority	C I C decision			Amount collected (Rs.)		
		Fully rejec-ted	Partially rejected		No. of decisions received	Penalty imposed	Disciplinary action, if any	Fee	Other Charges	Penalty amount
147	141	05	01	20	NIL	NIL	NIL	2842	NIL	NIL

8.7 Major Construction / Repair works taken up by the Institute

A. Bangalore

CIVIL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
1.	Construction of New Academic Building	2,33,00,000/-
2.	Extension of Canteen Building	25,68,000/-
3.	"B" type Quarters for differently abled persons	9,000/-
	Work Complete	
1.	Rain water protection shed at Security Room	63,000/-

B. Chennai

CIVIL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
1	Gate for the site	2,52,000/-

C. Delhi

CIVIL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
1	Renovation work of Guest House	64,32,800/-
2	New Steel Structure of lift & Miscellaneous work near faculty block	23,50,000/-
3	Rehabilitation of Platinum Jubilee Hostel	2,48,86,500/-
	Work Complete	
1	Window Replacement work in 'A' and 'B' Block Flats	65,06,500/-

ELECTRICAL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
1	Supply Installation Testing and Commissioning of 500 KVA Transformer	17,17,793/-
2	SITC of LIFT in Faculty Block	24,34,879/-

D. Kolkata

Brief description of all work undertaken (Civil) at Kolkata Centre alongwith the costs incurred against work done in the table below.

CIVIL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
1	R.C. Bose Centre for Cryptology and Security	3,87,00,000/-
2	Construction of Academic Building (G+5)	4,00,00,000/-

Sl. No.	Description of work	Total Amount (Rs.)
	Work in progress	
3	Repair, Renovation work of M. Tech Hostel	1,86,00,000/-
	Work Complete	
1	Repair, Renovation work of R. A. Fisher Bhavan & S.N. Bose Bhavan	82,68,396/-
2	Repair Renovation of Staff Qtrs. at Rose villa Campus, Giridih, ISI	40,84,600/-

ELECTRICAL WORK

Sl. No.	Description of work	Total Amount (Rs.)
	Work completed	
1	Miscellaneous electrical works	2,11,632.00/-

8.8 Specific Achievements

8.8.1. Society Type Activities

A. Membership: (as on 31st March 2021)

Membership Type	Number of New Members	Number of Existing Members
Ordinary	------	318
Life	09	1067
Institutional	------	05
Total	09	1390

B. Finance Committee Meetings:

Sl. No.	Date	Venue
1.	4th June, 2020 (Virtual)	Conference Room of Director's Office
2.	21st December, 2020 (Virtual)	Conference Room of Director's Office

C. Council Meetings:

Sl. No.	Date	Venue
1.	9th June, 2020 (Virtual)	Conference Room of Director's Office
2.	4th September, 2020 (Virtual)	Conference Room of CSSC, S.N. Bose Bhawan
3.	29th September, 2020 (Virtual)	Conference Room of CSSC, S.N. Bose Bhawan
4.	22nd December, 2020 (Virtual)	Conference Room of CSSC, S.N. Bose Bhawan

Council Meeting held on 22nd December, 2020 at ISI, Kolkata

D. Annual General Meeting:

Sl. No.	Date	Venue
1.	GBM - 9th September, 2020 (Virtual)	Conference Room of C.S.S.C, S.N. Bose Bhawan
2.	AGM - 23rd December, 2020 (Virtual)	Conference Room of C.S.S.C, S.N. Bose Bhawan

Annual General Meeting held at ISI, Kolkata

8.8.2 Awareness programmes conducted by Medical Welfare Unit

Medical Welfare Unit caters to the health care need of the students, faculty, workers and their family members of Indian Statistical Institute, Kolkata.

- Two (02) full time Resident Medical Officers perform regular OPD services as well as emergency medical services.
- Specialist clinic of EYE, ENT and Psychiatry are held two days a week.
- Regular counselling sessions by Two (02) numbers of psychological counsellors are held two days a week.
- Retired staff and their spouses are provided medical care on OPD basis.
- Some essential medicines are supplied by the pharmacy of MWU.
- All workers both temporary and permanent and all students of ISI undergo medical fitness test in MWU by the Resident Medical Officers.
- Medical fitness certification camp is organized every year by the MWU for the newly admitted students to the Institute.
- During lockdown MWU functioned relentlessly to provide Medical support to all beneficiaries of the Institute both by physical consultation and by telephonic consultation. Helped their admission in hospital by tying up with nearby Hospital.
- House visit for several patients was done who was seriously ill.
- Spreading of awareness of COVID appropriate behaviour among student by Hostel visit when research Scholars & some student returned to campus.
- We at Medical Welfare Unit prepared the Standard Operating Procedure (SOP) of COVID-19 for the Institute with the guidance of SOP of State and Central Government.
- Counselling session for various worker/ staff regarding COVID Pandemic.
- Doctors of MWU looked after the hygiene and sanitation measures at ISI campus and conducted awareness campaign among house keeping staff regarding sanitation of ISI campus
- We trained the Security Personnel of ISI to check body temperature at entry points and trained them about sanitization measures to be taken at all entry points at ISI.

During lockdown MWU functioned restlessly to provide Medical support to all beneficiaries of the Institute both by physical consultation and by telephonic consultation. House visit for several patients was done who was seriously ill.

8.8.3 Training programme

Sl. No.	No of Participants	Topics	Venue	Duration
1	20	Familiarization with the newly introduced APAR System	Virtual (Through Webex)	September 23, 2020
2	30	Virtual workshop regarding Non-GeM Procurement (GFR 154)	PJA Auditorium	February 22, 2021

8.9 A brief description of specific achievements and functions related to the implementation of the Official Language Policy by the official language of the Institute

Bangalore Centre

A. Hindi Pakhwara:

Sl. No.	Date	Name of the Competition	No of participants
1	September 14-18, 2020	Hindi competition such as Virtual quiz of 5 categories towards reading, writing, grammar and sentence building quizzes.	5

Delhi Centre

B. Official Language Implementation Committee Members:

Sl. No.	Name	Designation
1	Prof. Samir Kumar Neogy	Head, Delhi Centre
2	Shri S.A. Srinivas	Sr. Administrative Officer
3	Smt. Simmi Marwah	Administrative Officer
4	Shri Lalan Kumar Singh	Section Officer (Accounts)
5	Shri Praveen Pandey	Senior Assistant (A/c)
6	Shri Amardeep	Office Assistant 'B'

C. Official Language Implementation Meeting:

Sl. No.	Date	Agenda
1	January 15, 2021 (By Google Meet App)	(1) Discussion on Hindi problem in Delhi Centre. (2) Discussion on the competition and budget to be organized to promote Hindi in the institute. (3) Consideration of recruitment and requirements of Hindi cadre employees. (4) Any other topic/suggestions

E. Hindi Workshop:

Sl. No.	Date	Subject	No of participants	Speakers
1	March 26, 2021	Understanding the nitty gritties of properly preparing and submitting Hindi Timahi Report.	About 20-25	Shri Karan Singh (Deputy Director) from Kendriya Hindi Prashikshan sansthan.

F. Hindi Pakhwara:

Sl. No.	Date	Name of the Competition	No of participants
1	September 22, 2020 (Forenoon)	Hindi Nibandh Lekhan Pratiyogita (Hindi Essay Writing Competition)	7
2	September 22, 2020 (Afternoon)	Hindi Aashubhashan Pratiyogita (Extempore Speech)	8
3	September 24, 2020 (Forenoon)	Hindi Kavita Paath Pratiyogita (Hindi Poetry Recitation Competition)	8
4	September 24, 2020 (Afternoon)	Hindi Anuwad Pratiyogita (Hindi Translation Competition)	8
5	September 25, 2020 (Forenoon)	Hindi Desh Bhagti Geet Pratiyogita (Hindi Patriotism Song Competition)	8

Kolkata

A. Official Language Implementation Committee Members:

Sl. No.	Name	Designation
1.	Prof. Sanghamitra Bandyopadhyay, Director	Chairman
2.	Prof. Preeti Parashar	Chairman (Acting)
3.	Prof. Amita Pal	Member
4.	Brigadier J.N. Pandey, Chief Executive (Admin. & Finance) Retd.	Member
5.	Shri Amitabh Mukherjee, Deputy Chief Executive (Finance)	Member
6.	Dr. Jadab Kumar Pal, Dy. Chief Executive (Adm.)	Member
7.	Shri Anjan Mukherjee, Senior Administrative Officer	Member
8.	Shri Pratyush Banerjee, Dy. Chief Executive (Adm.)	Member
9.	Shri Manoj Kumar Pandey, Senior Administrative Officer	Member-Convener
10.	Shri Durgam Giri, Senior Administrative Officer	Member
11.	Shri Raj Narayan Mukherjee, Administrative Officer	Member
12.	Shri Shounak Chakraborty, Administrative Officer	Member
13.	Shri Prashant Tiwari, Official Language Officer	Member

B. Official Language Implementation Committee Meeting:

Sl. No.	Date	Agenda
1	**July 28, 2020**	• Confirmation of the Minutes of the last Meeting. • Discussion on Hindi Quarterly Progress Report. • Discussion on the Official Language Annual Program Year 2020-21. • Discussion on extension of Hindi Language Training (Praveen, Pragya and Parangat). • Discussion on nominating workers to participate in Virtual Hindi Intensive Workshops. • Discussion regarding creation of permanent Hindi Posts. • Discussion regarding the organization of Hindi Diwas and Hindi Pakhwada Program. • Discussion on any other subject with the permission of the Hon'ble Chairman.
2	**September 29, 2020**	• Confirmation of the minutes of the last meeting. • Discussion on Hindi Quarterly Progress Report. • Discussion on the Official Language Annual Program Year 2020-21. • Discussion on extension of Hindi Language Training (Praveen, Pragya and Parangat) program. • Discussion on nominating workers to participate in Virtual Hindi Intensive Workshops. • Discussion on nomination for the training in "5 days Basic Training Program for working in Hindi on Computer". • Discussion on the extension of the inspection work related to the Implementation of Official Language. • Discussion on any other subject with the permission of the Hon'ble Chairman.
3	**December 30, 2020**	• Confirmation of the minutes of the last meeting. • Discussion on Hindi Quarterly Progress Report. • Discussion on the Official Language Annual Program Year 2020-21. • Discussion on extension of Hindi Language Training (Praveen, Pragya and Parangat). • Nomination of workers to participate in Virtual Hindi Intensive Workshops. • Discussion regarding creation of permanent Hindi posts. • Discussion to be nominated for training in five half working days Virtual Oriented Program. • Discussion on any other subject with the permission of the Hon'ble Chairman.
4	**March 30, 2021**	• Confirmation of the minutes of the last meeting. • Discussion on Hindi Quarterly Progress Report. • Discussion on the Official Language Annual Program Year 2020-21. • Discussion on extension of Hindi Language Training (Praveen, Pragya and Parangat). • Discussion on nominating workers to participate in Virtual Hindi Intensive Workshops. • Discussion regarding creation of permanent Hindi posts. • Discussion on organizing 05 days Short Translation Training (outreach) Program in the Institute by Central Translation Bureau, Department of Official Language, Ministry of Home Affairs, Government of India, Kolkata Centre. • Discussion on any other subject with the permission of the Hon'ble Chairman.

C. Hindi Workshop:

Sl. No.	Date	Subject	No of participants	Speakers
1	August 28, 2020	"The changing nature of language in the Covid period"	23	**Chief Guest Speaker**: Dr. Vijeta Shaw, Former Lecturer, Rabindra Bharati University, Kolkata
2	September 14, 2020	"Increasing importance of Hindi in the 21st century : In context to Technology, Education and Industrialization"	30	**Chief Guest Speaker:** Dr. Sandeep Awasthi, PhD, Hindi, Honorary D. Lit, Educationist, Writer and Critic, Bhagwant University, Ajmer, Rajasthan.
3	December 30, 2020	**First Session:** Rajbhasha ke lakshya: Main Praapt kar sakta hoon" **Second Session:** Paribhashik Shabdawali ke Nirmaan ki Prakriya evam Prayog	35	**Chief Guest Speaker**: Shri Naveen Prajapati, Senior Consultant (Official Language) and In-charge, Kolkata Centre, Central Translation Bureau, Department of Official Language, Ministry of Home Affairs, Government of India. **Chief Guest Speaker**: Dr. Vijeta Shaw, Former Lecturer, Rabindra Bharati University, Kolkata
4	March 31, 2021	**First Session:** The Status and Direction of Official Language Implementation in present scenario" **Second Session:** Accurate Hindi Writing in Official Correspondence	30	**Faculty**: Sri Nirmal Dubey, Assistant Director (Implementation) and In- charge, Kolkata Centre, Regional Implementation Office, Department of Official Language, Ministry of Home Affairs, Government of India **Chief Guest Speaker**: Dr. Vijeta Shaw, Former Lecturer, Rabindra Bharati University, Kolkata

D. Hindi Pakhwara:

Sl. No.	Date	Name of the Competition	No of participants
1	September 14, 2020	Inauguration of Hindi Diwas, Hindi Pakhwada & Hindi Workshop	30
2	September 15, 2020	Hindi Debate Competition	11
3	September 16, 2020	Hindi Poem Recitation Competition	15
4	September 17, 2020	Hindi Extempore Competition	16
5	September 18, 2020	Hindi Patriotic Song Singing Competition	13
6	September 21, 2020	Hindi Speech Competition (Official Language in Governance-Administration)	14
7	October 16, 2020	Hindi Fortnight Closing & Prize Distribution Ceremony	30 (approx.)

Inauguration of Hindi Pakhwara by Prof Preeti Parashar at ISI, Kolkata

Hindi Extempore Competition during Hindi Pakhwara at ISI, Kolkata

Chief Executive (A&F) awarding workers during Hindi Pakhwara Prize Distribution Ceremony at ISI, Kolkata

E. Any other special Workshop/ Training Programme:

Sl. No.	Date	Subject	No of participants	Speaker/ Organizer
01.	March 15, 2021 – March 19, 2021	Virtual Oriented Program	02	Central Hindi Training Institute, Department of Official Language, Ministry of Home Affairs, Government of India, New Delhi.
02	February 22, 2021 – February 26, 2021	Five Days Virtual Translation Training Program	02	Central Translation Bureau, Department of Official Language, Ministry of Home Affairs, Government of India, Kolkata.
03.	September 16, 2020	Virtual meeting of Town Official Language Implementation Committee	02	Town Official Language Implementation Committee, Department of Official Language, Ministry of Home Affairs, Government of India, Kolkata.
04.	January,2021 – May, 2021	Organization of Classes for Hindi Language Training (Praveen, Pragya, Parangat)	25 (Praveen, Pragya, Parangat)	Hindi Teaching Scheme, Department of Official Language, Ministry of Home Affairs, Government of India, Kolkata.

8.10 Reports on various activities of the Institute

A. Celebration of Independence Day

Kolkata;

Indian Statistical Institute observed the 74th Independence Day on 15th August, 2020 by hoisting the National Flag in the Institute premises. Due to the pandemic situation, participation was restricted. Those who participated, maintained social distancing and observed the day with due respect.

Tezpur:

The national flag was hoisted at the North-East Centre of the Institute on the occasion of the 74th Independence Day on 15th August, 2020 by Mr. Biju Mathew, Sr. Administrative Officer, North-East Centre.

B. Celebration of Republic Day

Kolkata:

To mark the 72nd Republic Day of India, the Institute organized a National Flag hoisting ceremony. Workers with their families, research scholars, students, guests and dignitaries were present to make the event a grand success.

Tezpur:

The North-East Centre celebrated 72nd Republic Day on 26th January, 2021. The national flag was unfurled by Dr. H. S. Chungkham, Associate Professor, Applied and Official Statistics Unit, North-East Centre.

Celebration of the 72nd Republic Day of India at ISI, Kolkata

Celebration of the 72nd Republic Day of India at ISI, North-East Centre, Tezpur

C. Celebration of Birth Anniversary of Prof. P. C. Mahalanobis

Giridih:

Birthday of Prof. P.C Mahalanobis was celebrated but unlike last year, the celebration was a low key affair due to the Covid situation prevailing in the country. The occasion was graced by SP, Giridih Shri Surendra Jha . Faculty members and scholars highlighted various works of Prof. Mahalanobis and his immense contribution towards the economic development of our nation. In-Charge, Giridih felicitated SP, Giridih and the program ended with a thanksgiving ceremony.

Kolkata:

Indian Statistical Institute celebrated the 127th Birth Anniversary of Professor P.C. Mahalanobis on 29th June, 2020 as 'Workers' Day' and 'Statistics Day'. Due to the COVID-19 situation, physical participation was restricted and the programme was majorly celebrated through Virtual mode for which a link was shared to all the workers. Apart from the speech of President ISI, Chairman ISI Council and Secretary MoS& PI, Prof. Malay Ghosh from Florida University and Shri Jawahar Sarkar also joined to share their thoughts. Afterwards a short Film on Prof. Mahalanobis was also broadcast to grace the event.

Pune:

Events organised on 29th June, 2020 on the event of the birth anniversary of Prof. Prasanta Chandra Mahalanobis. It was an online deliberation as the country went in lockdown. We deliberated the contributions of Professor Mahalanobis and Indian Statistical Institute in nation building. Prof. Ashis K. Chakraborty of ISI, Kolkata and Mr. Sachin Satpute, Director, Eduplusnow, VIT, Pune participated in the discussions

Tezpur:

The workers at the North-East Centre observed the 127th birth anniversary of Prof. P. C. Mahalanobis and National Statistics Day on 29th June, 2020 by paying homage to the founder of the Institute.

Address by Shri Bibek Debroy, President ISI on 127th Birth Anniversary of Prof. P. C. Mahalanobis

Celebration of 127th Birth Anniversary of Prof. P. C. Mahalanobis at ISI, Kolkata

D. Celebration of International Yoga Day

Kolkata:

Indian Statistical Institute in association with ISI Club organized International Yoga Day on 21st June, 2020. Due to the pandemic situation, workers were encouraged to observe the event independently without compromising the Covid guidelines like social distancing etc. This effort was well received by the workers of the Institute.

Celebration of 90th Foundation Day of the Institute at Kolkata

E. Celebration of Foundation Day

Kolkata:

The 90th Foundation Day of the Institute was celebrated on 17th December, 2020.Due to the pandemic situation, it was celebrated Virtual through video conferencing mode. A short film on Prof. P. C. Mahalanobis was broadcast by the Reprography and Photography Unit of the Institute followed by lectures of Prof. Bhramar Mukherjee (Michigan University) and Prof. Siva Athreya (ISI).

Public lecture delivered by Prof Siva Athreya on 90th Foundation Day of ISI

F. Celebration of International Women's Day

Kolkata:

The Institute celebrated International Women's Day on 8th March, 2021 in virtual platform. Professor Pradipta Bandyopadhyay, Professor Amita Pal and Professor Debasis Sengupta participated in a discussion on "Perspective on underrepresentation of women in ISI: Issues and Solution". Dr. Manoshi Mitra Das, Professor Sanjukta Dasgupta, Professor Swati Patankar and Professor Subhamoy Maitra took part in the Panel discussion on "Gender Stereotypes in Higher Education : Maladies and Remedies". Prof. Madhura Swaminathan played the role of a Moderator. Dr. Manju Sharma, Padma Bhusan (ICMR Emeritus Professor & Ex-Dean, Bose Institute) delivered a special speech whereas Dr. Tanya Das performed to celebrate the occasion. Dr. Sarbani Palit concluded the event with a vote of thanks. Dr. Soumyanetra Munshi, Economic Research Unit, ISI and Professor Sanghamitra Bandyopadhyay were also present and participated in the event.

International Women's Day Celebration

G. Birth Anniversary celebration of B.R. Ambedkar

Kolkata:

The SC/ST/BC Employees' Co-ordination Council of Indian Statistical Institute celebrated the 129th Birth Anniversary of Dr. B.R. Ambedkar on 14th April, 2020. The Deputy Director and officials from SC/ST/BC Co-ordination Council, ISI, graced the event. A Seminar on "Reservation in the present situation and thoughts of Dr. B.R. Ambedkar' was arranged on 10th March 2021 in the New Academic Building of the Institute. Deputy Director of the Institute Prof. Dipti Prasad Mukherjee presided over the programme and Shri Sukriti Ranjan Biswas was present as the Guest Speaker. Participants included faculty, non-faculty, research scholars etc. who solely remembered Dr. B.R. Ambedkar and his contribution for the country. Later ISI Club arranged a cultural programme, consisted of a drama "Ganga-Nadir Shrot" and vocal performance by Mrs. Mita Kundu.

Celebration of 129th Birth Annivesary of B.R. Ambedkar at ISI, Kolkata

H. Observation of Vigilance Awareness Week

Kolkata & Bangalore:

The Vigilance Awareness Week was observed in the Institute from 27th October to 2nd November, 2020. In this occasion a seminar was organised at Kolkata, head quarters of the Institute. Integrity pledge was undertaken by the workers of the Institute.

The Director, ISI addressing the workers of ISI during the seminar on Vigilance Awareness

Integrity pledge undertaken by the workers of ISI

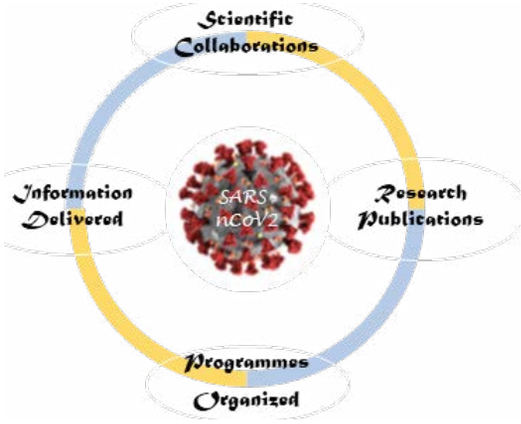
CHAPTER 09

RESPONSE OF ISI TO COVID-19

Glimpse of Activities

The World Health Organization (WHO) declared thenovel coronavirus (COVID-19) outbreak, caused by SARS-CoV, a global pandemic on March 11, 2020. Thelockdown imposed in our country from 24 March to 14 April, 2020 (further extended until 3 May, 2020) affected all - regardless of caste, gender or income. The pandemic also had a severe impact on all academic institutions whichwitnessed a complete shutdown in response to lockdown measures. Throughout this crisis, the researchers and staff members of the Indian Statistical Institute (ISI), across all locations, have also contributed to seeking solutions by using their expertise in various domains for meeting the intrinsic needs of the society at large. The Institute members have come forward with financial help to run a community kitchen for the Covid distressed people of nearby localities.

This report comprises a list of COVID-19 related activities of the ISI community under four broad sub-sections, that have been undertaken during the reporting year, as we continue to learn and cope with this global health crises.



9.1 Scientific Collaborations

Dr. Ansuman Banerjee (ACMU, Kolkata) pursued collaborative research with the scientists of Research Center Imarat, DRDO, Government of India, for the software specification and design of a VEntilator Multiplexing Adapter (VEMA) system for COVID patients.

Professor Arup Bose (TSMU, Kolkata) served as a Member of the *Consultative Committee for Covid 19 National Super Model,* formedunder the aegis of the Department of Science and Technology (DST), Govt. of India and the Science and Technology Research Board (SERB), with Prof. M. Vidyasagar as the Chairman. He further collaborated with Professor MadhuchhandaBhattacharjee of the School of Mathematics and Statistics, the University of Hyderabad as a part of Professor Bhattacharjee's DST funded MATRICS Special Covid-19 project *Spatio-Temporal Modelling and Analysis of COVID19: A domestic and global perspective (August 2020—July 2021).* Their findings obtained so far have been collected in the article *Modelling COVID-19-IA dynamic SIR(D) with application to Indian data*, to appear in the *Journal of Indian Statistical Association.* They propose a parsimonious dynamic SIR(D) model for COVID-19 data which is adapted in a manner similar to non-parametric curve fitting. A webpage has been built in connection with this project. Intermediate estimation and prediction results are being periodically updated and uploaded. It is hosted at https://sites.google.com/view/m-bhattacharjee/home/covid19-modelling-and-analyses

Dr. Malay Bhattacharyya (MIU, Kolkata)isserving as a member of *The Lancet COVID-19 Commission: India Task Force*, to provide policymakers with pragmatic, action-oriented recommendations for alleviating the COVID-19 problems. This task force has already published recommendations on how to suppress the second COVID-19 wave in India with country-wide containment strategies, address the humanitarian crises arising from the pandemic, and combat the financial and economic crises resulting from the pandemic.

He is involved in a modeling project entitled "*Network-Based Prediction of COVID-19 Spread in India under Migration*", sponsored by the Science and Engineering Research Board (SERB), Department of Science and Technology, Government of India. His model aims to understand how the migration between states affects the spread of infectious diseases like COVID-19 within India. This helps to predict the spread of COVID-19 in India under migration.With interstate network analysis, by defining the distance between states in the form of shortest path distance within the interstate connectivity network, we predict day-wise count of COVID-19 infection in India. On further studying the network parameters, we observed that degree of a node has a higher significance on the increase of COVID-19 spread than the between centrality.Dr. Bhattacharyya has been involved in several COVID-19 research studies related to understanding the risks of antimicrobial resistance evolution due to uncontrolled drug practices during the pandemic and the effect of this pandemic on the mental health of Indians.

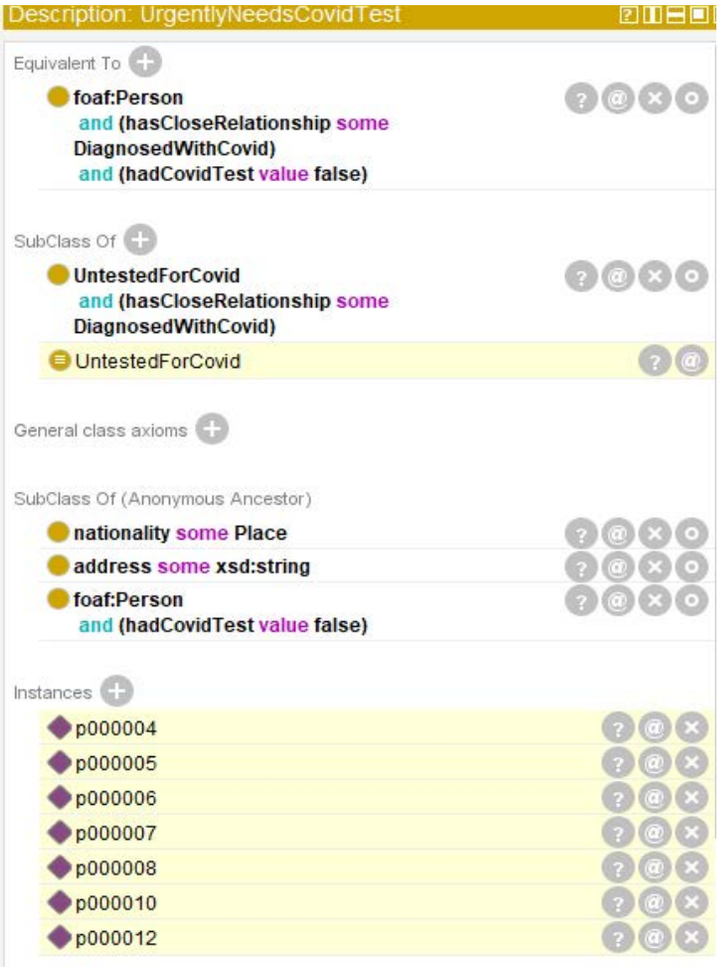
Professor Rajat K. De (MIU, Kolkata) reviewed the role of artificial intelligence (AI) in the identification, diagnosis and spread of SARS-CoV-2 virus. Here, they observed that AI-based image processing techniques had a colossal application in the detection of COVID-19 pneumonia in patients based on chest x-ray, chest computed tomography (CT) and chest high resolution computed tomography (HRTC) images. Further, AI-based predictive models had shown potential in the identification of effective drugs molecules, repurposing of which might help in the treatment of COVID-19 disease. Here, based on literature reviews and an auto-encoder-based deep learning methodology, they had identified Mozenavir, Oseltamivir and Di-hydro-artemisinin as probable drug molecules that might be effective in the treatment of SARS-CoV-2 virus. Studies have reported vitamin D3 and anti-parasitic drug ivermectin to be associated in the treatment of COVID-19 infection. Here, they have analyzed the available structure of SARS-CoV-2 virus and through knowledge-based docking, and identified probable binding sites for vitamin D3 and ivermectin. It thus opens up new avenues for repurposing of these drug molecules as potential drugs against SARS-CoV-2 viral infection.

Prof. Siva Athreya, (TSMU, Bangalore) collaborated with the Health Commissioner to help the Department of Health and Family Welfare Services, Government of Karnataka with:

- Error Correction tool (Used by DHFWS): To build a database tool for data reported by various districts from the line list data of COVID-19 positive patients. The health department was able to capture errors and rectify them in a timely manner.
- KA-Weekly District Prediction (IISc/INDSCI-SIM/JNCASR/CSIR): As requested by MDHNM they built an ensemble model for weekly Districtwise prediction. This is still on going at:
- https://www.isibang.ac.in/~athreya/incovid19/wp
- Swabs to Lab Allocation Engine and Hackathon (IISc-ISI): As requested by MDHNM they built an automated tool to assign labs to swabs collected at various collection agencies across the state. We also organised a hackathon competition as well.
- Sero-Surveillance: They were invited to be part of the Karnataka sero-surveillance committee to design, conduct and provide analysis for serological surveys in the state. They have completed one round of serological surveys and the second round is ongoing.

Prof. Bidyut Roy (retired, HGU, ISI),Prof. Pabitra Pal Choudhury (retired, ASU, ISI) and *Sk Sari f Hassan (Pingla Thana Mahavidyalaya, PaschimMedinipur*) conducted research on the Study of mutations inSARS-CoV-2 virus proteins and prediction of its implications in pathogenicity where they studied mutations in *E-protein, ORF3a,ORF6, ORF7b* and *ORF10*in this virus extracting genome sequences from NCBI database as of the year, 2020.

Dr B Dutta (DRTC, Bangalore) in collaboration with DeBellis, M. developed CODO, a formal Ontology for collection and analysis of COVID-19 data which provides a standard-based open-source model that facilitates the integration and automatic machine interpretation of the data from heterogeneous data sources. The ontology has been expressed in OWL DL. The goal of the ontology was to collect data about the pandemic so that researchers could answer questions, for example about infection paths based on information about relations between patients, geography, time, co-morbidities, etc. The developed ontology can be used by the various agencies, namely doctors, hospitals, policy-makers, Govt. agencies, application developers, etc. for various purposes, such as for developing applications, like search, question-answering systems, risk detection system; for document annotation; for developing knowledge graph, etc. The ontology was designed by analyzing disparate COVID-19 data sources such as datasets, literature, services, Govt. published COVID-19 guidelines, WHO literature, etc. The initial CODO v1.0 model is depicted in Figure 1. Figure 2 shows an example of a formal representation of a class "UrgentlyNeedsCovidTest" The latest CODO v1.3 is available from https://www.isibang.ac.in/ns/codo/.



9.2 Research Publications

Books

Chakraborty, P., **Maitra, S**., **Nandi, M**., &Talnikar, S. (2020). *Contact Tracing in Post-Covid World*. Springer Singapore, 135p. https://doi.org/10.1007/978-981-15-9727-5 [ASD]

Afridi, F., Dhillon, A., & Roy, S. (2021). *Livelihoods and Mental Well-being during Covid-19: Evidence from India in-progress book chapter commissioned by UNU-WIDE*. Oxford University Press.

Conference Proceedings

Basu, S., **Mitra, S.**, &Saha, N. (2020, December). Deep Learning for Screening COVID-19 using Chest X-Ray Images. *2020 IEEE Symposium Series on Computational Intelligence (SSCI)*. https://doi.org/10.1109/SSCI47803.2020.9308571

Dutta, B., &DeBellis, M. (2020). CODO: An Ontology for Collection and Analysis of Covid-19 Data. *Proceedings of the 12th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management*. https://doi.org/10.5220/0010112500760085

Journal Articles

Nadim, S. S., &**Chattopadhyay, J.** (2020). Occurrence of backward bifurcation and prediction of disease transmission with imperfect lockdown: A case study on COVID-19. *Chaos, Solitons & Fractals*, *140*, 110163. https://doi.org/10.1016/j.chaos.2020.110163

Sardar, T., Nadim, S. S., Rana, S., &**Chattopadhyay, J.** (2020). Assessment of lockdown effect in some states and overall India: A predictive mathematical study on COVID-19 outbreak. *Chaos, Solitons & Fractals*, *139*, 110078. https://doi.org/10.1016/j.chaos.2020.110078

Nadim, S. S., Ghosh, I., &**Chattopadhyay, J.** (2021). Short-term predictions and prevention strategies for COVID-19: A model-based study. *Applied Mathematics and Computation*, *404,* 126251. https://doi.org/10.1016/j.amc.2021.126251

Paul, A., Reja, S., Kundu, S., &**Bhattacharya, S.** (2021). COVID-19 pandemic models revisited with a new proposal: Plenty of epidemiological models outcast the simple population dynamics solution. *Chaos, Solitons & Fractals*, *144,* 110697. https://doi.org/10.1016/j.chaos.2021.110697

Aruru, M., Gurewitsch, R., Das, S., Ghosh, P., Sen, B., **Mukhopadhyay, I.**, &Pyne, S. (2020). A data-driven approach to COVID-19: Resources, policies, and best practices. *BLDE University Journal of Health Sciences*, *5*, 226–231.

Ahmed, N., Michelin, R. A., Xue, W., **Ruj, S.**, Malaney, R., Kanhere, S. S., Seneviratne, A., Hu, W., Janicke, H., &Jha, S. K. (2020). A Survey of COVID-19 Contact Tracing Apps. *IEEE Access*, *8*, 134577–134601. https://doi.org/10.1109/ACCESS.2020.3010226

Madalli, D. P., Sagar, B. G., Gopalji, ., & Kumar, A. A. (2020). A model for survival rate projection of Covid 19 patients. *Research Square*. https://doi.org/10.21203/rs.3.rs-28560/v2

Krishnamurthy, M., Bhalachandra, S. D., &Sajana C. (2020). Scientometrics analysis of recent trends in Global Corona virus Research. *Research Square*. https://doi.org/10.21203/rs.3.rs-43995/v1

Afshinnekoo, E., Bhattacharya, C., Burguete-García, A., Castro-Nallar, E., Deng, Y., Desnues, C., Dias-Neto, E., Elhaik, E., Iraola, G., Jang, S., Łabaj, P. P., Mason, C. E., Nagarajan, N., Poulsen, M., Prithiviraj, B., Siam, R., Shi, T., Suzuki, H., Werner, J., … **Bhattacharyya, M.** (2021). COVID-19 drug practices risk antimicrobial resistance evolution. *The Lancet Microbe*, 2(4), e135–e136. https://doi.org/10.1016/S2666-5247(21)00039-2

Pal, Jiban K. (2021). Visualizing the knowledge outburst in global research on COVID-19. *Scientometrics*, *126*(5), 4173–4193. https://doi.org/10.1007/s11192-021-03912-3

Kapoor M., Malani, A., Ravi, S., & Agrawal, A. (2020). Authoritarian Governments Appear to Manipulate COVID Data. *ArXiv*. https://arxiv.org/abs/2007.09566v1

Niyati, S., and Nelson Mandela, S. (2020), "Impact of the Pandemic on Accredited Social Health Activists (ASHA) in India,"*Review of Agrarian Studies,* vol. 10, no. 1, available at http://ras.org.in/61365ac2c2e523ec464847dbf0cbf4a5

Niyati, S., and Vijayamba, R. (2021), "Impact of the Covid-19 Pandemic on Food Security and Indebtedness in Rural India,"*Review of Agrarian Studies,* vol. 1, no. 3, available at http://ras.org.in/81c003cb981c02b9505b36fd24719f34

Singh, Tapas Modak, and Bhattacharya, Soham (2021), "The Covid-19 Pandemic and Agriculture in Rural India: Observations from Indian Villages," *Review of Agrarian Studies*, vol. 1, no. 3, available at http://ras.org.in/718c8ab7a88f7d4194c895870 1507f63

Singh, Tapas Modak, Baksi, Sandipan, and Johnson, Deepak (2020), "Impact of Covid-19 on Indian Villages," *Review of Agrarian Studies*, vol. 10, no. 1, available at http://ras.org.in/d1f1c91f41c51238d19a505303ce14eb

Siva Artheya, *Nitya Gadhiwala and Abhiti Mishra Effective Reproduction Number and Dispersion under Contact Tracing and Lockdown on COVID-19 in Karnataka https://www.medrxiv.org/content/10.1101/2020.08.19.20178111v1*

Basak, Gopal K., Chakraborty, Chandramauli, and Das, Pranab Kumar (2021). **Optimal Lockdown Strategy in a Pandemic: An Exploratory Analysis for Covid-19 (preprint).** arXiv:2109.02512v1 **[math.DS]** .

Journal (editorial)

R. Ramakumar and MadhuraSwaminathan (eds.) The Impact of the Covid-19 Pandemic, In Focus section of *Review of Agrarian Studies*, 10, 1, 2020.

M. Swaminathan co-edited a special issue of the *Review of Agrarian Studies* journal that examined the impact of Covid-19 and associated lockdown on rural India, http://www.ras.org.in/index.php?id=HomePage

Published Reports

Bansal, Gaurav, and Bhattacharya, Soham (2020), "Situation Assessment Report during the COVID-19 Lockdown: A Report from Hakamwala and Tehang Villages in Punjab," in *SSER Reports on Indian Villages - Impact ofCovid-19 Policies in India*, Society for Social and Economic Research, New Delhi, available athttps://coronapolicyimpact.org/2020/04/20/hakamwala-tehang/

Niyati, S., and Vijayamba, R. (2020), "Situation Assessment Report from Alabujanahalli (Mandya) and Siresandara (Kolar) in Karnataka," in *SSER Reports on Indian Villages - Impact ofCovid-19 Policies in India*, Society for Social and Economic Research, New Delhi, available at https://coronapolicyimpact.org/2020/04/07/alabujanahall-siresandara/

The paper of **Prof A. Rajagopal, Former Head, SQC & OR Unit, Coimbatore** on AI, MI Based informed decision support model of soft ware prepared with one paper as IPR PUBLISHED IN GOVT GAZATTTEE and is accepted all 4 papers for royal college of OBSTETTRICS AND GYNEACOLGY WORLD CONGRESS -June 9th to June 12th 2021 - among 5000 papers submitted - about 750 papers accepted in poster- my all 4 papers are accepted

Newspaper articles/Media Reports

Niyati, S., and *Vijayamba, R.* (2020), "**COVID-19 in Rural India–II: 'I Had to Sell Cocoon @Rs 150/kg,Instead of Rs 500/kg**," *Newsclick*, April 7, 2020 available at https://www.newsclick.in/COVID-19-Rural-India-Sell-Cocoon-Rs-150-kg-Instead-%20Rs%20500-kg, viewed on May 13, 2021.

The twisted tale of a pandemic By *DipankarDasgupta* / April 08, 2020 https://www.telegraphindia.com/opinion/coronavirus-the-covid-19-crisis-globalisation-and-global-economy/cid/1762950

Covid-19: Online classes and the digital divide By*AbhiroopMukhopadhyay*09 April, 2020 https://www.ideasforindia.in/topics/poverty-inequality/covid-19-online-classes-and-the-digital-divide-during-the-times-of-corona1.html

Math model predicts slow Covid win with localised lockdownby*Saibal Sen* / Apr 15, 2020 https://timesofindia.indiatimes.com/city/kolkata/math-model-predicts-slow-covid-win-with-localised-lockdown/articleshow/75149806.cms

Swaminathan, Madhura, and *Johnson, Deepak* (2020), "**Kerala's approach to containing Covid**," *Business Standard*, April 22, 2020 available at https://www.business-standard.com/article/opinion/kerala-s-approach-to-containing-corona-120042200026_1.html, viewed on May 31, 2020.

North Calcutta Kitchen for footpath toilers: ISI, Presidency and CU students provide ration to pavement dwellers By SubhankarChowdhury,Calcutta, April 27, 2020 https://www.telegraphindia.com/calcutta/coronavirus-lockdown-north-calcutta-kitchen-for-footpath-toilers/cid/1768329

Bansal, Gaurav, and *Bhattacharya, Soham*(2020a), "**COVID-19 in Rural India XIX: Punjab Villages Face Double Brunt of Lockdown and Curfew**," *Newsclick*. April 21, available at https://www.newsclick.in/COVID-19-Rural-India-Punjab-Villages-Face-Double-Brunt-Lockdown-Curfew, viewed on May 12, 2021.

Need a cost-effective sampling strategy to estimate Covid-19 cases : By *Atanu Biswas*, Last Updated at May 9, 2020 https://www.business-standard.com/article/current-affairs/need-a-cost-effective-sampling-strategy-to-estimate-covid-19-cases-120050901130_1.html

Silicon Valley plots for post-CovidboomTNN | Updated: May 12, 2020 https://timesofindia.indiatimes.com/city/kolkata/silicon-valley-plots-for-post-covid-boom/articleshow/75684907.cms

Bansal, Gaurav, and *Bhattacharya, Soham* (2020b), "**Harvesting Misery**," *Frontline*, print edition, May 22, 2020 available at https://frontline.thehindu.com/cover-story/article31535013.ece , viewed on May 12, 2021.

Bhattacharya, Soham, and *Dam, Tinanjali* (2020), "**India's Digital Divide: Who Faces It and How Wide Is It?**" with Tinanjali Dam, *Newsclick*, July 18, 2020 available at https://www.newsclick.in/india-digital-divide-who-faces-how-wide-it , viewed on May 13, 2021.

Bhattacharya, Soham (2020), "**Research Debunks India's Low Covid Fatality Rate**," *The Federal*, September 12,2020 available at https://thefederal.com/covid-19/research-debunks-claim-of-indias-low-covid-fatality-rate/, viewed on May 13, 2021.

Johnson, Deepak (2021), "**The Kerala alternative**," *Frontline*, print edition, January 1, available at https://frontline.thehindu.com/cover-story/kerala-government-policy-interventions-in-terms-of-expanding-price-support-and-ensuring-direct-procurement-of-farm-produce-present-an-alternative-course-for-agricultural-policies-in-india/article33319094.ece?homepage=true, viewed on May 13, 2021.

Swaminathan, Madhura (2020a) "**Reset rural job policies, recognise women's work**," *The Hindu*, July 4, 2020.

Swaminathan, Madhura (2020b), "**The majority cannot afford a balanced diet**," *The Hindu*, July 28, 2020.

Academicians suggest PM to recruit science graduates, use biology labs in fight against COVID-19 https://economictimes.indiatimes.com/news/politics-and-nation/academicians-suggest-pm-to-recruit-science-graduates-use-biology-labs-in-fight-against-covid-19/articleshow/75290129.cms

Real-time forecasts and risk assessment of novel coronavirus (COVID-19) cases: A data-driven analysis By *Tanujit Chakraborty, Indrajit Ghosh* doi: https://doi.org/10.1101/2020.04.09.20059311 https://www.medrxiv.org/content/10.1101/2020.04.09.20059311v1.article-info

COVID-19: A Way to Test More People With Fewer Kits *By Atanu Biswas* https://science.thewire.in/the-sciences/covid-19-a-way-to-test-more-people-with-fewer-kits/

If COVID-19's Symptoms Are Milder Than SARS, the Fight Is Harder *By Atanu Biswas* / April 04, 2020 https://science.thewire.in/the-sciences/if-covid-19s-symptoms-are-milder-than-sars-the-fight-is-harder/

Statewide lockdown should continue past April 30: Study by ISI Kolkata https://www.hindustantimes.com/mumbai-news/statewide-lockdown-should-continue-past-april-30-study/story-q6ijHlSAHkoMxyIz4Nq66O.html

Lockdown Effect? Data Reveals Minor Flattening of Covid-19 Growth Curve in India https://www.news18.com/news/india/lockdown-effect-a-minor-flattening-of-covid-19-growth-curve-in-india-2576245.html

Indian Scientists Issue Statement on Pandemic, Call for 'Cooperation', 'Humanity' https://science.thewire.in/the-sciences/indian-scientists-statement-coronavirus-pandemic-government-research-vaccine-misinformation/

By ISI Alumni

India's lockdown was needed: US Academic By *Amit Roy* / April 2, 2020 https://www.easterneye.biz/indias-lockdown-was-needed-us-academic/

India's lockdown politics - In India, the right-wing establishment uses Covid-19 to further its divisive agenda against minorities and the marginalized By *Mihir S Sharma* / April 13, 2020 https://www.ips-journal.eu/regions/asia/article/show/indias-lockdown-politics-4254/

Coronavirus lockdown | Perth, the lone perk for a stranded Chennai resident By *Bishwanath Ghosh*, Kolkata, April 27, 2020 https://www.thehindu.com/news/national/coronavirus-lockdown-perth-the-lone-perk-for-a-stranded-chennai-resident/article31447695.ece

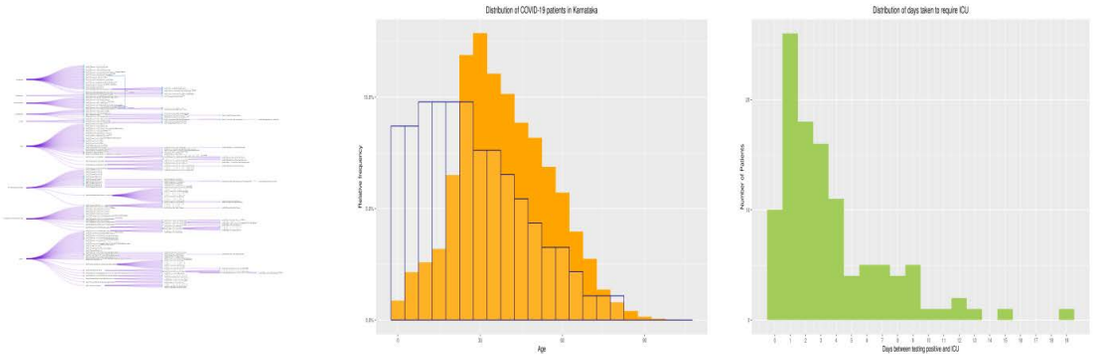
Indian Maths Genius Who Debunked Euler's Theory, Made it to NYT Front Page Dies at 103 By *JaideepHardikar*, LAST UPDATED: May08, 2020 https://www.news18.com/news/opinion/indian-maths-genius-who-debunked-eulers-theory-made-it-to-nyc-front-page-dies-at-103-2611193.html

An attempt- Detection of COVID-19 presence from Chest X-ray scans using CNN & Class Activation Maps By *Souradip Chakraborty* https://towardsdatascience.com/detection-of-covid-19-presence-from-chest-x-ray-scans-using-cnn-class-activation-maps-c1ab0d7c294b

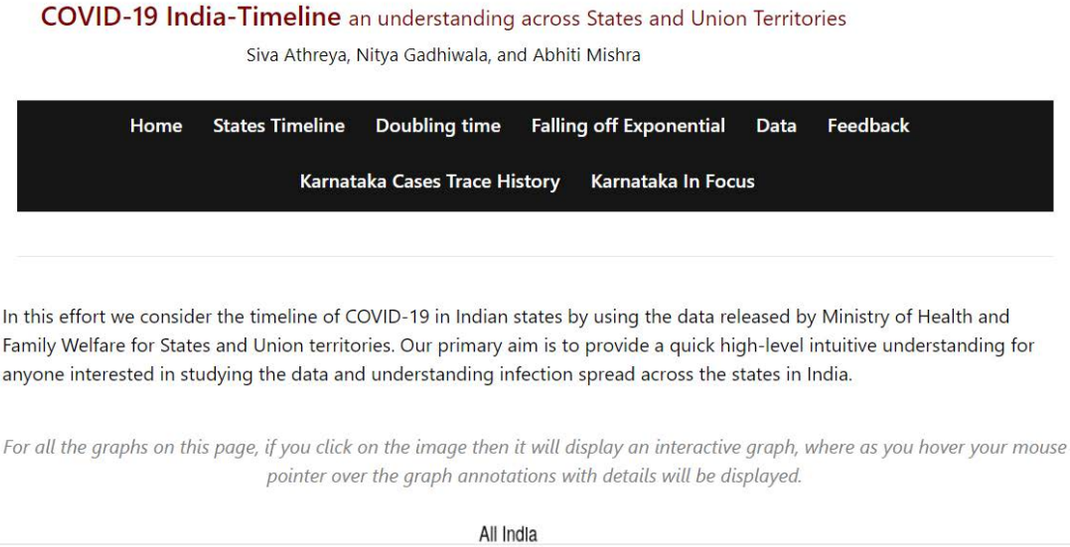
9.3 Information Delivered

- The Institute has created a resource page (under the supervision of Dr. Malay Bhattacharyya) to collate all the contributions from the researchers who are working on COVID-19 at ISI. This is available here: https://www.isical.ac.in/~covid19.

- Prof. Siva Athreya, TSMU, Bangalore has developed a **Covid Time Line &Data Repository Portal (**https://www.isibang.ac.in/~athreya/incovid19) by using the data released by Ministry of Health and Family Welfare for States and Union territories to provide a quick high-level intuitive understanding for anyone interested in studying the data and understanding infection spread across the states in India. In this effort we consider the timeline of COVID-19 in Indian states.

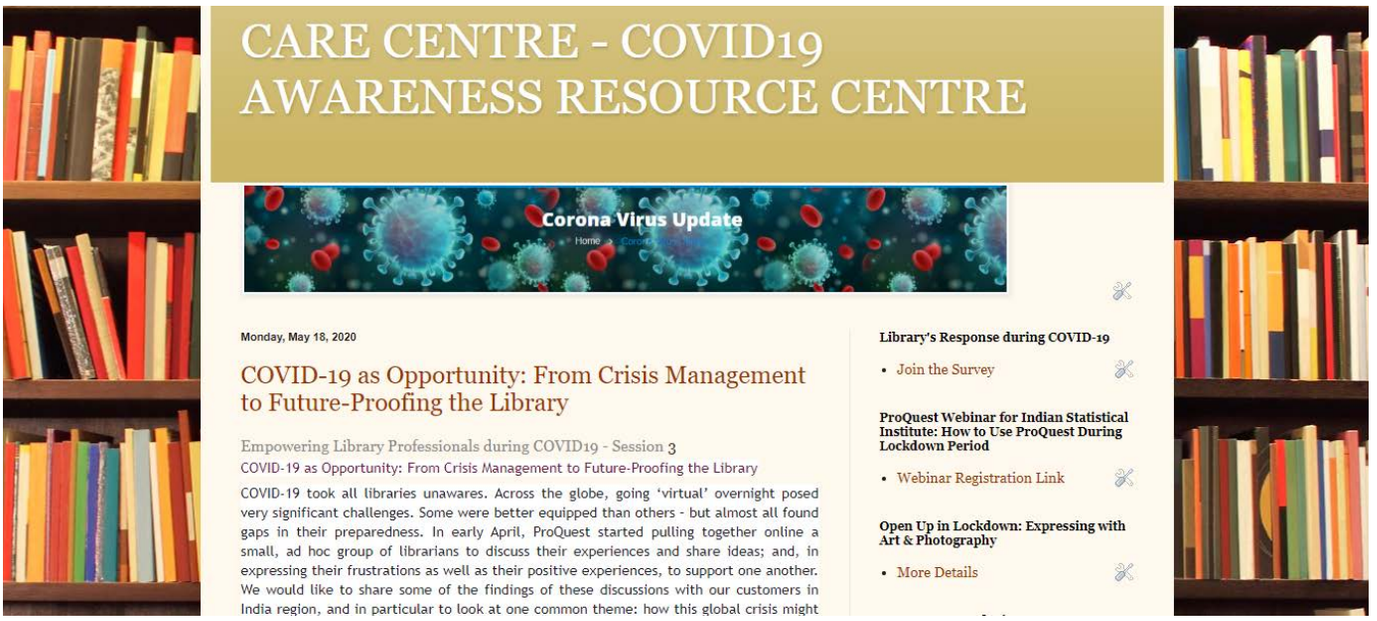


(a) Trace History **(b)** Age Distribution **(c)** Days to I.C.U.



- Prof. DevikaMadali (DRTC, Bangalore) hosted CURE is as an immediate response to the COVID-19 pandemic. It is an effort to provide access to worldwide resources on COVID-19 and related topics. CURE is developed as an Open Knowledge Aggregator as part of the Open Knowledge Portal of the Documentation Research and Training Centre, Indian Statistical Institute, which will be eventually integrated in the New Global Open Access Portal that UNESCO is developing based on a previous version launched in 2012.

- Dr. KIshor Chandra Satpathy (Library, Kolkata) hosted a blog called CARE (Covid Awareness Resource Centre) to reach out to the community and for dissemination of Covid related information. The Link is https://covid19isi.blogspot.com/2020/04/. Also organized a few webinars & workshops for users & professionals. Given access to OA materials.



9.4 Programmes Organized

- A philanthropic work was done by Professor DebashishGoswami (TSMU, Kolkata) by providing financial and material support like musk, food items, sanitizer, etc. to COVID patients and their families and/or to the poor and jobless people during the lockdown phase. Professor Goswami also initiated spreading awareness about Covid protocol and the need for getting vaccinated among the less educated and well-off people known to him. Eventually, he helped them with the registration of vaccination and in some cases arranged transport for them to a convenient vaccination centre.

- Based on a call from the Director (ISI) during the first lockdown of COVID-19 (in 2020), Dr. Ashis Kumar Chakraborty (Head, SQC & OR Division) designed a course almost overnight, for the senior officers and delivered the course with its subsequent extension. Those deliberations helped the officers not only to know ISO-9000 quality management system but also helped them to keep mentally and physically fit during the sudden and boring experience. It was a highly useful and effective one, as it was a new, out-of-the-box experience.

- Boby John (SQC & OR Unit Bangalore) organized a free online course on Data Processing using R during 02 - 25 September 2020. Students, research scholars, teachers, healthcare workers including government doctors, pharmaceutical company employees, working professionals from NGOs, industries, etc participated. The total number of participants was 61.

- Two MS-QMS students have carried out their dissertation work in the covid related fields under the supervision of Boby John, AnirbanKundu& KK Chowdhury (SQC & OR Unit Bangalore)

- Staff members of the Interdisciplinary Science Research Unit (ISRU) of ISI came forward with financial help to run a community kitchen for the covid distressed people of the locality. They also extended overwhelming financial support to the family members of the needy student of ISI. Prof. Rita SahaRay took an active interest in organizing the same.

- Economic Analysis Unit under the supervision of Prof. MadhuraSwaminathanhas been committed to understanding the impact of Covid-19, the lockdown and various phases of unlocking down, on the rural economy, in general, and on the most vulnerable rural households, in particular. This work builds on an understanding of agrarian India developed by members of the Unit in the course of their research. Research scholars conducted telephonic interviews with rural households, selected from earlier surveys, two times during the reference year, and wrote about the impact of Covid-19 on employment, wages, incomes and livelihoods of rural households (Singh, Baksi, and Johnson, 2020) on crop production, costs and prices, and incomes (Singh, and Bhattacharya, 2021) on food security and indebtedness (Niyati, and Vijayamba, 2021). One paper focussed on ASHA (accredited social and health activists) workers, a group of women thrust in to the role of frontline workers with low remuneration and little social support (Niyati and Mandela, 2020).

- Psychology Research Unit conducted Research & Training Activities related to Covid-19 under the supervision of Dr. Debdulal Dutta Roy.

- Dr. Prasun Das (SQC & OR Unit, Kolkata)created a Covid care group in whatsapp consisting of ISI Alumni and few social workers. Participated in food relief distribution in the locality through "Panchavati" group - being a member of Executive Committee of this group, consisting of members from five residential complexes. Provided numerous connections to neighbours, relatives, friends, directly or indirectly, in association with ISI Alumni whatsapp group, covid care group (self) and PWC test team being led by one of ISI Alumni (Dr. Shirshendu Roy, M.Tech QROR) in Kolkata for the health care services: Home Collection for RT-PCR test, including KMC health department through "Panchavati" group; Established relationship with MedicaSuperspeciality Hospital (Relationship Manager: Mr. Kalyan Sarkar, Medica) forcovid testing, other radiological investigations, in-patient admission (covid& non-covid as well), ambulance facility and home collection of blood samples through "Panchavati" group; Vendors for supplying Oxygen cylinders and concentrators.

- ISI Club extended its support by running a community kitchen for the needy and underprivileged people of society. Such services were rendered for several days in different locations.

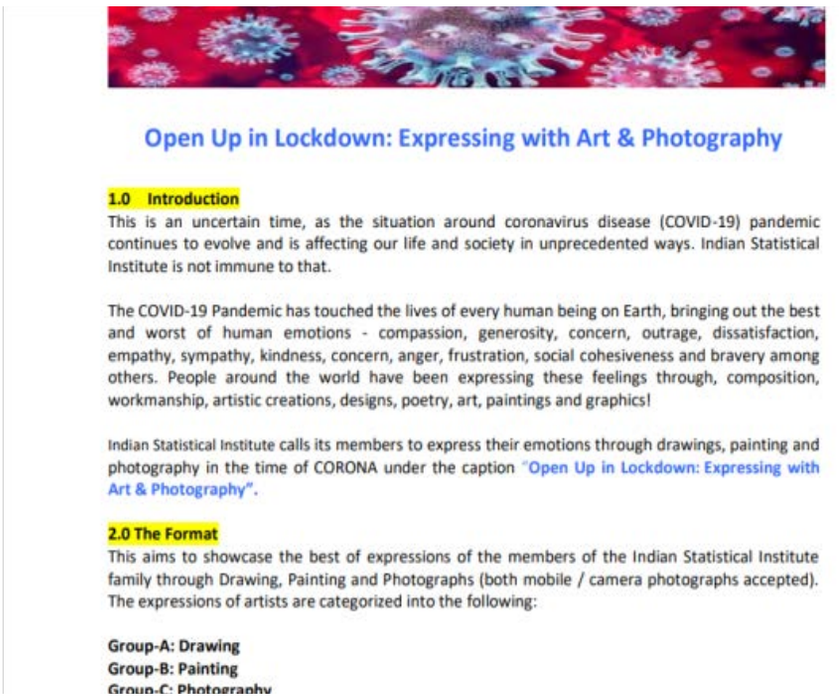
- A considerable number of staff members of ISI contributed to PM-CARES Fund (The *Prime Minister's* Citizen Assistance and Relief in Emergency Situations) for the collective fight against the *COVID*-19 pandemic in India.

- ISI Medical Unit organized health camps & vaccination camps.

- The COVID-19 Pandemic has touched the lives of every human being on Earth, bringing out the best and worst of human emotions - compassion, generosity, concern, outrage, dissatisfaction, empathy, sympathy, kindness, concern, anger, frustration, social cohesiveness and bravery among others. People around the world have been expressing these feelings through, composition, workmanship, artistic creations, designs, poetry, art, paintings and graphics! Keeping in this in mind ISI Library Division under the supervision of DrKishor Chandra Satpathy organized a competition for its members to express their emotions through drawings, painting and photography in the time of CORONA under the caption **"Open Up in Lockdown: Expressing with Art & Photography".**

Open Up in Lockdown: Expressing with Art & Photography 2020

Here are some of the creative expression participants,of varying age groups:



Open Up in Lockdown: Expressing with Art & Photography

1.0 Introduction

This is an uncertain time, as the situation around coronavirus disease (COVID-19) pandemic continues to evolve and is affecting our life and society in unprecedented ways. Indian Statistical Institute is not immune to that.

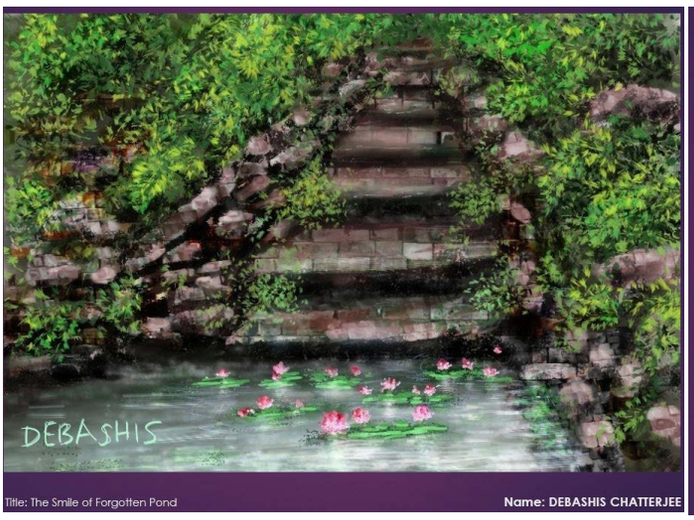
The COVID-19 Pandemic has touched the lives of every human being on Earth, bringing out the best and worst of human emotions - compassion, generosity, concern, outrage, dissatisfaction, empathy, sympathy, kindness, concern, anger, frustration, social cohesiveness and bravery among others. People around the world have been expressing these feelings through, composition, workmanship, artistic creations, designs, poetry, art, paintings and graphics!

Indian Statistical Institute calls its members to express their emotions through drawings, painting and photography in the time of CORONA under the caption "Open Up in Lockdown: Expressing with Art & Photography".

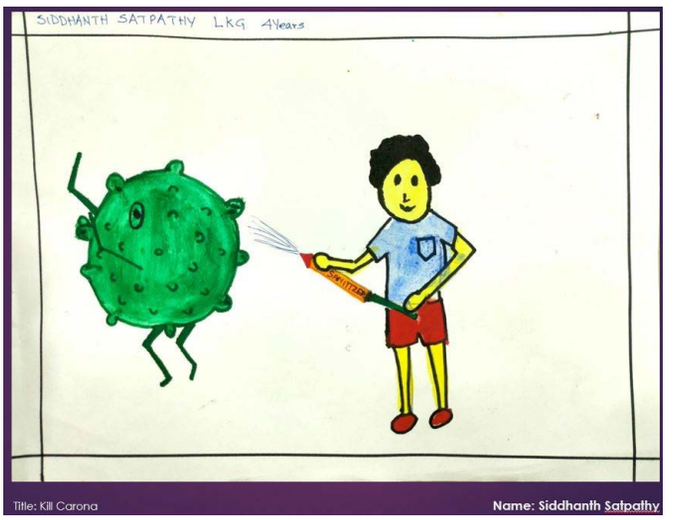
2.0 The Format

This aims to showcase the best of expressions of the members of the Indian Statistical Institute family through Drawing, Painting and Photographs (both mobile / camera photographs accepted). The expressions of artists are categorized into the following:

Group-A: Drawing
Group-B: Painting
Group-C: Photography



Title: The Smile of Forgotten Pond — **Name: DEBASHIS CHATTERJEE**

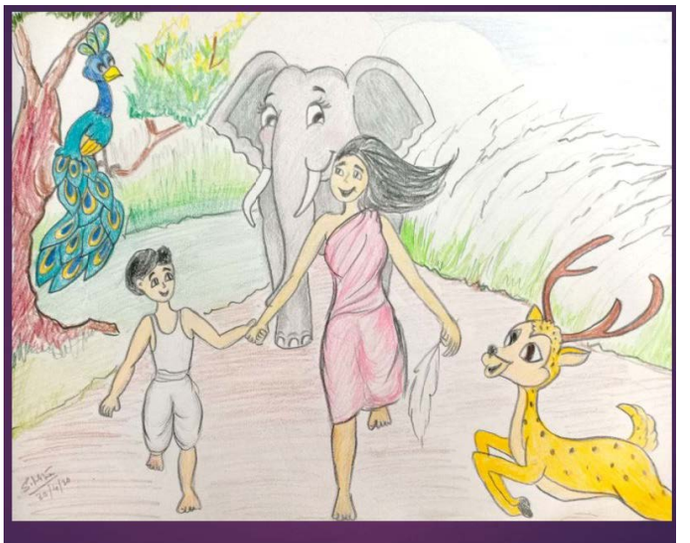


Title: Kill Corona — **Name: Siddhanth Satpathy**

Title: Locked down, eyes open to nature — **Name: Debidwiti Bhattacharyya**

Title: Poverty, Thy Name is Fatality? — **Name: Sutanuka Mitra**

Title: `Go Corona' **Name: Sara Shrirati Trivedi**

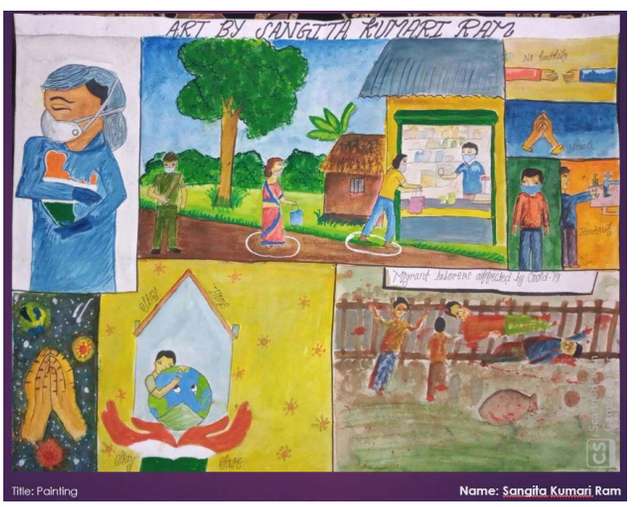


Title: Beyond CORONA: Off to a healthy World **Name: Sutanuka Mitra**

Title: Corona: A blessing or a curse? **Name: Sudarshana Mitra**

Title: Painting **Name: Lalita Kumari Ram**

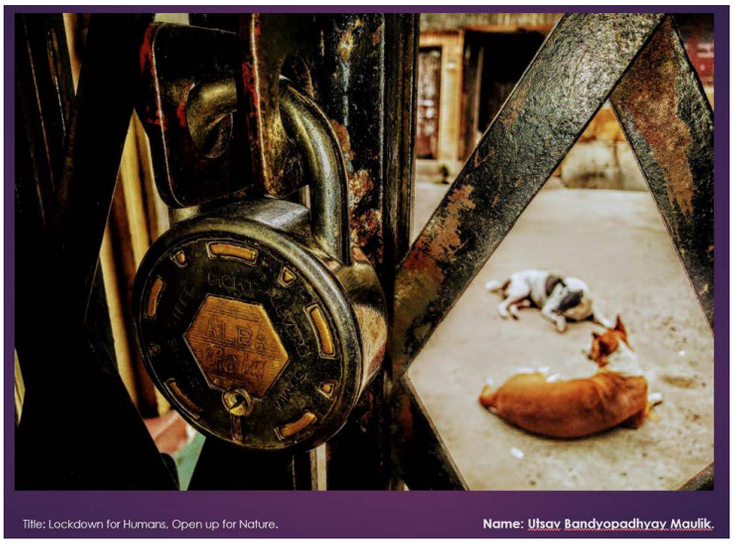
Title: Lockdown Dream **Name: Monalisa Ray (Tezpur)**



Title: Painting **Name: Sangita Kumari Ram**

Title: Stay Safe

Name: Rituparnna Satpathy



Title: Lockdown for Humans, Open up for Nature.

Name: Utsav Bandyopadhyay Maulik.

Title: Drawing

Name: Babita Kumari Ram

CHAPTER 10

ANNUAL ACCOUNTS

INDIAN STATISTICAL INSTITUTE

Balance Sheet as at 31.03.2021

(Amount In Rupees)

PARTICULARS	SCHEDULE	CURRENT YEAR (2020-21)	PREVIOUS YEAR (2019-20)
LIABILITIES			
CORPUS/CAPITAL FUND	1	2,00,83,73,753	1,88,39,81,248
EARNMARKED /ENDOWMENT FUNDS	3	1,24,94,57,719	1,08,60,78,240
CURRENT LIABILITIES & PROVISION	7	42,22,16,723	45,91,37,400
LIABILITIES FOR FIXED ASSETS OF EXT. AIDED FUND		24,16,67,154	23,19,58,102
LIABILITIES FOR FIXED ASSETS OF ISEC FUND		11,67,659	11,67,659
LIABILITIES FOR FIXED ASSETS OF IGP PROJECT		76,86,123	75,70,523
TOTAL		**3,93,05,69,131**	**3,66,98,93,172**
ASSETS			
EARNMARKED / ENDOWMENT FUNDS	3	75,01,800	65,07,877
FIXED ASSESTS	8	2,05,62,89,474	2,02,24,04,179
INVESTMENT / ASSETS FROM EARMARKED/			
EARMARKED/ENDOWMENT FUNDS	9	85,79,41,536	80,17,27,341
CURRENT ASSETS OF EXT. AIDED FUND	11	75,83,15,385	59,85,57,491
FIXED ASSETS OF EXT. AIDED FUND		24,16,67,154	23,19,58,102
FIXED ASSETS OF ISEC FUND		11,67,659	11,67,659
FIXED ASSETS OF IGP PROJECT		76,86,123	75,70,523
TOTAL		**3,93,05,69,131**	**3,66,98,93,172**
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES & NOTES ON ACCOUNTS	25		

Signed in terms of our Report of even date.

Place : Kolkata
Date: 12.11.2021

Sd/-
A Mukherjee/ S.K Chakraborty
Dy.Chief Executive(F)

Sd/-
Brig J N Pandey
Chief Executive (A&F)

Sd/-
Sanghamitra Bandyopadhyay
Director

For K. S. Bothra & Co
Chartered Accountants
(Firm Registration No . 304084E)

Sd/-
Sandeep Kochar
Partner
Membership No. 058892
ICAI UDIN : 20058892AAAABG7529

INDIAN STATISTICAL INSTITUTE

Income & Expenditure Account for the Year Ended 31.03.2021

(Amount in Rupees)

PARTICULARS	SCHEDULE	CURRENT YEAR (2020-21)		PREVIOUS YEAR (2019-20)	
		GRANT SALARY	GRANT GENERAL	GRANT SALARY	GRANT GENERAL
INCOME					
MISCELLANEOUS RECEIPTS	**12**	3,23,55,405	1,80,00,000	0	9,45,51,134
GRANT IN AID FROM GOVT OF INDIA	**13**	223,78,72,063	21,18,00,108	217,07,46,349	29,44,32,951
TOTAL (A)		**2,27,02,27,468**	**22,98,00,108**	**217,07,46,349**	**38,89,84,085**
EXPENDITURE					
ESTABLISHMENT EXPENSES	**20**	2,32,22,41,545	0	249,01,37,286	0
OTHER ADMINISTRATIVE EXPENSES	**21**	0	22,97,74,527	0	30,16,83,976
TOTAL(B)		**2,32,22,41,545**	**22,97,74,527**	**249,01,37,286**	**30,16,83,976**
BALANCE BEING SURPLUS / (DEFICIT)[A-B]		-5,20,14,077	25,581	-31,93,90,937	8,73,00,109
CARRIED TO CORPUS/ CAPITAL			-5,19,88,496	-23,20,90,829	
SIGNIFICANT ACCOUNTING POLICIES	**24**				
CONTINGENT LIABILITIES & NOTES ON ACCOUNTS	**25**				

Signed in terms of our Report of even date.

Place : Kolkata

Date: 12.11.2021

Sd/-
A Mukherjee/ S.K Chakraborty
Dy.Chief Executive(F)

Sd/-
Brig J N Pandey
Chief Executive (A&F)

Sd/-
Sanghamitra Bandyopadhyay
Director

For K. S. Bothra & Co
Chartered Accountants
(Firm Registration No . 304084E)

Sd/-
Sandeep Kochar
Partner
Membership No. 058892
ICAI UDIN : 20058892AAAABG7529

INDIAN STATISTICAL INSTITUTE

Capital Utilization Statement for the Year Ended 31.03.2021

(Amount in Rupees)

PARTICULARS	CURRENT YEAR (2020-21)	PREVIOUS YEAR (2019-20)
GRANT RECEIVED FOR CREATION OF CAPITAL ASSETS	14,22,13,000.00	31,52,21,705.00
(INCL C/F OF PREVIOUS YEAR)		
TOTAL(A)	**14,22,13,000.00**	**31,52,21,705.00**
EXPENDITURE ON CREATION OF CAPITAL ASSETS	13,75,83,124.00	22,09,97,431.80
TOTAL(B)	**13,75,83,124.00**	**22,09,97,432.00**
NET BALANCE(A-B)	**46,29,876.00**	**9,42,24,273**

Place : Kolkata
Date: 12.11.2021

Signed in terms of our Report of even date.

Sd/-
A Mukherjee/ S.K Chakraborty
Dy.Chief Executive(F)

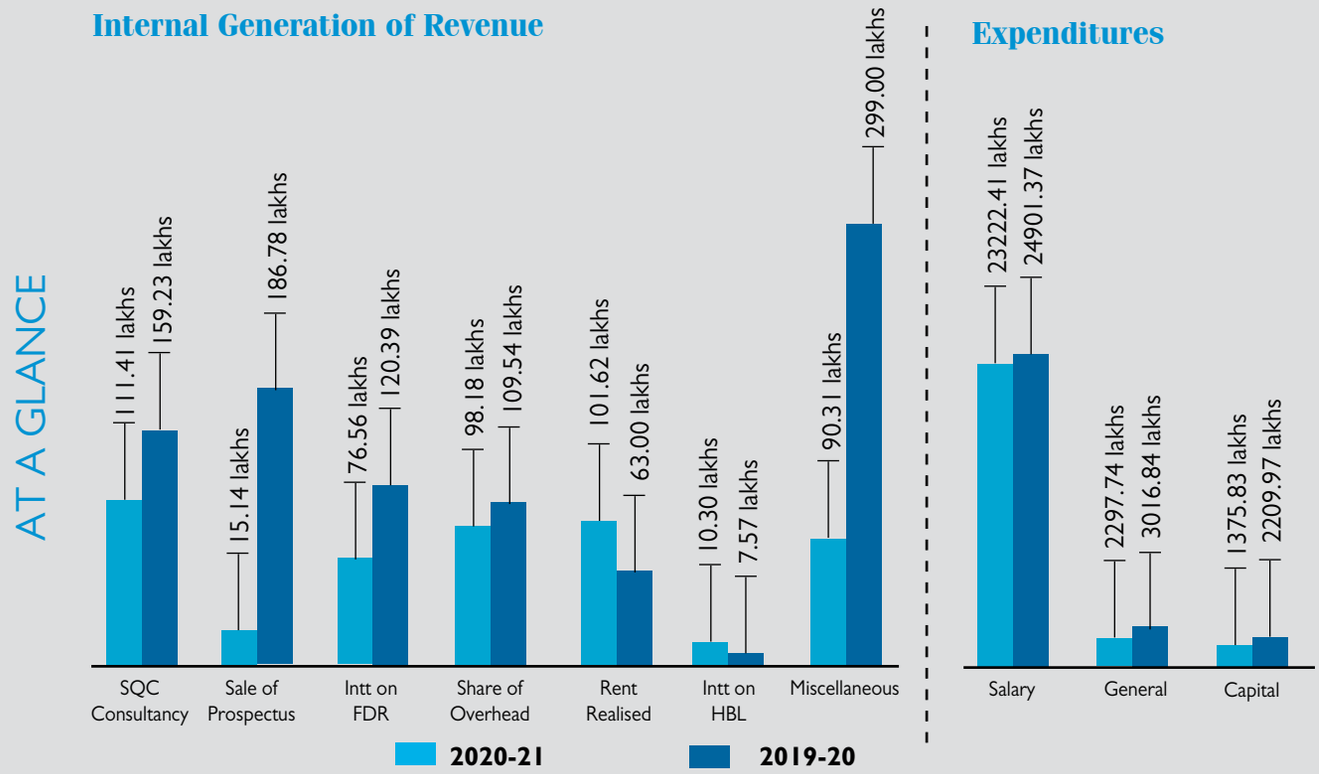
Sd/-
Brig J N Pandey
Chief Executive (A&F)

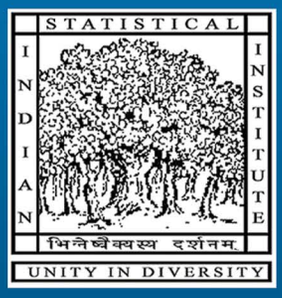
Sd/-
Sanghamitra Bandyopadhyay
Director

For K. S. Bothra & Co
Chartered Accountants
(Firm Registration No . 304084E)

Sd/-
Sandeep Kochar
Partner
Membership No. 058892
ICAI UDIN : 20058892AAAABG7529

AT A GLANCE





Indian Statistical Institute

203, Barrackpore Trunk Road, Kolkata - 700108
http://www.isical.ac.in

Semaphore Technologies Pvt. Ltd