PReMI'23

10th INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION AND MACHINE INTELLIGENCE

December 12-15, 2023

Programme Brochure

Organized by:

Machine Intelligence Unit
Indian Statistical Institute
203, B. T. Road, Kolkata

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PReMI: Aims and Achievements

The primary goal of the conference is to provide a platform for presenting state-of-the-art scientific results, enabling academic and industrial interactions, and promoting collaborative research activities in Pattern Recognition, Machine Intelligence and related fields, involving scientists, engineers, professionals, academicians, and students. This premier biennial event is an ideal forum for people to share their views and experiences in the said areas. The conference was originated from the Machine Intelligence Unit (MIU), Indian Statistical Institute (ISI) Kolkata, India in 2005. The successive editions were held in ISI Kolkata (2007); Indian Institute of Technology (IIT), Delhi (2009); Higher School of Economics (HSE), Moscow, Russia (2011); ISI Kolkata, India (2013); Warsaw University of Technology, Warsaw, Poland (2015); ISI Kolkata (2017); Tezpur University (TU), Tezpur, India (2019); and ISI Kolkata (Virtual) (2021). The upcoming conference (PReMI'23) will be held at ISI Kolkata during December 12-15, 2023.

Machine Intelligence Unit (MIU): Research Activities

The objective of the Machine Intelligence Unit (MIU) is to carry out basic research concerning certain aspects of machine intelligence and soft computing. This signifies the work associated with attempting to make a machine behave like a human being. In other words, it integrates the core concept of pattern recognition and machine learning with advanced technologies like fuzzy logic, artificial neural networks, evolutionary computation, particle swarm optimization, and rough sets, collectively called the soft computing paradigm. They provide techniques for flexible information processing, to deal with real life ambiguous situations in an efficient manner using ideas from cognitive sciences and theories of perception thus forming the basis of future generation computing systems. The investigation that is currently being done in MIU comprises both developing these technologies individually and in an integrated manner, and demonstrating their effectiveness in solving various problems of pattern recognition, machine learning, image and video processing, biometrics, data mining, bioinformatics, etc. related to the design of intelligent systems.

Indian Statistical Institute (ISI): Tradition and objectives

Founded by the late Prof. P. C. Mahalanobis in December 1931, the Indian Statistical Institute (ISI) has all along been playing a pioneering role in theoretical and applied research, promoting teaching and training in the fields of Statistics, Mathematics, Computer & Communication Science, Quantitative Economics, Statistical Quality, Reliability & Operations Research, Physics and Earth Sciences and other related disciplines that include Human Genetics, Agriculture and Ecology, Biological Anthropology, Population Studies, Sociology, Linguistics and Psychology. It has made significant contributions to social and economic planning of the Government of India, research and development in theoretical and applied Computer Science and in disseminating scientific quality control and quantitative management techniques for the industry. By a special act of Parliament, the institute was declared an Institution of National Importance as early as in 1959. The active leadership of ISI scientists in areas of digital computing, signal processing and pattern recognition is a major force in the development of Computer and Communication Sciences in India. The Institute offers graduate level courses in Computer Science that includes specialized areas like pattern recognition, image processing, computer vision, data mining, remote sensing, bioinformatics, computational biology, soft computing and artificial intelligence, among others.

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Venue of the Conference

The Kolkata campus of the Indian Statistical Institute is located in a sprawling 30-acre estate on the Barrackpore Trunk Road (B T Road) in the Baranagore suburb of Greater Kolkata at its extreme north. It consists of two approximately equal parts - the office complex (conference venue) and the residential complex (comprising the Guest House and Hostels), separated by a public road. This road (Girish Chandra Ghosh Street) connects B. T. Road with Gopal Lal Tagore Road. The last mentioned road runs along the western boundary of the main campus. The office complex bears gate numbers 202, 203 and 204, and the residential complex 205 and 206. There is a subway connecting the two parts of the campus - residential and office complexes to easily move between these two complexes.

The principal buildings in the office complex are the R A Fisher Bhavan (RAFB), the Pamela Robinson Bhavan (PRB), the A N Kolmogorov Bhavan (ANKB), the Platinum Jubilee Academic Bhavan (PJAB), the Satyendra Nath Bose Bhavan (SNBB), the C D Desmukh Bhavan, the P N Haksar Bhavan (PNHB), the Rani Kuthi (Canteen) and the Amrapali (P C Mahalanobis Museum). The residential campus at 205, and 206, B. T. Road premises includes, apart from several staff quarters, the Guest House, the Medical Welfare Unit, the Boys' Hostel, the M. Tech Hostel, the Research Scholars' and ISEC Hostel, and the Ladies Hostel.

Auditorium of Platinum Jubilee Academic Building (PJAB) :	Registration, Inauguration, Keynote Talks, Invited Talks, Public Lecture, Industrial Session, Doctoral Colloquium, Cultural Program, Tutorial 1, Tutorial 2, Tutorial 4, TS01, TS05, TS09, TS12, TS14
Auditorium 1 of New Academic Building (NAB1) :	Tutorial 3, Valedictory, TS02, TS04, TS08, TS11, TS13
Auditorium 2 of New Academic Building (NAB2) :	Student Research Workshop, TS03, TS06, TS07, TS10, TS15

Paper Presentation Details

Audio-visual equipment available includes PC/Laptop (with USB port) equipped with Windows O/S MS PowerPoint, PDF Viewer and LCD and Overhead Projector.

Instructions for Speakers:

- Time allotted for each keynote talk is 60 minutes, including 10 minutes for Q&A.
- Time allotted for each invited talk is 45 minutes, including 5 minutes for Q&A.
- Time allotted for each contributed talk is 20 minutes, including 3 minutes for Q&A.
- Time allotted for each public lecture is 60 minutes, including 10 minutes for Q&A.

Instructions for Chairpersons:

- Please request the speakers to finish their presentation 3 minutes before the allotted time.
- Please note that there is no specific time slot for pre and post session moderation. Please apply your judgment to adjust/monitor this so that overall time limit for the session could be maintained.
- Representative of the organizing committee will try to inform you about any change of schedule/non-availability of speakers for any particular session.

In case of any difficulty, the chairperson should communicate with the volunteers present in the room. The chairperson may seek assistance of the registration desk for contacting organizing committee members

Overview

It is our pleasure to welcome you all to the 10th International Conference on Pattern Recognition and Machine Intelligence (PReMI'23), held in the Indian Statistical Institute, Kolkata, India, during December 12-15, 2023. The primary goal of the conference is to provide a platform for presenting state-of-the-art scientific results, enabling academic and industrial interactions, and promoting collaborative research activities in Pattern Recognition, Machine Intelligence and related fields, involving scientists, engineers, professionals, academicians, and students. This premier biennial event is an ideal forum for people to share their views and experiences in the said areas. This is the tenth conference in this series.

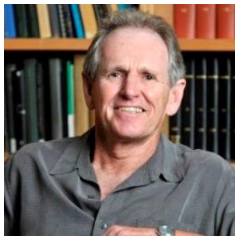
The conference has four keynote talks, five invited lectures and one public lecture, all by very eminent and distinguished researchers from around the world. It also has some special events such as Doctoral Colloquium, Student Research Workshop, and Industrial Session. There is also a pre-conference tutorial by distinguished researchers both from academia and industry. The conference had a very good response in terms of paper submissions. It received more than 300 submissions from across the globe. Each paper went through a rigorous review (double-blind) process and was critically reviewed by at least three experts of the technical program/review committee. Based on the review reports, only the top quality and highly relevant 94 submissions are accepted. Among them, 91 submissions are included in the proceedings. The acceptance rate of PReMI'23 is ~30%. Accepted papers are divided into fifteen groups, although there could be some overlaps. Abstracts of the keynote and invited speeches are also included in the proceedings

We wish to express our appreciation to the Technical Program Committee members and reviewers who worked hard to ensure the quality of the contributions of this volume. We are thankful to Professor Trevor Hastie of Stanford University (USA), Professor Bernhard Schölkopf of Max Planck Institute for Intelligent Systems (Germany), Professor Dacheng Tao of The University of Sydney (Australia), and Professor Alison Noble of University of Oxford (UK) for accepting our invitation to be the keynote speakers in this conference. We take this opportunity to express our gratitude to Professor Balaraman Ravindran of Indian Institute of Technology Madras, Professor SP Arun of Indian Institute of Science Bangalore, Professor Gajendra P. S. Raghava of Indraprastha Institute of Information Technology, New Delhi, Professor Richa Singh of Indian Institute of Technology Jodhpur and Dr. Balasubramanian Narasimhan of Stanford University, USA for agreeing to be the invited speakers of the conference. We are also grateful to Professor Dipankar Banerjee of Aryabhatta Research Institute of Observational Sciences (India) for accepting our invitation to deliver the IAPR Public lecture in this conference. We thank Dr. Soma Biswas of Indian Institute of Science Bangalore, Professor Animesh Mukherjee of Indian Institute of Technology Kharagpur, Dr. Sangheeta Roy of TCS Research Lab, and Dr. Anirban Santara of Google Research India for accepting our invitation to deliver pre-conference tutorial lectures. We gratefully acknowledge the staff of Springer for their co-operation in the publication of the PReMI'23 proceedings. Finally, we would like to thank all the contributors for their enthusiastic response.

We believe that you will find the proceedings to be a valuable source of reference for your ongoing and future research.

Pradipta Maji
Tingwen Huang
Nikhil R. Pal
Santanu Chaudhury
Rajat K. De

Abstracts of Keynote Talks and Invited Talks



Trevor Hastie
Stanford University, USA

Title of Talk: Statistical Learning with Sparsity

Abstract: In a statistical world faced with an explosion of data, regularization has become an important ingredient. Often data are "wide" - we have many more variables than observations - and the lasso penalty and its hybrids have become increasingly useful. This talk presents a general framework for fitting large scale regularization paths for a variety of problems. We describe the approach, and demonstrate it via examples using our R package GLMNET. We then outline a series of related problems using extensions of these ideas.

Bernhard Schölkopf
Max Planck Institute for Intelligent Systems, Germany

Title of Talk: Symbolic, Statistical and Causal AI

Abstract: We describe basic ideas underlying research to build and understand artificially intelligent systems: from symbolic approaches via statistical learning to interventional models relying on concepts of causality. Some of the hard open problems of machine learning and AI are intrinsically related to causality, and progress may require advances in our understanding of how to model and infer causality from data.

Alison Noble
University of Oxford, UK

Title of Talk: Progress in Learning to Simplify Ultrasound

Abstract: Automating the human skill of clinical ultrasound acquisition and interpretation is proving surprisingly difficult. Deep learning, which has been around for over a decade now, has provided a computational tool to advance understanding of both why scanning is hard, and to define assistive technologies to support humans to perform diagnostic ultrasound. I describe two quite different approaches we have been investigating on this topic. The first approach builds computational models of ultrasound tasks from simple-to-learn bespoke ultrasound scan sweep protocols making the models potentially suitable for triage in global health settings. The second is to take a multi-modal video analysis approach, whereby we use human gaze, probe movements and audio together with video to build learning-based models of ultrasound-based tasks. As I will show, deep learning underpins these solutions, but demonstrating success requires thinking beyond the algorithm.

Dacheng Tao
The University of Sydney, Australia

Title of Talk: More Is Different - Beyond Wittgenstein's Philosophy

Abstract: Unleashing the hidden wisdom within broad data has become a captivating pursuit for the community. Among the myriad of possibilities, one solution stands out: foundation models. These behemoth architectures, powered by transformers, possess the ability to extract and harness the enigmatic dark knowledge that resides within broad data. Parameters, computations, and data combine in a symphony of potential, demonstrating that in the world of transformers, "more is different", and reigniting our dreams for Artificial General Intelligence.

In this presentation, we embark on a thrilling journey into the world of foundation models. We begin by introducing the ground-breaking LLMs ChatGPT and the wave of innovation they have set in motion. Along the way, we discuss concerns about the singularity of these techniques and offer our insights into this emerging trend. We then delve into theoretical foundations, example designs in NLP and CV, efficient decentralized optimization algorithms, and useful applications that flourish under the influence of foundation models. Yet, this adventure also highlights the challenges and opportunities that lie ahead in the era of these models. As we conclude, we do so with unwavering optimism: foundation models will play a pivotal role in shaping artificial intelligence. Join us on this remarkable expedition into the seamless integration of data, computational power and algorithms, where the future unveils itself in unprecedented ways

Dipankar Banerjee
Aryabhatta Research Institute of Observational Sciences, India

Title of Talk: India's first Solar Space observatory: Aditya L1 and scope of AI

Abstract: Aditya L1 mission is the first observatory class solar mission from the Indian Space Research organization, launched in September 2023. With a combination of four remote sensing and 3 in situ instruments covering multi-wavelength it provides a unique opportunity to have joint observations with other co temporal missions. I will give a quick summary update of the status of the mission. In the context of AI and ML I will demonstrate how these techniques will enable us to analyze the data from these instruments and help us performing predictive science as well.

Balaraman Ravindran
Indian Institute of Technology Madras

Title of Talk: Reinforcement Learning with Structured Actions and Policies

Abstract: Deep Reinforcement Learning has been very successful in solving a variety of hard problems. But many RL architectures treat the action as coming from an unordered set or from a bounded interval. It is often the case that the actions and policies have a non-trivial structure that can be exploited for more efficient learning. In this talk, I will present several scenarios in which taking advantage of the structure leads to more efficient learning. In particular, I will talk about some of our recent work on learning representations for actions that capture the underlying spatial structures and on learning ensemble policies.

SP Arun
Indian Institute of Science Bangalore

Title of Talk: Improving Machine Vision using Insights from Neuroscience

Abstract: Deep neural networks have revolutionized computer vision with their impressive performance on vision tasks. Recently their object representations have been found to match well to the visual areas of the brain. Yet their performance is still worse than humans, and it has been challenging to derive insight into why deep networks work or how they can be improved. In our lab we have been comparing object representations in brains and deep networks with the aim of understanding how we see and to make machine see better. We have shown that systematic biases in deep networks can be identified by comparing with brain representations, and that fixing these biases can improve performance. We have also been testing deep networks for the presence or absence of a variety of classic perceptual phenomena. Taken together these results suggest that accumulated wisdom from vision neuroscience can help us understand and improve deep neural networks. For more information, visit our research group, the Vision Lab at IISc at https://sites.google.com/site/visionlabiisc/

Gajendra P. S. Raghava
Indraprastha Institute of Information Technology, New Delhi

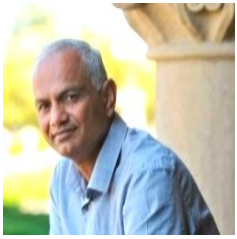
Title of Talk: Computer-Aided Healthcare in Era of Artificial Intelligence

Abstract: The field of health informatics encompasses a wide range of disciplines aimed at acquiring, processing, and interpreting data to improve human health and healthcare services. Within the healthcare domain, informatics encompasses several specialized fields, including cheminformatics, pharmacoinformatic, health informatics, and medical/clinical informatics, which collectively generate an extensive amount of biological and clinical data. Bioinformatics, in particular, plays a pivotal role in compiling, storing, annotating, and analysing this data, making it accessible to both biologists and non-biologists alike. In light of the escalating global healthcare burden caused by emerging infectious diseases, the need for efficient drug discovery and development has become paramount. Informatics advancements, such as cheminformatics and pharmacoinformatic, have significantly reduced costs and time associated with drug discovery by enabling the identification of drug targets, selection of lead compounds, and prediction of crucial drug properties. Moreover, the field of immunoinformatic has emerged as a crucial player in vaccine development, employing computational tools to expedite the discovery of potential vaccine candidates. Medical/clinical informatics deals primarily with patient data, clinical knowledge, and information related to patient care, playing a pivotal role in disease diagnosis through the identification of biomarkers and assisting healthcare professionals in providing personalized treatments. The advent of the Internet of Things (IoT) has further revolutionized healthcare by facilitating the development of mobile apps, telemedicine platforms, and wearable sensor-based devices that enable remote monitoring and real-time health data collection. This talk aims to provide a comprehensive overview of freely available computational tools and databases in key areas of healthcare, such as drug discovery, toxicity and adverse effects assessment, vaccine development, disease diagnosis, and IoT applications. The featured resources encompass databases, web servers, standalone applications, and mobile apps, offering a diverse range of support to researchers across various healthcare disciplines. By highlighting these valuable resources, researchers can leverage their functionalities to expedite their work and contribute to the advancement of human health and healthcare services (https://webs.iiitd.edu.in/)

Richa Singh
Indian Institute of Technology, Jodhpur

Title of Talk: Adventures and Impact of AI in Face Recognition and Deepfakes

Abstract: The increasing capabilities of machine learning algorithms is enabling the research community to address a number of long standing computer vision problems. However, as the saying goes that beauty lies in the eyes of the beholder, a technology can be utilized for both positive and negative tasks. For instance, while face recognition can provide solutions to problems like missing children and injured face identification, it can also be misused for similar tasks. We will discuss research initiatives in face recognition and deepfake that we have been pursuing along with the technological contributions and the social impact in the community.



Balasubramanian Narasimhan
Stanford University, USA

Title of Talk: Convex Optimization: Tools and Applications in Statistics and Data Science

Abstract: Optimization plays an important role in Statistics and Data Science and many algorithms rely on estimators that result from solving convex optimization problem. I will introduce "Disciplined Convex Optimization" (DCP), a constructive approach to formulating such problems. DCP provides mathematical building blocks with known properties along with a set of rules to combine them. Although these rules are sufficient (but not necessary) conditions for convexity, the approach captures a sizeable class of problems researchers encounter. Specifically, I will describe our work on CVXR, which implements DCP in the R programming language. To solve a convex problem, one specifies an objective and constraints by combining constants, variables, parameters, and a library of functions in a manner that closely mirrors the actual mathematical description. CVXR then applies DCP rules to verify the problem's convexity. Once verified, the problem is converted into standard conic form using graph implementations and passed to a numerical solver. If time permits, I will demonstrate with some examples.

Pre-Conference Tutorial

Day 0: Monday, December 11, 2023		
09:00 - 10:00	**REGISTRATION** **(Venue:** Ground Floor, PJAB)	
10:00 - 12:00	**Tutorial**	**Title:** Matching Across Domains Using Limited Data **Speaker:** Soma Biswas, Indian Institute of Science Bangalore **Chair:** Pabitra Mitra, IIT Kharagpur **Venue:** PJAB
12:00 - 12:30	**Tea/Coffee Break**	
12:30 - 14:30	**Tutorial**	**Title:** AI and Ethics **Speaker:** Animesh Mukherjee, IIT Kharagpur **Chair:** Swapna Agarwal, TCS Research Lab, Kolkata **Venue:** PJAB
14:30 - 15:30	**Lunch Break**	
15:30 - 17:30	**Tutorial**	**Title:** On Learning Useful Skills by Exploring Real Environments **Speaker:** Anirban Santara, Google Research India **Chair:** Dinabandhu Bhandari, HIT Kolkata **Venue:** NAB1 **Title:** Unveiling the Code of Neuronal Activation Patterns **Speaker:** Sangheeta Roy, TCS Research Lab, Kolkata **Chair:** Raghunath Chatterjee, ISI Kolkata **Venue:** PJAB
18:00 - 18:30	**Tea/Coffee Break**	
18:30 - 19:30	**Cultural Program: BONDI-JUGOL** **Venue:** PJAB 	
19:30 - 21:00	**Welcome Dinner** **Venue:** Guest House	

PreMI'23 Conference Programme

Day 1: Tuesday, December 12, 2023		
09:00 - 10:00	**REGISTRATION** **(Venue:** Ground Floor, PJAB)	
10:00 - 10:30	**INAUGURATION** **(Venue:** PJAB)	
10:30 - 11:00	**High Tea/Coffee Break**	
11:00 - 12:00	**Keynote Talk**	**Title:** Statistical Learning with Sparsity **Speaker:** Trevor Hastie, Stanford University, USA **Chair:** Probal Chaudhuri, ISI Kolkata **Venue:** PJAB
12:05 - 12:50	**Invited Talk**	**Title:** Adventures and Impact of AI in Face Recognition and Deepfakes **Speaker:** Richa Singh, IIT Jodhpur **Chair:** Bhabatosh Chanda, IIIT Kalyani **Venue:** PJAB
12:50 - 14:00	**Lunch Break**	
14:00 - 16:00	**Technical Session**	**TS01: Pattern Recognition** **Venue:** PJAB **Chair:** Amita Pal, ISI Kolkata **Paper ID:** 007, 087, 109, 120, 143, 169 **TS02: Machine Learning** **Venue:** NAB1 **Chair:** Anil K. Ghosh, ISI Kolkata **Paper ID:** 003, 024, 027, 105, 277, 298 **TS03: Deep Learning** **Venue:** NAB2 **Chair:** Smarajit Bose, ISI Kolkata **Paper ID:** 123, 136, 161, 251, 259, 286
16:00 - 16:30	**Tea/Coffee Break**	
16:30 - 17:30	**Keynote Talk**	**Title:** Symbolic, Statistical and Causal AI **Speaker:** Bernhard Schölkopf, Max Planck Institute for Intelligent Systems, Germany **Chair:** Arup Bose, ISI Kolkata **Venue:** PJAB
17:35 - 18:35	**IAPR Public Lecture**	**Title:** India's first Solar Space observatory: Aditya L1 and scope of AI **Speaker:** Dipankar Banerjee, Aryabhatta Research Institute of Observational Sciences, India **Chair:** Supratik Pal, ISI Kolkata **Venue:** PJAB

Day 2: Wednesday, December 13, 2023		
09:00 - 10:00	**REGISTRATION** **(Venue:** Ground Floor, PJAB)	
10:00 - 12:00	**Technical Session**	**TS04: Statistical Learning** **Venue:** NAB1 **Chair:** Sukhendu Das, IIT Madras **Paper ID:** 151, 156, 160, 201, 221, 302 **TS05: Cognitive Computing** **Venue:** PJAB **Chair:** Partha Bhowmick, IIT Kharagpur **Paper ID:** 026, 057, 134, 148, 174, 306 **TS06: Computational Intelligence** **Venue:** NAB2 **Chair:** Ananda M. Mondal, FIU, USA **Paper ID:** 054, 055, 146, 178, 203, 208
12:00 - 12:30	**Tea/Coffee Break**	
12:30 - 13:30	**Keynote Talk**	**Title:** Progress in Learning to Simplify Ultrasound **Speaker:** Alison Noble, University of Oxford, UK **Chair:** Malay K. Kundu, ISI Kolkata **Venue:** PJAB
13:30 - 14:45	**Lunch Break**	
14:45 - 15:30	**Invited Talk**	**Title:** Improving Machine Vision using Insights from Neuroscience **Speaker:** SP Arun, Indian Institute of Science Bangalore **Chair:** Dipti Prasad Mukherjee, ISI Kolkata **Venue:** PJAB
15:30 - 16:00	**Tea/Coffee Break**	
16:00 - 18:20	**Technical Session**	**TS07:** Medical Imaging **Venue:** NAB2 **Chair:** Jaya Sil, IIEST Shibpur **Paper ID:** 059, 118, 129, 159, 163, 192, 307 **TS08:** Image and Video Processing **Venue:** NAB1 **Chair:** Ananda Chowdhury, Jadavpur University **Paper ID:** 018, 093, 121, 158, 191, 200, 280 **TS09:** Computer Vision **Venue:** PJAB **Chair:** Amlan Chakrabarti, University of Calcutta **Paper ID:** 041, 083, 104, 110, 111, 175, 264
19:00 - 20:00	**CULTURAL PROGRAM: SAROD SISTERS** **Venue:** PJAB 	
20:00 - 22:00	**BANQUET**	**Venue:** Guest House

Day 3: Thursday, December 14, 2023		
09:00 - 10:00	**REGISTRATION** **(Venue:** Ground Floor, PJAB)	
10:00 - 12:00	**Technical Session**	**TS10: Soft Computing** **Venue:** NAB2 **Chair:** Vasilii A. Gromov, HSE, Russia **Paper ID:** 011, 022, 082, 092, 140, 231 **TS11: Information Security** **Venue:** NAB1 **Chair:** Nabendu Chaki, University of Calcutta **Paper ID:** 012, 016, 035, 091, 095, 173 **TS12: Signal Processing** **Venue:** PJAB **Chair:** Swagatam Das, ISI Kolkata **Paper ID:** 020, 025, 097, 126, 128, 147, 152
12:00 - 12:30	**Tea/Coffee Break**	
12:30 - 13:30	**Keynote Talk**	**Title:** More Is Different - Beyond Wittgenstein's Philosophy **Speaker:** Dacheng Tao, University of Sydney, Australia **Chair:** Bidyut B. Chaudhuri, TIU Kolkata **Venue:** PJAB
13:30 - 14:45	**Lunch Break**	
14:45 - 15:30	**Invited Talk**	**Title:** Reinforcement Learning with Structured Actions and Policies **Speaker:** Balaraman Ravindran, IIT Madras **Chair:** Bhargab B. Bhattacharya, ISI Kolkata **Venue:** PJAB
15:30 - 16:30	**Industrial Session**	**Presentation by Sponsoring Organizations** **Venue:** PJAB **Chair:** Utpal Garain, ISI Kolkata
16:30 - 18:30	**Doctoral Colloquium**	**Presentation by Doctoral Candidates** **Venue:** PJAB **Chair:** Tanmay Basu, IISER Bhopal

Day 4: Friday, December 15, 2023		
09:00 - 10:00	**REGISTRATION** **(Venue:** Ground Floor, PJAB)	
10:00 - 11:40	**Technical Session**	**TS13: Computational Neurology** **Venue:** NAB1 **Chair:** Amitava Chatterjee, Jadavpur University **Paper ID:** 005, 108, 162, 207, 299 **TS14: Biometrics** **Venue:** PJAB **Chair:** Hemant A. Patil, DA-IICT, Gujrat **Paper ID:** 008, 135, 180, 217, 266 **TS15: Bioinformatics** **Venue:** NAB2 **Chair:** Sudipto Saha, Bose Institute, Kolkata **Paper ID:** 182, 210, 249, 276, 283
11:40 - 12:10	**Tea/Coffee Break**	
12:10 - 12:55	**Invited Talk**	**Title:** Convex Optimization: Tools and Applications in Statistics and Data Science **Speaker:** Balasubramanian Narasimhan, Stanford University **Chair:** Biswabrata Pradhan, ISI Kolkata **Venue:** PJAB
13:00 - 13:45	**Invited Talk**	**Title:** Computer-Aided Healthcare in Era of Artificial Intelligence **Speaker:** Gajendra P. S. Raghava, IIIT, New Delhi **Chair:** Pinakpani Chakrabarti, Bose Institute, Kolkata **Venue:** PJAB
13:45 - 14:45	**Lunch Break**	
14:45 - 16:45	**Student Research Workshop**	**Poster Presentation by Students / Research Scholars** **Venue:** NAB2 **Chair:** Angshuman Paul, IIT Jodhpur
16:45 - 17:15	**High Tea/Coffee Break**	
17:15 - 18:00	**Valedictory**	**Prize Distribution** **Venue:** NAB1 **Feedback from the Participants** **Concluding Remarks by Head, MIU**

Conference Technical Sessions

12th December 2023 (Tuesday)

TS01: Pattern Recognition		
12 December 2023	**Venue: PJAB**	**14:00 - 16:00**
Session Chair: Amita Pal (ISI Kolkata)		
1	**An Efficient Approach for Findings Document Similarity Using Optimized Word Mover's Distance** *Atanu Dey, Mamata Jenamani and Arijit De*	
2	**Aggregate Load Forecasting in Residential Smart Grids Using Deep Learning Model** *Kakuli Mishra, Srinka Basu and Ujjwal Maulik*	
3	**Spot the Bot: Distinguishing Human-Written and Bot-Generated Texts Using Clustering and Information Theory Techniques** *Vasilii Gromov and Quynh Nhu Dang*	
4	**Conditioning Covert Geo-Location (CGL) Detection on Semantic Class Information** *Binoy Saha and Sukhendu Das*	
5	**Search-Time Efficient Device Constraints-Aware Neural Architecture Search** *Oshin Dutta, Tanu Kanvar and Sumeet Agarwal*	
6	**Gödel Number Based Encoding Technique for Effective Clustering** *Pankajbhai Narodia Parth and Kamalika Bhattacharjee*	

TS02: Machine Learning		
12 December 2023	**Venue: NAB1**	**14:00 - 16:00**
Session Chair: Anil K. Ghosh (ISI Kolkata)		
1	**Unsupervised Discovery of Recurring Spoken Terms Using Diagonal Patterns** *P. Sudhakar, K. Sreenivasa Rao and Pabitra Mitra*	
2	**MuOE: A Multi-task Ordinality Aware Approach Towards Engagement Detection** *Saumya Gandhi, Aayush Fadia, Ritik Agrawal, Surbhi Agrawal and Praveen Kumar*	
3	**Handling Small Disjuncts and Class Skew Using Sequential Ellipsoidal Partitioning** *Ranjani Niranjan and Sachit Rao*	
4	**Error-Bounded Bimodal Isotropic Remeshing Using Curvature Map and Voronoi Tessellation** *Preetam Chayan Chatterjee and Partha Bhowmick*	
5	**Multi-criteria Decision-Making Based Classifier Ensemble by Using Prioritized Aggregation Operator** *Chandrima Debnath, Debashree Guha, Swati Rani Hait, Soumita Guria and Debjani Chakraborty*	
6	**Federated Optimization with Linear-Time Approximated Hessian Diagonal** *Mrinmay Sen, C. Krishna Mohan and A. Kai Qin*	

TS03: Deep Learning		
12 December 2023	**Venue: NAB2**	**14:00 - 16:00**
Session Chair: Smarajit Bose (ISI Kolkata)		
1	**Oscillatory Network and Deep Value Network Based Memory Replay Model of Hippocampus** *Tamizharasan Kanagamani, Madhuvanthi Muliya, V. Srinivasa Chakravarthy, Balaraman Ravindran and Ramshekhar N. Menon*	
2	**Statistically Matched DWT Based Novel DNN Framework for Visual SLAM** *Anvaya Rai, Brejesh Lall, Astha Zalani, Raghwender Prakash and Shikha Srivastava*	
3	**Compression of Large LSTM Networks for Inference on Space Constraint Systems** *Suyash Saxena, Varun Singh Negi and Kolin Paul*	
4	**Deep Adaptive Pix-2-Pix Conditional Generative Adversarial Networks for Semantic Segmentation of Medium Resolution Google Earth Imagery** *Bhuvanagiri V. Hari Priya and B. Sirisha*	
5	**Fine-Grained Attribute-Object Feature Representation in Compositional Zero-Shot Learning** *Nazir Shabbir, Ranjeet Kr. Rout, Saiyed Umer and Partha Pratim Mohanta*	
6	**Precise and Faster Image Description Generation with Limited Resources Using an Improved Hybrid Deep Model** *Biswajit Patra and Dakshina Ranjan Kisku*	

13th December 2023 (Wednesday)

TS04: Statistical Learning		
13 December 2023	**Venue: NAB1**	**10:00 - 12:00**
Session Chair: Sukhendu Das (IIT Madras)		
1	**Inverse Reinforcement Learning with Constraint Recovery** *Nirjhar Das and Arpan Chattopadhyay*	
2	**Transfer Learning: Kernel-Based Domain Adaptation with Distance-Based Penalization** *Jainendra Prakash, Mrinmoy Ghorai and Rakesh Sanodiya*	
3	**A Contrastive Learning Approach for Infrared-Visible Image Fusion** *Ashish Kumar Gupta, Meghna Barnwal and Deepak Mishra*	
4	**A Supervised Approach for Efficient Video Anomaly Detection Using Transfer Learning** *Rangachary Kommanduri and Mrinmoy Ghorai*	
5	**Deep Sparse Representation Learning for Multi-class Image Classification** *Amit Soni Arya, Shreyanshu Thakur and Sushanta Mukhopadhyay*	
6	**A Novel Graph Representation Learning Approach for Visual Modeling Using Neural Combinatorial Optimization** *Subhrasankar Chatterjee, Subrata Pain and Debasis Samanta*	

TS05: Cognitive Computing		
13 December 2023	**Venue: PJAB**	**10:00 - 12:00**
Session Chair: Partha Bhowmick (IIT Kharagpur)		
1	**Explainable Decision Tree-Based Screening of Cognitive Impairment Leveraging Minimal Neuropsychological Tests** *Km Poonam, Aayush Prasad, Rajlakshmi Guha, Aritra Hazra and Partha P. Chakrabarti*	
2	**Semi-supervised Contrastive Regression for Estimation of Eye Gaze** *Somsukla Maiti and Akshansh Gupta*	
3	**iBEHAVE: Behaviour Analysis Using Eye Gaze Metrices** *S. Akshay, P. Kavya Bijith, S. Sanjana and J. Amudha*	
4	**EngageDat-vL: A Multimodal Engagement Dataset Comprising of Emotional, Cognitive, and Behavioral Cues in Virtual Learning Environment** *Sarthak Akre, Nilesh Palandurkar, Akshat Iyengar, Gourav Chayande and Praveen Kumar*	
5	**iGAME: Cognitive Game Analysis Through Eye Movements of the Player** *S. Akshay, B. Shreyas Bhargav and J. Amudha*	
6	**Cortical Circuits of Context Adaptability: Understanding the Neurobehavioral Mechanisms Underlying Flexible Behavior** *Sweta Kaman, Ankita Sharma and Romi Banerjee*	

TS06: Computational Intelligence		
13 December 2023	**Venue: NAB2**	**10:00 - 12:00**
Session Chair: Ananda M. Mondal (FIU, USA)		
1	**Generation of Multi-Layered QR Codes with Efficient Compression** *Pratheesh Suresh, Debanjan Sadhya and Amitesh Singh Rajput*	
2	**Analysis of Segmented Spectrograms for Human Activity Recognition via Neural Network** *Avinash Dixit, Vinay Kulkarni and V.V. Reddy*	
3	**Modified Group Delay Features for Emotion Recognition** *S. Uthiraa, Aditya Pusuluri and Hemant A. Patil*	
4	**Formal Concept Analysis for Evaluating Intrinsic Dimension of a Natural Language** *Sergei O. Kuznetsov, Vasilii A. Gromov, Nikita S. Borodin and Andrei M. Divavin*	
5	**User Interest Drift Identification Using Contextual Factors in Implicit Feedback-Based Recommender Systems** *Vinnakota Saran Chaitanya, Sayali Deo and P Santhi Thilagam*	
6	**Spot the Bot: Coarse-Grained Partition of Semantic Paths for Bots and Humans** *Vasilii A. Gromov and Alexandra S. Kogan*	

TS07: Medical Imaging		
13 December 2023	**Venue: NAB2**	**16:00 - 18:20**
Session Chair: Jaya Sil (IIEST Shibpur)		
1	**Self-supervised Diffusion Model for Anomaly Segmentation in Medical Imaging** *Komal Kumar, Snehashis Chakraborty and Sudipta Roy*	
2	**Ensemble Methods with [^{18}F]FDG-PET/CT Radiomics in Breast Cancer Response Prediction** *Moumita Dholey, Ritesh J.M. Santosham, Soumendranath Ray, Jayanta Das, Sanjoy Chatterjee, Rosina Ahmed and Jayanta Mukherjee*	
3	**3-D Attention-SEV-Net for Segmentation of Post-operative Glioblastoma with Interactive Correction of Over-Segmentation** *Swagata Kundu, Subhashis Banerjee, Dimitrios Toumpanakis, Johan Wikstrom, Robin Strand and Ashis Kumar Dhara*	
4	**Local Binary Pattern Induced Optimized CNN for Brain Tumor Diagnosis from MRI Data** *Pranay Nath, Surajit Mondal and Lidia Ghosh*	
5	**iPyrDAE: Image Pyramid-Based Denoising Autoencoder for Infrared Breast Images** *Kaushik Raghavan, B. Sivaselavan and V. Kamakoti*	
6	**Domain Adapted Few-Shot Learning for Breast Histopathological Image Classification** *Anindita Mohanta, Sourav Dey Roy, Niharika Nath and Mrinal Kanti Bhowmik*	
7	**Attention-CNN Model for COVID-19 Diagnosis Using Chest CT Images** *S. Suba and Nita Parekh*	

TS08: Image and Video Processing		
13 December 2023	**Venue: NAB1**	**16:00 - 18:20**
Session Chair: Ananda Chowdhury (Jadavpur University)		
1	**Multi-focus Image Fusion Using Reorganized DTT Moments and Sparse Representation** *Manali Roy and Susanta Mukhopadhyay*	
2	**Universal Detection and Source Attribution of Diffusion Model Generated Images with High Generalization and Robustness** *Sanandita Das, Dibyarup Dutta, Tanusree Ghosh and Ruchira Naskar*	
3	**Semi-supervised Video Object Segmentation Using Parallel Coattention Network** *Sangramjit Chakraborty, Monalisha Mahapatra and Anup Nandy*	
4	**SoccerKDNet: A Knowledge Distillation Framework for Action Recognition in Soccer Videos** *Sarosij Bose, Saikat Sarkar and Amlan Chakrabarti*	
5	**DeFlare-Net: Flare Detection and Removal Network** *Allabakash Ghodesawar, Vinod Patil, Ankit Raichur, Swaroop Adrashyappanamath, Sampada Malagi, Nikhil Akalwadi, Chaitra Desai, Ramesh Ashok Tabib, Ujwala Patil and Uma Mudenagudi*	
6	**A Novel Network Architecture for Microplankton Classification in Digital Holographic Images** *A. Shrihari, Prithwijit Guha and Rishikesh Dilip Kulkarni*	
7	**Generation of Data for Training Retinal Image Segmentation Models** *Srinjoy Bhuiya, Suchandra Chakraborty, Subhopriyo Sadhukhan, Deba Prasad Mandal and Dinabandhu Bhandari*	

TS09: Computer Vision		
13 December 2023	**Venue: PJAB**	**16:00 - 18:20**
Session Chair: Amlan Chakrabarti (University of Calcutta)		
1	**Object Detection with YOLO Model on NAO Humanoid Robot** *Sougatamoy Biswas, Anup Nandy and Asim Kumar Naskar*	
2	**Scene Estimation for Making Active Decisions** *Sambhunath Biswas and Sabyasachi Moitra*	
3	**Quantized Disentangled Representations for Object-Centric Visual Tasks** *Daniil Kirilenko, Alexandr Korchemnyi, Konstantin Smirnov, Alexey K. Kovalev and Aleksandr I. Panov*	
4	**RGB-D Fusion Based on Fuzzy Optimization for Salient Object Detection** *Sudipta Bhuyan, Debashis Sen and Sankha Deb*	
5	**AfforDrive: Detection of Drivable Area for Autonomous Vehicles** *Mahek Jain, Guruprasad Kamat, Rochan Bachari, Vinayak A. Belludi, Dikshit Hegde and Ujwala Patil*	
6	**Revealing the Unseen: A Single-Stage Attention Based Occluded Object Detection Model in Remote Sensing Imagery** *Nandini Saini, Chiranjoy Chattopadhyay and Debasis Das*	
7	**A Study of Quantifying the Deviation of Remotely Sensed Objects from Multi-spectral Images** *Prateek Tewary and Jit Mukherjee*	

14th December 2023 (Thursday)

TS10: Soft Computing		
14 December 2023	**Venue: NAB2**	**10:00 - 12:00**
Session Chair: Vasilii A. Gromov (HSE, Russia)		
1	**Multi-objective Non-overlapping Front Generation: A Pivot-Based Deterministic Non-dominated Sorting Approach** *Sourab Mandal and Paramartha Dutta*	
2	**Elephant Swarm Water Search Algorithm (LESWSA) for Solving Constrained Optimization Problems: A List Based Randomized Approach** *Joy Adhikary and Sriyankar Acharyya*	
3	**Fuzzy Rule-Based Approach Towards Cognitive Load Measurement During Mental Task Using fNIRS** *Subashis Karmakar, Chiranjib Koley, Aniruddha Sinha, Sanjoy Kumar Saha and Tandra Pal*	
4	**A Grammatical Evolution Based Automated Configuration of an Ensemble Differential Evolution Algorithm** *M.T. Indu and C. Shunmuga Velayutham*	
5	**Scalable Centroid Based Fuzzy Min-Max Neural Network Ensemble Classifier Using MapReduce** *Vadlamudi Aadarsh and P.S.V.S. Sai Prasad*	
6	**Membership Adjusted Superpixel Based Fuzzy C-Means for White Blood Cell Segmentation** *Arunita Das, Amrita Namtirtha and Animesh Dutta*	

TS11: Information Security		
14 December 2023	**Venue: NAB1**	**10:00 - 12:00**
Session Chair: Nabendu Chaki (University of Calcutta)		
1	**MSPIS: Multimodal Suspicious Profile Identification System in Online Social Network** *Monika Choudhary, Satyendra Singh Chouhan, Emmanuel Shubhankar Pilli and Nehul Singh*	
2	**Ignore-and-Recalculate Strategy for a Lossless and Low-Cost Secret Image Sharing Scheme** *Krishnendu Maity, Satyam Kumar and Susanta Mukhopadhyay*	
3	**Cyberbully: Aggressive Tweets, Bully and Bully Target Profiling from Multilingual Indian Tweets** *Suman Karan and Suman Kundu*	
4	**Financial Misinformation Detection via RoBERTa and Multi-channel Networks** *Ashraf Kamal, Padmapriya Mohankumar and Vishal Kumar Singh*	
5	**Quantum Image Teleportation Based on Probabilistic Bit-Encoding Strategy** *Arnab Chatterjee, Subrata Sarkar, Ishan Dutta and Suvamoy Changder*	
6	**Annihilation of Image Stegogram Through Deep Texture Extraction Based Sterilization** *Sreeparna Ganguly, Ankit Mishra and Imon Mukherjee*	

TS12: Signal Processing		
14 December 2023	**Venue: PJAB**	**10:00 - 12:00**
Session Chair: Swagatam Das (ISI Kolkata)		
1	**Heterogeneous Stacked Ensemble Framework for Surface Electromyography Signal Classification** *Suman Samui, Soumen Garai, Anindya Ghosh and Anand Kumar Mukhopadhyay*	
2	**Audio Fingerprinting System to Detect and Match Audio Recordings** *Kaushal Kishor, Spoorthy Venkatesh and Shashidhar G. Koolagudi*	
3	**Analysis of Speaker Recognition in Blended Emotional Environment Using Deep Learning Approaches** *Shalini Tomar and Shashidhar G. Koolagudi*	
4	**Spatiotemporal Co-occurrence Index Using Spatiotemporal Variability Signals** *Rahul Dasharath Gavas, Debatri Chatterjee, Soumya Kanti Ghosh and Arpan Pal*	
5	**Noise Robust Whisper Features for Dysarthric Severity-Level Classification** *Siddharth Rathod, Monil Charola and Hemant A. Patil*	
6	**Multilingual Speech Identification Framework (MSIF) A Novel Approach in Language Identification** *Swapnil Sawalkar and Pinki Roy*	
7	**Spoken Language Identification Using Linear Frequency Residual Cepstral Coefficients** *Krishna Parmar, Baveet Singh Hora, Shrey Machhar, Hemant Arjun Patil, Kiran Praveen and Balaji Radhakrishnan*	

15th December 2023 (Friday)

TS13: Computational Neurology		
15 December 2023	**NAB1**	**10:00 - 11:40**
Session Chair: Amitava Chatterjee (Jadavpur University)		
1	**Multi-modal Multi-class Parkinson Disease Classification Using CNN and Decision Level Fusion** *Sushanta Kumar Sahu and Ananda S. Chowdhury*	
2	**Mental Workload Classification with One-Dimensional CNN Using fNIRS Signal** *Ashish Kumar, Subashis Karmakar, Isha Agarwal and Tandra Pal*	
3	**An Effective Centrality-Based Community Detection Approach Using scRNA-Seq Data for Critical Neuro-Degenerative Diseases** *Tonmoya Sarmah and Dhruba K. Bhattacharyya*	
4	**Chronologically Arranged Convolutional Gated Recurrent Network for EEG-Based Schizophrenia Detection** *Shipra Swati and Mukesh Kumar*	
5	**A Novel Brain Connectivity-Powered Graph Signal Processing Approach for Automated Detection of Schizophrenia from Electroencephalogram Signals** *Subrata Pain, Naincy Vimal, Debasis Samanta and Monalisa Sarma*	

TS14: Biometrics		
15 December 2023	**Venue: PJAB**	**Time: 10:00 - 11:40**
Session Chair: Hemant A. Patil (DA-IICT, Gujrat)		
1	**FVINet: Translating Thermograms to Facial Vasculature Imprints** *Anushree Basu, Anirban Dasgupta, Aurobinda Routray and Pabitra Mitra*	
2	**Enforcement of DNN with LDA-PCA-ELM for PIE Invariant Few-Shot Face Recognition** *Anvaya Rai, Brejesh Lall, Astha Zalani, Raghwender Prakash and Shikha Srivastava*	
3	**Identifying a Person in Mask: Fusion of Masked Face and Iris** *Shadab Ahmad, Rajarshi Pal and Avatharam Ganivada*	
4	**A PCA-Based Keypoint Tracking Approach to Automated Facial Expressions Encoding** *Shivansh Chandra Tripathi and Rahul Garg*	
5	**A Clustering-Based Approach for the Extraction of ROI from Fingerprint Images** *Santhoshkumar Peddi, Nishkal Prakash, Rakesh Krishna Konduru, Alka Ranjan and Debasis Samanta*	

TS15: Bioinformatics		
15 December 2023	**Venue: NAB2**	**10:00 - 11:40**
Session Chair: Sudipto Saha (Bose Institute)		
1	**Encoded Deep Vectors for Eukaryotic Exon Prediction** *Praveen Kumar Vesapogu and Bapi Raju Surampudi*	
2	**Quantifying Intratumor Heterogeneity by Key Genes Selected Using Concrete Autoencoder** *Raihanul Bari Tanvir, Ricardo Ruiz, Samuel Ebert, Masrur Sobhan, Abdullah Al Mamun and Ananda Mohan Mondal*	
3	**Identification of Potential Prognostic Biomarkers for ESCC Using Single-Cell RNA Sequencing Data Analysis** *Pallabi Patowary, Dhruba K. Bhattacharyya and Pankaj Barah*	
4	**Litchi Fruit Instance Segmentation from UAV Sensed Images Using Spatial Attention-Based Deep Learning Model** *Debarun Chakraborty and Bhabesh Deka*	
5	**ccLoopER: Deep Prediction of *C*TCF and *c*ohesin Mediated Chromatin *loop*ing Using DNA Transform*er* Model** *Anup Kumar Halder, Abhishek Agarwal, Sevastianos Korsak, Karolina Jodkowska and Dariusz Plewczynski*	

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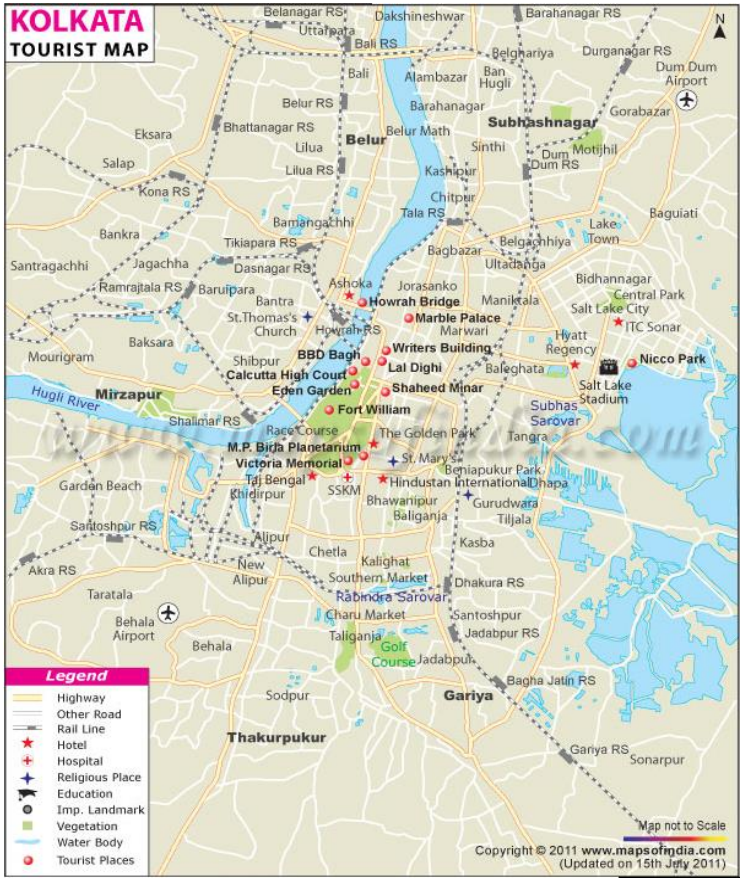
Council of Scientific and Industrial Research, Ministry of Science & Technology, Government of India

KOLKATA

In the fall of 1687 Job Charnock, an agent of the East India company, secured permission from the Mughals to establish a base at Sutanati. In 1696, Old Fort William was established and this was the origin of the city of Kolkata. One of the sayings goes, the name Kolkata is derived from Kalikata, one of three villages whose lands became a part of the new settlement. In the three centuries, Kolkata has grown from a mere fishing village into one of the largest cities in India with a population of 14.9 million, and indeed, one of the largest cities in the world. Kolkata served as the capital of British India until 1912 and it is not surprising that one sees predominantly Western architectural styles in its many buildings and monuments. Two of the finest examples are Writers Building and the Victoria Memorial, where the architecture is a medley of the best of Occidental and Oriental styles. It is proud to have one of the best libraries and museums in Asia. Kolkata is a city with strong cultural, literary and scientific flavour. This is reflected in the ever increasing flow of activities in diverse fields such as science, fine arts, writing, music, dance and theatre. The first Noble laureate in literature from Asia was from Kolkata and it was the main place of work of several other Nobel laureates.



PLACES TO VISIT

Founded by Swami Vivekananda, the world famous socio-religious reformer and disciple of Sri Ramakrishna Paramhansa, it is the Headquarters of Ramakrishna Mission. This International tourist attraction is located on the bank of the river Hooghly near Belur, close to Indian Statistical Institute. Its sprawling prayer hall with a statue of Ramakrishna is remarkable. It is well connected by train and by bus.

Belur Math

Established in 1959, it is located at 19A Gurusaday Road. It features permanent exhibition on scientific and technological progress. It has workshop which designs and produces much of its exhibits.

Birla Industrial & Technological Museum

One of the largest in Asia, it is located at 96, Jawaharlal Nehru road, near the Victoria Memorial. Daily programs are conducted in English, Bengali and Hindi from 12 noon to 7 pm. It can accommodate 500 persons.

Birla Planetarium

The largest and oldest of its kind in India, it was laid out in 1787. It covers an area of 109.27 Ha and is famous for the over 250 years old Great Banyan tree which covers 382 m in its circumference, with over 600 aerial roots. There are more than 30,000 varieties of trees and plants. Situated about 9 km from Kolkata, across the Hooghly river, it is a lovely picnic spot, well- connected by bus and ferry service.

Botanical Garden

Built by Rani Rasmoni in the 19th century on the bank of the river Hooghly in the northern suberb of Kolkata and very close to the Indian Statistical Institute. It is here that Sri Ramakrishna Paramhansa, the renowed spiritual personality and the guru of Swami Vivekananda had worshipped the goddess Kali. It is a world famous place of pilgrimage.

Dakshineswar Temple

A sprawling garden set up by the Brtitish in the early 20th century with a band stand and a beautiful pagoda. It is an attractive picnic spot on Strand Road. A stadium has been built adjacent to it for cricket test matches which can accommodate as many as 100,000 people.

Eden Gardens

A National Museum housing rare antiques, armaments, armor, fossils, stones, paintings of Mughal India, regal dresses/uniforms, rare animal skeletons, mummies, etc. It is situated on J L Nehru Road, near the Birla Planetarium.

Indian Museum

Legend goes that the name of Kolkata, is derived from the famous Kali deity of this temple located at Kalighat in South Kolkata. It is a great attraction for Hindu pilgrimage and is easily accessible by Metro railway from Shyambazar in the north Kolkata.

Kalighat Temple

Previously vice-Regal House, it is one of the largest libraries in Asia with a collection of rare books and manuscripts. It is located opposite the Zoological Gardens, Alipore.

National Library

Previously known as Octerloney Monument, it resembles the Qutab Minar of Delhi. It is located near Esplanade on the Maidan, a green stretch at the heart of Kolkata comprising many football, cricket, hockey and athletic clubs. The Saheed Minar is the seat of many memorable political meetings.

Saheed Minar

The Anglican Cathedral of Kolkata built in 1847, is adjacent to the Birla Planetarium. Its tower is 65 m high and is famous for the serene service rendered on Christmas Eve.

St. Paul's Cathedral

One of the few such facilities in the World, the Science City on the Eastern Metropolitan Bypass has a Convention Center and Science Theme Park. Here modern technology combines with impressive visuals to bring science closer to people.

Science City

Built in memory of Queen Victoria, between 1906 and 1921 imitating the Taj Mahal, topped with an angel, this memorial faces the Kolkata Maidan. It houses paintings, manuscripts, and other objects of historic value in its Museum and Art Gallery. Two regular sound and light shows are held in the evening.

Victoria Memorial

One of the biggest zoological gardens in India, it has a vast collection of animals, birds, snakes and reptiles. It also has a section for children. It remains a favourite picnic spot during winter and attracts a large number of emigrant birds. Directly across the main zoo is an aquarium, with a variety of aquatic life from around the world.

Zoological Garden

A famous mosque in Kolkata, India. Located at 185 Dhartamtalla Street near Saheed Minar, the mosque is a relic of architectural and cultural heritage. People from all sections of society and religions are allowed to visit and take pictures of this historical premise. This building was built in 1832 by Prince Ghulam Mohammed, the youngest son of Tipu Sultan, the great warrior of Mysore.

Tipu Sultan Mosque

PReMI'23: PROGRAM AT A GLANCE

Pre-Conference Tutorial: December 11, 2023

Conference: December 12 – December 15, 2023

Venue: Indian Statistical Institute, Kolkata

Monday, December 11		Tuesday, December 12		Wednesday, December 13		Thursday, December 14		Friday, December 15	
Time	**Event**	**Time**	**Event**	**Time**	**Event**	**Time**	**Event**	**Time**	**Event**
9:00 - 10:00	Registration	9:00 - 10:00	Registration	9:00 - 10:00	Registration	9:00 - 10:00	Registration	9:00 - 10:00	Registration
10:00 - 12:00	**Tutorial 1**	10:00 - 10:30	**Inauguration**	10:00 - 12:00	TS04, TS05, TS06	10:00 - 12:00	TS10, TS11, TS12	10:00 - 11:40	TS13, TS14, TS15
12:00 - 12:30	Tea/Coffee Break	10:30 - 11:00	High Tea/Coffee	12:00 - 12:30	Tea/Coffee Break	12:00 - 12:30	Tea/Coffee Break	11:40 - 12:10	Tea/Coffee Break
12:30 - 14:30	**Tutorial 2**	11:00 - 12:00	**Keynote Talk 1**	12:30 - 13:30	**Keynote Talk 3**	12:30 - 13:30	**KeynoteTalk 4**	12:10 - 12:55	**Invited Talk 4**
		12:05 - 12:50	**Invited Talk 1**					13:00 - 13:45	**Invited Talk 5**
14:30 - 15:30	Lunch Break	12:50 - 14:00	Lunch Break	13:30 - 14:45	Lunch Break	13:30 - 14:45	Lunch Break	13:45 - 14:45	Lunch Break
15:30 - 17:30	**Tutorial 3 Tutorial 4**	14:00 - 16:00	TS01, TS02, TS03	14:45 - 15:30	**Invited Talk 2**	14:45 - 15:30	**Invited Talk 3**	14:45 - 16:45	**Student Research Workshop**
18:00 - 18:30	Tea/Coffee Break	16:00 - 16:30	Tea/Coffee Break	15:30 - 16:00	Tea/Coffee Break	15:30 - 16:30	**Industrial Session**	16:45 - 17:15	High Tea/Coffee Break
18:30 - 19:30	**Cultural Program**	16:30 - 17:30	**Keynote Talk 2**	16:00 - 18:20	TS07, TS08, TS09	16:30 - 18:30	**Doctoral Colloquium**	17:15 - 18:00	**Valedictory**
19:30 - 21:00	**Welcome Dinner**	17:35 - 18:35	**IAPR Public Lecture**	19:00 - 20:00	**Cultural Program**				
				20:00 - 22:00	**Banquet**				

Keynote Talk 1: Trevor Hastie
Keynote Talk 2: Bernhard Schölkopf
Keynote Talk 3: Alison Noble
Keynote Talk 4: Dacheng Tao
IAPR Public Lecture: Dipankar Banerjee

Tutorial 1: Soma Biswas
Tutorial 2: Animesh Mukherjee
Tutorial 3: Anirban Santara
Tutorial 4: Sangheeta Roy

Invited Talk 1: Richa Singh
Invited Talk 2: SP Arun
Invited Talk 3: Balaraman Ravindran
Invited Talk 4: Balasubramanian Narasimhan
Invited Talk 5: Gajendra P. S. Raghava

TS01: Pattern Recognition
TS04: Statistical Learning
TS07: Medical Imaging
TS10: Soft Computing
TS13: Computational Neurology

TS02: Machine Learning
TS05: Cognitive Computing
TS08: Image and Video Processing
TS11: Information Security
TS14: Biometrics

TS03: Deep Learning
TS06: Computational Intelligence
TS09: Computer Vision
TS12: Signal Processing
TS15: Bioinformatics

NAB1: Tutorial 3, Valedictory, TS02, TS04, TS08, TS11, TS13

PJAB: Registration, Inauguration, Keynote Talks, Invited Talks, Public Lecture, Industrial Session, Doctoral Colloquium, Cultural Program, Tutorial 1, Tutorial 2, Tutorial 4, TS01, TS05, TS09, TS12, TS14

NAB2: Student Research Workshop, TS03, TS06, TS07, TS10, TS15