

IEEE Computational Intelligence Society (CIS) Distinguished Lecture Program (DLP) Report

Organizer: IEEE CIS Australian Capital Territory (ACT) chapter

Speaker: Prof. Ujjwal Maulik, Jadavpur University, Kolkata, India.

Date: June 05, 2023

Venue: LT12, Bldg. 32 (LT North), Northcott Drive, UNSW Canberra, Australia

Number of attendees: 15

Prof. Ujjwal Maulik gave a distinguished lecture as part of DLP program on the topic: *Artificial Intelligence and Data Science: Current Trends and Future Challenges*. The talk was pitched at a level suitable for audiences to understand without deep background in AI. The talk was attended by a range of researchers working from students to full professors, working on topics such as evolutionary computation, optimization, games and computational intelligence.

In conjunction with the DL talk, we also organized another CIS seminar in the same afternoon, by Professor Sanghamitra Bandyopadhyay, Indian Statistical Institute (ISI), Kolkata, India. Her talk was entitled: *Multiobjective Optimization and Beyond: Methods and Applications*.

Both the above talks were well received by the audience and led to engaging discussions during QnA sessions as well as during the tea-break between the two sessions. A number of students took the opportunity to closely interact with both speakers during as well as after the sessions.

The talks were advertised through the IEEE MGA vtools events/enotice to IEEE CIS ACT chapter, as well as internally circulated in the newsletter of the host university, i.e., University of New South Wales (UNSW), Canberra ACT, Australia. A copy of the flyers circulated for both the talks are given in the next two pages; and include more details of the talks and speakers.

We deeply appreciate the opportunity and funding provided by IEEE DLP to support Prof. Ujjwal Maulik in travelling to Canberra and delivering a distinguished lecture.





IEEE CIS Distinguished Lecture

Prof. Ujjwal Maulik

Jadavpur University,
Kolkata, India.



School of Engineering & Information Technology

Time: 2pm – 3pm, 5th June 2023

Venue: LT12, Bldg. 32 (LT North), Northcott Drive, UNSW Canberra, ADFA

RSVP at <http://tinyurl.com/act-cis-5jun23A>.

Artificial Intelligence and Data Science: Current Trends and Future Challenges

Abstract: In this lecture, first we will discuss current trends in Artificial Intelligence (AI). Supervised and unsupervised pattern classification are important Machine Learning (ML) techniques which is an integral part of AI and have wide range of applications. While supervised classification techniques use training samples to obtain the class information of test samples, unsupervised classification partitions the given data set into homogeneous groups based on some similarity/dissimilarity metric. In addition to the fundamentals of ML, we will demonstrate the importance of using Deep Learning (DL), Graph neural network (GNN) and explainable AI. While DL has been used very successfully for image analysis, GNN are being used extensively for unstructured datasets including biological datasets available in the form of graphs containing the interaction between genes, drugs, diseases etc.

In the second part of the lecture, we will focus on the basic issues and challenges in data science, starting with the simple to complex data and finally to the big data. Finally, we will discuss the challenges and future of AI research.



About the speaker: Dr. Ujjwal Maulik is a Professor in the Dept. of Comp. Sc. and Engg., Jadavpur University since 2004. He was also the former Head of the same Department. He also held the position of the Principal in charge and the Head of the Dept. of Comp. Sc. and Engg., Kalayni Govt. Engg. College. Dr. Maulik has worked in many universities and research laboratories around the world as visiting Professor/ Scientist including Los Alamos National Lab., USA , Univ. of New South Wales, Australia, Univ. of Texas at Arlington, USA , Univ. of

Maryland at Baltimore County, USA, Fraunhofer Institute for Autonomie Intelligent Systems, St. Augustin, Germany, Tsinghua Univ., China, Sapienza Univ., Rome, Italy, Univ. of Heidelberg, Germany , German Cancer Research Center (DKFZ), Germany, Grenoble INP, France, University of Warsaw, University of Padova, Italy, Corvinus University, Budapest, Hungary, University of Ljubljana, Slovenia and International Center for Theoretical Physics (ICTP), Trieste, Italy. He is the recipient of Alexander von Humboldt Fellowship and Senior Associate of ICTP, Italy. He is the Fellow of Indian National Academy of Engineers (INAE), India, National Academy of Science India (NASI), International Association for Pattern Recognition (IAPR), USA, Asia-Pacific Artificial Intelligence Association(AAIA), Singapore and The Institute of Electrical and Electronics Engineers (IEEE), USA. He is also the Distinguish Member of the ACM. He is a Distinguish Speaker of IEEE as well as ACM. His research interest include Machine Learning, Pattern Analysis, Data Science, Bioinformatics, Multi-objective Optimization, Social Networking, IoT and Autonomous Car. In these areas he has published ten books, more than four hundred papers, mentoring several start-ups, filed several patents and already guided twenty five doctoral students. His other interest include outdoor Sports and Classical Music.



IEEE CIS Seminar

Prof. Sanghamitra

Bandyopadhyay

Indian Statistical Institute,
Kolkata, India.

School of Engineering & Information Technology

Time: 3.30pm – 4.30pm, 5th June 2023

Venue: LT12, Bldg. 32 (LT North), Northcott Drive, UNSW Canberra, ADFA

RSVP at <http://tinyurl.com/act-cis-5jun23B>.



Multiobjective Optimization and Beyond: Methods and Applications

Abstract: Multi-objective optimization problems (MOPs) are ones that require simultaneous optimization of multiple conflicting objectives to attain the state of Pareto-optimality, where improving solutions in terms of one objective leads to deterioration in terms of one or more of the other objectives. Many real-life problems belong to the class of MOPs and a number of algorithms exist for solving them. In some special cases of MOPs, multiple subsets of the Pareto-optimal set could independently generate the same Pareto-Front. Such problems are referred to as Multi-modal MOPs (MMMOPs), where a many-to-one mapping exists from solution space to objective space. The discovery of equivalent solutions across such different subsets is important during decision-making to facilitate the downstream analysis.

In this talk, we will first provide a brief introduction to MOPs, followed by an application to the real-life problem of drug design. This will be followed by a discussion on the basic concept of multi-modality in MOPs. We will then discuss the crowding illusion problem in MMMOPs. A method for solving MMMOPs with a graph Laplacian-based Optimization using Reference vector assisted Decomposition (LORD) will thereafter be discussed. The talk will conclude with the mention of an application of MMMOPs to the problem of building energy optimization.



About the speaker: Prof. Sanghamitra Bandyopadhyay did her B Tech, M Tech and Ph.D. in Computer Science from Calcutta University, IIT Kharagpur and Indian Statistical Institute respectively. She then joined the Indian Statistical Institute as a faculty member, and became the Director in 2015. Since 2020 she is continuing in her second tenure as the Director of the Institute. Her research interests include computational biology, soft and evolutionary computation, artificial intelligence and machine learning. She has authored/co-authored several books and numerous articles in journals, book chapters, and conference proceedings and has a citation

h-index of more than 60. Prof. Bandyopadhyay has worked in many Institutes and Universities worldwide. She is the recipient of several awards including the Shanti Swarup Bhatnagar Prize in Engineering Science, TWAS Prize, Infosys Prize, JC Bose Fellowship, Swarnajayanti fellowship, INAE Silver Jubilee award, INAE Woman Engineer of the Year award (academia), IIT Kharagpur Distinguished Alumni Award, Humboldt Fellowship from Germany, Senior Associateship of ICTP, Italy, young engineer/scientist awards from INSA, INAE and ISCA, and Dr. Shanker Dayal Sharma Gold Medal and Institute Silver from IIT, Kharagpur, India. She is a Fellow of the Indian National Science Academy (INSA), National Academy of Sciences, India (NASI), Indian National Academy of Engineers (INAE), Indian Academy of Sciences (IASc), Institute of Electrical and Electronic Engineers (IEEE), The World Academy of Sciences (TWAS), International Association for Pattern Recognition (IAPR) and West Bengal Academy of Science and Technology. She serves as a member of the Science, Technology and Innovation Advisory Council of the Prime Minister of India (PM-STIAC). In 2022, she received the Padma Shri award, the fourth highest civilian award of the Government of India.