DLAI7 2023 Speaker List

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3. Sriparna Saha
4. Hamid Laga
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22. Rajarshi Pal

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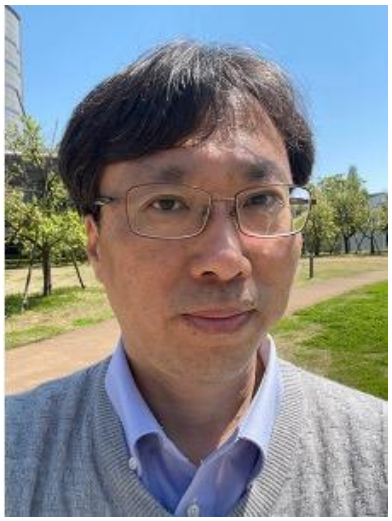
23. Irwin King
24. Kasturi Dewi Varathan
25. Sriparna Saha

1. Naoyuki Kubota, Tokyo Metropolitan University, Japan



Title: Topological Intelligence and Topological Clustering

Abstract: Recently, cyber-physical systems and digital twin have been discussed with the integration of information, intelligence, communication, and robot technologies. In order to conduct multiscale and multiphysics simulations on a real-world phenomenon in the cyber world based on the digital twin, we often have to extract topological features and structures from given or measured big data. Therefore, we proposed the concept of *topological twin*. The aim of topological twin is to (1) extract topological structures hidden implicitly in the real world, (2) reproduce them explicitly in the cyber world, and (3) simulate and analyze the real world in the cyber world. While we have to deal with the physical dynamics in the microscopic level, we have to deal with spatiotemporal qualitative relationships between objects, people, culture, and knowledge in the macroscopic level. Furthermore, we need a mesoscopic integration method connecting microscopic and macroscopic topological features. Thus, the topological twin plays an important role in extracting and connecting structures hidden in the real world from the multiscopic point of view. Furthermore, we need a multiscopic approach to deal with inference, learning, search, and prediction based on topological and graphical data as the methodology of *topological intelligence*. In this talk, first, we introduce the concept of multiscopic topological twin. Next, I explain various types of topological clustering methods and graph-based methods related with topological intelligence. One of them is Growing Neural Gas (GNG) that can dynamically change the topological structure composed of nodes and edges. One important advantage of GNG is in the incremental learning capability of nodes and edges according to a target data distribution, but the computational cost of standard GNG is very expensive. Therefore, we proposed a method of multi-scale batch-learning GNG called Fast GNG. Next, we show the comparison result of Fast GNG with other methods. Furthermore, we show several experimental results of topological intelligence in trailer living laboratory, robot partners and mobility support robots. Finally, we discuss the applicability and future direction of topological intelligence.

Biography: Naoyuki Kubota is currently a Professor in the Department of Mechanical Systems Engineering, the Graduate School of Systems Design, and Director of the Community-centric Systems Research Center, Tokyo Metropolitan University, Japan. He received a doctoral degree from Nagoya University, Japan, in 1997. He joined Osaka Institute of Technology and Fukui University, Japan. He was an Associate Professor from 2005 to 2012, and a Professor from 2012 at the Graduate School of Systems Design, Tokyo Metropolitan University, Japan. He was a Visiting Professor at University of Portsmouth, UK and Seoul National University, and others. His current interests are in the fields of topological mapping, coevolutionary computation, spiking neural networks, robot partners, and informationally structured space. He has published more than 500 refereed journal and conference papers in the above research fields. He was an associate editor of the IEEE Transactions on Fuzzy Systems from 1999 to 2010, the IEEE CIS Intelligent Systems Applications Technical Committee, Robotics Task Force Chair from 2007 to 2014, IEEE Systems, Man, and Cybernetics Society, Japan Chapter Chair from 2018 to 2021, IEEE Transactions on Affective Computing Steering Committee Member from 2019, and others.

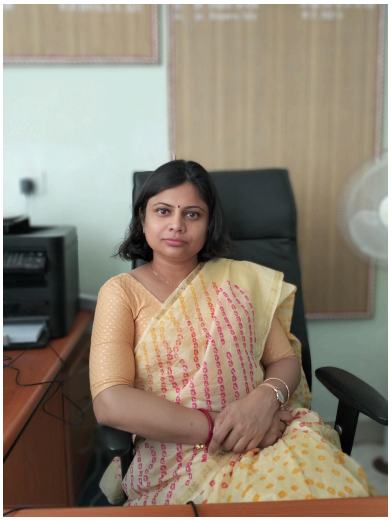
2. Xiaofeng Liu, Hohai University, China

Title: Affective Human-Robot Interaction

Abstract : Affect is essential to artificial intelligence. In 2021, Science reprised the 125 Questions theme in a new edition that focuses on exploration and discovery in collaboration with Shanghai Jiao Tong University. These questions relate to the role of affect in the development of intelligence. Affective HRI is related to, but separate from, human factors and human–computer interaction (HCI). While HRI certainly benefits from considering the various HCI design principles and iterative design process, affective HRI may be more complex than traditional HCI. In order to research affective HRI, we have developed an affective humanoid robot with a humanoid appearance and skin. The affective system based on our humanoid robot mainly includes the robot's perception of the user's affect and the expression of the robot's affect. Regarding interaction patterns in affective HRI, perception of affective human behavior in HRI mainly includes speech recognition, facial expression recognition, physiological signal perception, gesture recognition, etc. The research group has conducted a series of work. At the same time, we have explored the generation of affect in HRI based on the facial expression. Finally, we discuss the practical problems in the application of affective HRI.

Biography: Xiaofeng Liu is a full professor at Hohai University, where he is also the leader of the Cognition and Robotics Laboratory and the vice director of the Jiangsu Key Laboratory of Special Robotic Technologies. He is also an Honorary Professor at the University of Manchester. He has successively presided over projects, including Science and Technology Innovation 2030 - "New Generation of Artificial Intelligence" major projects, the National High-Tech Research and Development Program and the National Basic Research Program, Jiangsu Provincial Natural Science Foundation, Jiangsu Provincial Key Research and Development Plan. He has twice won the Wu Wenjun Artificial Intelligence Science and Technology Award. His research interests include human-robot interactions, social robotics, bio-inspired navigation, and neural engineering.

3. Sriparna Saha, Indian Institute of Technology Patna, India

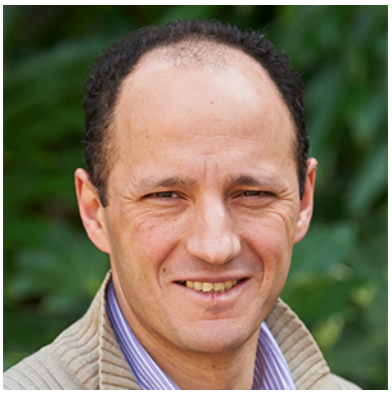


Title: AI/ML Applications in Digital Health

Abstract: In recent years, we are working on developing several AI-based assistants to help improve the physical and mental health issues of common people of the society. In order to support telemedicine facilities, we have developed some virtual doctors which can conduct symptom investigations and can replace junior doctors in a hospital. In general in a hospital, when patients report, firstly a junior doctor used to conduct a symptom investigation by asking some relevant questions, and finally, a senior doctor takes the decision about the illness based on the symptoms investigated. We have developed a virtual doctor with the support of AL, ML, and NLP techniques which can conduct symptom investigation. This conversational agent is capable of detecting symptoms either from textual responses of the patients or the images shown by the patient. I will discuss the research challenges faced during this virtual doctor development in the first part of my talk. The second part of my talk will discuss the research challenges faced for the development of a motivational chatbot that will act as the first point of contact for patients suffering from mental distress. This conversational agent generates empathetic and motivational utterances to help in boosting the morale of patients who are suffering from some mental disorders.

Biography: Dr. Sriparna Saha received M.Tech and Ph.D. degrees in computer science from Indian Statistical Institute Kolkata, Kolkata, India, in 2005 and 2011, respectively. She is currently an Associate Professor and Head of the Department of Computer Science and Engineering, Indian Institute of Technology Patna, India. She has authored or co-authored more than 350 papers. Her current research interests include deep learning, natural language processing, machine learning, information extraction, text mining, bioinformatics, and multiobjective optimization. Stanford University in a survey also listed her as one of the top 2% of scientists in AI with more than five published papers. She is the Associate Editors of several reputed journals, including IEEE Transactions of Computational Social Systems, IEEE/ACM Transactions on Computational Biology and Bioinformatics, Plos One, Pattern Recognition Letters, Expert Systems with Applications, Neurocomputing, ACM Transactions on Asian and Low-Resource Language Information Processing, etc. Her current h5-index is 35 and the total citation count of her papers is more than 6854(according to Google Scholar). She is the recipient of several awards and fellowships including the SERB Women in Excellence Award 2018, Google Indian Women in Engineering Award 2008, NASI Young Scientist Platinum Jubilee Award for the year 2016 in the field of Electronics, Computer Science, and Engineering, ISIAA Rashi Ray Memorial Medal from Indian Statistical Institute, Kolkata, India, for being adjudged the First Class First in M.Tech Examination in Computer Science in the year 2005, Humboldt Research Fellowship 2015, CNRS fellowship.

4. Hamid Laga, Murdoch University, Australia



Title: Deep Learning-based 3D/4D Reconstruction and Analysis

Abstract: In this talk, I will review the latest developments in deep learning-based 3D reconstruction and analysis of static and dynamic objects from 2D RGB images. 3D and 4D (i.e., 3D + motion) reconstruction of the physical world from images is a long-standing problem in computer vision and graphics. However, the latest developments of the past five years in the area of deep learning has reshaped the field, with state-of-the-art methods achieving unprecedented results. In this talk, I will provide an overview of the latest developments in this field. I will particularly focus on the role of neural representations and generative models, discuss the benefits and limitations of various classes of methods, and highlight potential directions for future research.

Biography: Hamid's expertise is in Machine Learning, Computer Vision, and Computer Graphics. While his primary focus is on fundamental research, he undertakes cross-disciplinary and translational research across agriculture, animal science, biosecurity and health. His research interests include: (1) 3D reconstruction, modelling and analysis of static and dynamic objects, using tools from artificial intelligence, machine learning, statistics and differential geometry. In addition to solving the underlying fundamental problems, he also targets applications such as modelling and simulation in computer graphics, medical diagnosis, and sports analytics. (2) virtual and augmented reality in Health, and (3) machine learning, computer vision and image processing for Health, Agriculture and Biosecurity. He co-authored two books published, respectively, in 2017 and 2019, and more than 40 articles in top journals including IEEE Transactions on Pattern Analysis and Machine Intelligence and ACM Transactions on Graphics (Siggraph). His work received multiple awards including the Best Paper Awards at (1) the Eurographics Symposium on Geometry Processing (2017), (2) the APRS/IAPR Best Paper Prize at DICTA (2012), and (3) the IEEE International Conference on Shape Modelling (2006). He has also received the Japan Society of Art and Science Award (2008) for the best computer graphics paper published between 2006 and 2008. He was the recipient of the Japan Society for the Promotion of Science Fellowship (April 2006 to March 2008).

5. Joni Zhong, Hong Kong Polytechnic University, Hong Kong

Title: Human centered AI for health care

Abstract: Human-centered AI focuses on designing and developing intelligent systems that prioritize and enhance human well-being and experiences. In the context of healthcare, human-centered AI refers to the application of AI technologies to improve the quality, efficiency, and accessibility of healthcare services while placing the needs and values of patients and healthcare providers at the forefront. In this talk, three aspects of human-centered AI and its applications will be introduced.

One of the significant advantages of human-centered AI in healthcare is its potential to augment and support medical professionals in diagnosing diseases, developing treatment plans, and providing personalized care. I will introduce the collaboration with Hospital Authority's data lab, where clinical big data can be used to develop personalized reminders and schedules that are tailored to the individual's specific needs and progression of dementia. Additionally, human-centered AI enables the development of adaptive assistive devices incorporating human feedback. Human feedback, including physiological, behavioral, and neurological signals, as well as voluntary instructions, can enable the devices to adapt to the user's needs and preferences, resulting in improved performance and user satisfaction. Furthermore, human-centered AI has found valuable applications in creating smart home environments that cater to the needs and well-being of elderly individuals. I will show smart sensors, powered by deep learning models, play a crucial role in monitoring the activities and safety of older adults, promoting their independence and ensuring their security.

Biography: Dr Joni Zhong is a research assistant professor at the Hong Kong Polytechnic University. He graduated from South China University of Technology with a Bachelor in Automation. He obtained his MPhil degree at the Hong Kong Polytechnic University, Hong Kong, and Ph.D. degree at the University of Hamburg, Germany. Before returning the PolyU, he has been a researcher at the University of Hertfordshire (UK), University of Plymouth (UK), Waseda University (Japan), the National Institute of Advanced Industrial Science and Technology (AIST, Japan) and Nottingham Trent University (UK). His current research focuses on human-centered AI models, cognitive assistive robots and their usage in wellbeing and elderly healthcare. He is the associate editor of International Journal of Advanced Robotic Systems, and Frontiers in Robotics and AI. He is also the Chair of the Task force on Action and Perception, IEEE CIS Technical Committee on Cognitive and Developmental Systems

6. Hwee Kuan Lee, Agency for Science, Technology and Research, Singapore

Title: APOLLO: AI Driven CT Coronary Angiography for Clinical and industrial applications

Abstract: Coronary artery disease (CAD), a blockage of the blood vessels, affects 6% of the general population and up to 20% of those over 65 years of age. CAD is a leading cause of cardiac mortality in Singapore and worldwide, with 19% of deaths in Singapore due to CAD (MOH website). Numbers of CAD cases are growing rapidly due to aging and higher prevalence of diabetes. Computed Tomography Coronary Angiography (CTCA) is the first-line investigator for CAD as indicated by updated National Institute for Clinical Excellence (NICE) guidelines. Recent Prospective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) and Scottish Computed Tomography of the Heart (SCOT-HEART) trials support CTCA as the dominant means for evaluating coronary anatomy and physiology because CTCA increases diagnostic certainty, improves efficiency of triage to invasive catheterization and reduces radiation exposure when compared with functional stress testing. Current practice of CAD report generation requires 3-6 hours of a CT specialist's time for annotating the scans, and with inter-observer variability of 20%. In addition, there is no effective toolkit to analyse Agatston scores (a measure of calcified CAD), severity of stenosis, and plaque characterisation. These problems have strongly and severely constrained the effectiveness of CTCA as a diagnostic and research tool. The APOLLO platform uses AI-driven algorithms to reduce the report generation time from 3-6 hours to under 10 minutes. This platform is capable of automated anonymization, reporting, Agatston scoring and plaque quantification in CAD. It is a "one-stop" platform spanning from diagnosis to clinical, management and prognosis, and aid in predicting therapy response in the pharmaceutical industries.

7. Kwan Hoong Ng, Universiti Malaya, Malaysia

Title: Grand Challenges facing AI in Medical Imaging

Abstract: Medical imaging is at the forefront of Artificial Intelligence (AI) applications in medicine, which are currently pervasive. This development has been prompted by a number of factors, such as a global shortage of radiologists, population expansion, and an increase in the demand for imaging and diagnostic services. Non-interpretive AI tools have already been put in place in major medical centres worldwide.

Regulatory compliance, legal liability, ethical considerations, data privacy, cybersecurity, standards for data sharing, algorithm robustness, and safe AI incorporation into everyday practice are just a few of the obstacles and challenges that must be overcome. The aforementioned problems are being solved to varying degrees of success.

I will discuss what I consider as the three grand challenges facing AI in medical imaging: the lack of high-quality annotated datasets required for training; bias in data acquisition, selection of training dataset, disease demographics; and human elements such as the concerns about being replaced by machines in future and experiencing constant fear and hype surrounding AI.

8. Md Zakir Hossain, Curtin University, Australia

Title: Deep Learning for Assessing and Supporting Autistic Individuals

Abstract: Autism Spectrum Disorder (ASD) is a neurodevelopmental condition impacting an individual's ability to communicate, interact, and socialise with others. People with ASD often experience challenges in facial expression recognition, social interaction, and communication, which can lead to stress, anxiety, and other negative outcomes. It is estimated that the global prevalence of ASD is 0.625% with 1% prevalence in Australia, with many individuals' experiencing challenges in everyday life situations. Our research highlights the importance of deep learning techniques to assess and support individuals with ASD. At the beginning, we focused on using a 3D-CNN model to detect autistic from healthy individuals using functional magnetic resonance imaging (fMRI) of the brain. The model achieved a promising accuracy of 74.5% and shows potential for future prognosis models or behavioural pattern-based multi-modal models for early detection of ASD. Accordingly, we investigated automated methods for early diagnosis of ASD using brain fMRI data. The proposed approach utilizes a weighted ensemble learning framework and a novel deep neural network classifier. The model achieved high accuracy of 98.0% on a subset and 75.2% on the whole dataset, showcasing state-of-the-art performance in detecting ASD. These advancements in deep learning provide valuable insights for assessing and supporting autistic individuals, improving diagnosis accuracy and potentially leading to development of earlier interventions for better outcomes.

Biography: Dr. Md Zakir Hossain has been a Senior Research Fellow at the Optus-Curtin Centre of Excellence in AI, School of Electrical Engineering, Computing and Mathematical Sciences (EECMS) at Curtin University in Perth since January 2023. His research focuses on developing advanced technologies for health-related problem-solving through qualitative and quantitative research in responsive AI and responsible AI. He has worked on computer vision and privacy-preserving AI approaches for health-related predictions, including affective computing, emotion recognition, and diagnosing and managing human diseases. Prior to joining Curtin University, he worked at the Australian National University (2018-2022) and CSIRO (2020-2022), where he developed machine learning models for predicting diseases in salmon and wheat traits. He has contributed to developing AI models for diagnosing COVID-19, predicting cancer types, multiple sclerosis, and diabetes. He also worked for Macquarie University and Canberra University. Zakir holds a PhD in Computer Science from ANU and has taught a number of university courses while supervising students at various institutions. He is an Associate Fellow of the UK Higher Education Academy (AFHEA).

9. Wei Liu, University of Western Australia, Australia

Title: Query Embeddings for Multi-hop Reasoning Over Knowledge Graphs

Abstract: Recent query embedding techniques have been shown to efficiently model complex logical queries (including the intersection operation) over Knowledge Graphs. In this talk, I will provide an overview of the query embedding research landscape with a starting point on geometric-based models (using points, boxes embeddings). In particular, I will introduce our recent works on unbounded cylinder embeddings (namely CylE) - the first 3D geometric-based approach. Empirical results show that the performance of multi-hop reasoning task using CylE significantly increases over state-of-the-art geometric-based query embedding models for queries without negation. For queries with negation operations, though the performance is on a par with the best performing geometric-based model, CylE significantly outperforms a recent distribution-based model. Then we will move on to our most recent work on Simplified Cone Embeddings with Symbolic Operators (SConE). By using symbolic operators, SConE reduces the computation cost while enjoying a significant improvement in answering complex queries (both non-negative and negative FOL forms) over previous geometric-based models.

Biography: Dr Liu received her PhD from the University of Newcastle, Australia in 2003. She is now a full time teaching & research academic in the Department of Computer Science and Software Engineering at the University of Western Australia. Her research focuses on knowledge discovery from natural language text, deep learning methods for knowledge graph construction and analysis, as well as sequential data mining and forecasting in traffic and water consumption domain. She has published in highly reputable venues such as ACM Computer Surveys, Journal of Data Mining and Knowledge Discovery, Knowledge and Information Systems, International Conference on Data Engineering (ICDE), ACM International Conference on Information and Knowledge Management (CIKM). She has won three Australian Research Council Grants and managed several industry grants. Her current industry-related research projects include knowledge graph refinement for geological survey reports, incident log analysis and visualisation, short-term traffic predication and cognitive computing for asset management.

10. Yi Zhang University of Technology Sydney, Australia

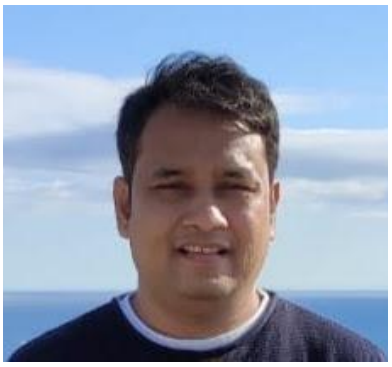
Title: AI + Informetrics for Tracking Technological Change

Abstract: Tracking technological change is among the top interests of the science, technology, and innovation (ST&I) community. Its tasks include identifying key ST&I components, measuring ST&I characteristics, monitoring ST&I dynamics over time, and predicting future ST&I trend. Inspired by this actual problem and supported by the 2019 ARC DECRA, I developed a series of computational models, called intelligent bibliometrics, which incorporate AI and data science techniques with bibliographical information. Some representative works include embedding-based models for topic extraction and classification, heterogeneous network analytics for relationship discovery and prediction, etc. We have successfully applied intelligent bibliometrics to a wide range of ST&I scenarios, e.g., profiling large-scale coronavirus literature, discovering gene-disease associations, detecting emerging technologies, recommending knowledge trajectories of scientific researchers.

In this talk, I will describe how my efforts take actions on recombining AI and data science with practical scenarios, problems, and issues, particularly in the case of ST&I studies. I will showcase two cases: (1) intelligent bibliometrics for analysing COVID-19 literature and measuring its social impacts (e.g., community disruption and resilience, and the dynamics of international collaborations); and (2) intelligent bibliometrics for characterising emerging technologies.

Biography: Yi Zhang serves as a Senior Lecturer at the Australian Artificial Intelligence Institute, Faculty of Engineering and Information Technology, University of Technology Sydney (UTS) and is the Australian Research Council's 2019 DECRA fellow. He obtained dual Ph.D. degrees, one in Management Science & Engineering (Beijing Institute of Technology, 2016) and the other in Software Engineering (UTS, 2017). His more than 100 publications highlight his research interest in intelligent bibliometrics, crossing research areas in bibliometrics, information science, and technology management. He is the Associate Editor for Technological Forecasting & Social Change and for Scientometrics, and the Editorial Board Member for the IEEE Transactions on Engineering Management. He is the Advisory Board Member of the International Center for the Study of Research. He has been recognised as the Research Field Leader in Library and Information Science by the 2023 Australian's Research Award.

11. Asif Ekbal, Indian Institute of Technology Patna, India



Title: Neural Networks for Natural Language Processing

Abstract: Natural Language Processing (NLP) is one of the most promising areas that encompasses Artificial Intelligence, Linguistics, Cognition, Physics, Mathematics, logic etc. There has been a phenomenal growth in terms of techniques, models and applications during the last few years, such as the RNN based models like transformers; large language models like GPT-2, GPT-3; Alexa, Google's Search Engine, Google Machine Translation etc. This lecture introduces very briefly the fundamentals of NLP, its applications and deep learning based models for question-answering, machine translation, sentiment analysis and conversational AI. Some of the interesting topics that will be covered include aspect based sentiment analysis, empathetic conversational agent, low-resource machine translation and code-mixed question-answering.

Biography: Asif Ekbal is currently an Associate Professor in the Department of Computer Science and Engineering, IIT Patna. He has been pursuing research in Natural Language Processing (NLP), Information Extraction, Text Mining and Machine Learning (ML) for the last 18 years; and authored around 300 papers in top-tier conferences and high-impact journals. Asif has been involved in several sponsored research projects, funded by both Govt as well as private agencies. He has been serving as a PC Chair, Area Chair, Senior PC member, PC member, reviewer to several well-known conferences like EACL, HLT/NAACL, AAAI, IJCAI, EMNLP, ACL etc. He is the Associate Editor of ACM TALLIP; Editorial board member of Computer Speech and Language, Elsevier; Plosone; and Action Editor, Neural Networks. He is an awardee of "Best Innovative Project Award" from the Indian National Academy of Engineering", Govt. of India, "JSPS Invitation Fellowship" from Govt of Japan and "Young Faculty Research Fellowship Award" of the Govt. of India. He is listed in the top 2% scientists, published by Stanford University findings in Elsevier, and in the list of top computer scientists, published by Openrsearch.com Google Scholar Citations: 8149; h-index is: 44 and i-10 index: 189.

12. Siridech Boonsang, King Mongkut's Institute of Technology Ladkrabang, Thailand

Title: Advancing Industrial Manufacturing with Generative AI and Synthetic Image Generation

Abstract: This work explores the application of generative models in industrial manufacturing, specifically in the context of creating synthetic images. The use of generative models to generate synthetic images has gained traction in various industries, including the automobile and manufacturing sectors. In the automobile industry, the Latent Diffusion Model (LDM), in combination with fine-tuning techniques, has been proposed as an approach to generate automobile images based on text input. However, limited datasets can lead to overfitting, and fine-tuning is used to pre-train the model to handle smaller-scale datasets. The synthetic images are generated based on conditional input, such as the brand, color, location, and automobile position. In industrial manufacturing, the development of automated surface inspection systems requires a large amount of representative product image data. However, obtaining such data, especially with defects that reflect real-world scenarios, can be challenging, resulting in difficulties in developing robust detection algorithms. Generative models can be utilized to create synthetic datasets that contain product images augmented with defects. These datasets provide images with a variety of defective shapes and positions over the surface, reflecting what would occur over longer production periods. In conclusion, the use of generative models has become essential in creating synthetic images in several industries, including industrial manufacturing. The LDM and fine-tuning techniques can be used to generate automobile images based on text input, while synthetically generated datasets with defects can help in the development of automated surface inspection systems.

Biography: Dr. Siridech Boonsang is the current Dean of the School of Information Technology at King Mongkut's Institute of Technology Ladkrabang (KMITL). He was born in Thailand and has an impressive educational background, having earned his Bachelor's degree in Electrical Engineering with Second Class Honours from KMITL in 1994. Dr. Boonsang then went on to pursue his Master's degree in Electrical and Electronic Engineering with a specialization in Electronic Instrumentation System from the University of Manchester Institute of Science and Technology (UMIST) in 2001. He completed his Ph.D. in Instrumentation from the same institution in 2004. He is an expert in AI for Industrial Automation, Sensors and Actuators, and Optical and Electronic Materials. He has published numerous papers, including "A deep learning system for recognizing and recovering contaminated slider serial numbers in hard disk manufacturing processes," "Optical and Structural Properties of Insoluble and Flexible Biodegradable Regenerated Silk Films for Optically Transparent Hydrophilic Coating of Medical Devices," and "Evaluation of Micro- and Nano-Bismuth(III) Oxide Coated Fabric for Environmentally Friendly X-Ray Shielding Materials." In his current role as the Dean of the School of Information Technology at KMITL, he is responsible for overseeing the academic programs and research activities of the faculty. He is known for his dedication to promoting excellence in education and research and for his commitment to fostering innovation and creativity among his students and faculty members.

13. Siamak Mehrkanoon, Utrecht University, Netherland

Title: Deep Short-Term Weather Elements Forecasting

Abstract: Deep learning and artificial neural networks based models have significantly improved the state-of-the-art techniques in machine learning and data driven modeling, thanks to the increasing computing power as well as vast amount of available data. The accuracy and reliability of weather forecasting are of importance for many economic, business and management activities. To date, the primary method for weather forecasts is numerical weather prediction (NWP). NWP relies on mathematical models that take into account different physical properties of the atmosphere such as air velocity, pressure and temperature. The NWP-based models can generate accurate weather predictions of several hours to days into the future. However, they involve solving highly complex mathematical models which are computationally expensive and require enormous computing power and thus usually are performed on expensive super computers. The tutorial is organized in two parts. In the first part, I will give a brief introduction to the deep neural networks-based models. In the second part I will give an overview of recent developments of advanced deep data-driven models that do not base their prediction on the calculations of the underlying physics of the atmosphere. Instead, they analyze and learn from historical weather variables to predict the future.

14. Haiqin Yang, IDEA, China

Title: Aspect-level Sentiment Analysis Under Large Language Models: Our Investigation

Abstract: Aspect-based sentiment analysis (ABSA) conducts critical fine-grained opinion mining or sentiment analysis to understand people's opinions or sentiments at the aspect level and is significant for various real-world applications. In this talk, we will provide an overview of the research in this area and elaborate on our investigation within large language models. The report hopes to open up new research topics in natural language processing in the era of large models by sharing our research observations.

Biography: Haiqin Yang is a principal researcher at International Digital Economy Academy (IDEA) to head the DataStory AI lab. He is an IEEE senior member, an adjunct professor at the South China University of Technology, and an industry mentor at Shenzhen University and the South University of Science and Technology. His current research lies in natural language processing, deep learning, and big data analytics, where he has published two monographs and over 60 publications in top-tier conferences and high-impact journals. He received the 2018 Asia Pacific Neural Network Society (APNNS) Young Researcher Award. He was recognized as the Most Influential Scholar Award Honorable Mention for outstanding and vibrant contributions to the field of AAAI/IJCAI three times.

15. Sirawaj Itthipuripat, KMUTT, Thailand

Title: A model-based approach for determining attention deficits in mild cognitive impairment using scalp-EEG

Abstract: Mild cognitive impairment (MCI) is a neurocognitive disorder found in ~30% of the elderly population. Deficits in visuospatial and executive functions are common in MCI. However, it is still unclear whether these deficits are due to dysfunction in selective attention. This is in part due to a lack of neural indexes that track early selective attention function in MCI. Here, we adopted a machine learning approach that uses the inverted encoding model (IEM) to reconstruct spatially selective neural representations of visuospatial attention based on slow-going EEG oscillations at ~8-13 Hz, known as the alpha band activity. This model-based approach allowed us to quantify the strength and precision of attentional fields in individual subjects with millisecond resolution. Specifically, we measured behavioral and EEG responses from neurologically healthy adults as well as elderly individuals with and without MCI, while they performed the attention-cueing Eriksen Flanker task. Using the IEM, we found that alpha-based reconstructions of visuospatial attention were significantly weaker with significantly slower onsets in healthy individuals, whose ages were above 30 years old. That said, spatial tuning profiles of alpha-based spatial reconstructions remained the same throughout late adulthood (31-72 years old). Importantly, MCI patients showed significantly broader alpha-based spatial reconstructions with significantly slower onsets, compared to those in the healthy aging group. Together, these results suggest that MCI is in part contributed by the diminishing fidelity of selective sensory information processing. Moreover, this model-based approach could be applied further in future studies to study attention deficits in different MCI subtypes.

Biography: Sirawaj (Sean) Itthipuripat is an Assistant Professor in Neuroscience and the director of the Neuroscience Center for Research and Innovation at Learning Institute, King Mongkut's University of Technology Thonburi (KMUTT), Thailand. Sean has an academic background in neuroscience and psychology, with expertise in cognitive and computational neuroscience. He obtained his Ph.D. in Neuroscience from UCSD and then underwent his postdoctoral training in Cognitive Neuroscience at the Center for Integrative and Cognitive Neuroscience, Vanderbilt University. His research is focused on investigating the neural mechanisms that implement selective visual attention in human brains and examining how selective attention interacts with executive function, working memory, long-term memory, and reward-related processes. As principal investigator (PI) on multiple grants, Sean has laid the foundations of his proposed projects by developing a multimodal integrative theoretical framework, currently applied to study cognitive development and cognitive aging across healthy and clinical populations in Thailand.

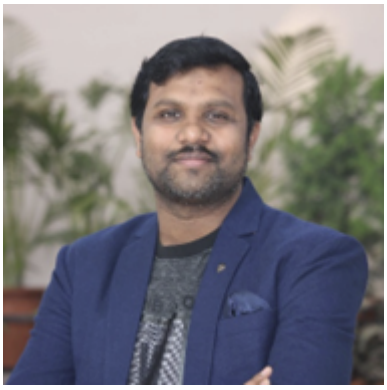
16. Nuttida Rungratsameetaweemana, Columbia University, USA

Title: Random noise promotes robust working memory dynamics in deep learning models

Abstract: Recurrent neural networks (RNNs) based on model neurons that communicate via continuous signals have been widely used to study how cortical neurons perform cognitive tasks. Training such networks to perform tasks that require information maintenance over a brief period (i.e., working memory tasks) remains a challenge. Critically, the training process becomes difficult when the synaptic decay time constant is not fixed to a large constant number for all the model neurons. Here, we show that introducing random noise to the RNNs not only speeds up the training but also produces stable models that can maintain information longer than the RNNs trained without internal noise. Importantly, this robust working memory performance induced by internal noise during training is attributed to an increase in synaptic decay time constants of a distinct subset of inhibitory units, resulting in slower decay of stimulus-specific activity critical for memory maintenance.

Biography: Nuttida Rungratsameetaweemana is a Provost's Research Fellow at the Department of Biomedical Engineering (BME), Columbia University. Nuttida obtained her PhD in Neuroscience from UCSD. She was a Postdoctoral Research Fellow at the Humans in Complex Systems Division at The US Army Research Laboratory. Concurrently, she was the Swartz Fellow at the Computational Neurobiology Laboratory, The Salk Institute for Biological Studies, and a Visiting Postdoctoral Scientist at the Department of Neurosurgery, Cedars-Sinai Medical Center. Nuttida received many awards such as the U.S. ARL Humans in Complex Systems Award, Rising Star in Engineering Health Award, Inaugural UCLA Young Neuroscience Citizen Scholar, Cell Press/Society for Neuroscience Anuradha Rao Memorial Award, *etc*. Her current research interests include adaptive value-based learning, adaptive schema learning, and hybrid decision making.

17. Badri N Subudhi, IIT Jammu, India



Title:

Abstract: Thermal sensors are capable of apprehending the long-wave infrared radiation reflected or emitted by the objects in the scene, which are not easy to be analyzed or detectable by a normal human vision. The conventional ferroelectric barium strontium titanate (BST) thermal sensors are used in many surveillance cameras and have a good signal to noise ration (SNR) value. Thermal camera for surveillance is one of the prime areas of focus for several military and naval research. However for any surveillance task the thermal sequences are found to be affected by poor texture, low resolution and many artifacts. This also degrades the performance of the surveillance system and completely fails at required instances. Hence it is essential that, before object detection the improvements of visual details of the scene is unavoidable. This can be attained by many ways, and fusion of multiple sensors data is one of the major way particularly reported in many state-of-the-art techniques. Image fusion is a technique of combining features from various sources of an image of the same view. Hence most of the industry grades thermal surveillance module is a combination of image fusion followed by the object detection in scene. This talk will try to cover the above said two modules using developed deep learning architecture while solving several real-life challenges.

Biography: Dr. Badri Narayan Subudhi received M.Tech. in Electronics and System Communication from National Institute of Technology, Rourkela, India, in 2008-09. He worked for his PhD from Jadavpur University, India in year 2014. Currently he is serving as an Assistant Professor at Indian Institute of Technology Jammu, India. Prior to this he was working as an Assistant Professor at NIT Goa from July 2014 to November 2017. He received CSIR senior research fellowship for the year 2011-2015. He was nominated as the Young Scientist Awardees by Indian Science Congress Association for the year 2012-2013. He was awarded with Young Scientist Travel grant award from DST, Government of India and Council of Scientific and Industrial Research, India in the year 2011. He is the recipient of Bose-Ramagnosi Award for the year 2010 from DST, Government of India under India-Trento Programme for Advanced Research (ITPAR). He was a visiting scientist at University of Trento, Italy during Aug. 2010 to Feb 2011. His research interests include Video Processing, Image Processing, Medical Image Processing, Machine Learning, Pattern Recognition, and Remote Sensing Image Analysis. He has published 85 research papers in reputed journals and conferences. He is a senior Member of IEEE and Life member of IUPRAI.

18. Surajit Ghosh, International Water Management Institute (IWMI), Sri Lanka

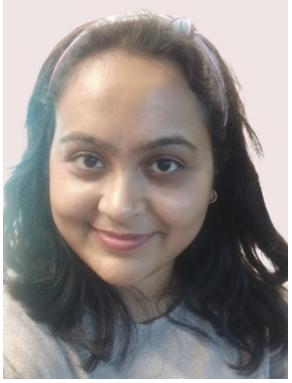
Title: Developing a Flood Extent Monitoring Framework using Deep Learning and Open-Source Data

Abstract: The present work focuses on addressing the challenges posed by floods in Africa by developing a flood extent monitoring framework. The study explores the use of open-source data and computational resources, specifically deep learning architectures, for flood and permanent water segmentation. We trained and tested various deep learning models by utilizing the street to cloud and S1Floods11 datasets. The results highlight the effectiveness of the U-Net model with a mobilenet_v2 encoder and squeeze and Excitation blocks (scSE) decoder, achieving an Intersection over Union (IoU) score of 86.202% for flood and water mapping. These findings contribute to improving flood detection and monitoring systems, aiding decision-makers in responding effectively to floods and minimizing the associated losses.

Biography: Surajit Ghosh is an experienced researcher with a demonstrated history of working in the environmental services industry (Applications of spatial techniques in Forestry, Water Resources and Agriculture). He is skilled in Machine learning, Geo-Big Data analytics and cloud computing. He is experienced in Hydrological and Ecological modelling. He worked for various profit and non-profit organizations such as the International Center for Agricultural Research in the Dry Areas (ICARDA) and IORA Ecological Solutions Pvt. Ltd, and space agencies such as the Indian Space Research Organisation (ISRO). He has completed his PhD at the National Institute of Technology (NIT) Durgapur in collaboration with the Indian Institute of Remote Sensing (IIRS). Currently, he is working for International Water Management Institute (IWMI). He is also a certified Chartered Engineer from the Institution of Engineers (India) and a Senior Member of IEEE.

His work has primarily been in the South Asia region and Africa. His current research focuses on multi-sensor data integration to develop spatial decision support systems to mitigate Climate Risks, specifically floods and droughts. He is a member of the Science Application Team of the upcoming NASA project SWOT and has done several projects with the World Bank, IFAD, and other international agencies. He published over 50 scientific articles, policy briefs, technical reports, etc. He and his team in IWMI received the World Geospatial Award and GEO SDG Awards in 2020.

19. Debasrita Chakraborty, Codelogicx Technologies, India



Title: Revolutionizing Research with Deep Learning

Abstract: Deep learning has emerged as a groundbreaking technology that is reshaping numerous industries across the globe. This talk explores the remarkable applications of deep neural networks and highlights the innovative products that research and industries are developing. Delve into the captivating world of deep learning as we unveil the potential of popular tools and the underlying concepts that drive them.

In this dynamic era, industries are harnessing the power of deep learning to propel themselves to new heights of success. Visionary companies are leveraging convolutional neural networks (CNNs) to revolutionize computer vision applications. From autonomous vehicles to smart surveillance systems, CNNs enable real-time object detection, recognition, and tracking, enhancing safety and efficiency. We will explore how tools such as TensorFlow and PyTorch have become the go-to frameworks for building CNN-based vision systems, empowering researchers and practitioners to unlock the potential of computer vision. Furthermore, deep learning has found extensive use in the realm of recommender systems, transforming the way we discover new products and services. Collaborative filtering techniques based on deep neural networks provide personalized recommendations that delight consumers and drive sales. Netflix's recommendation engine, powered by deep learning algorithms, is a prime example of how businesses can leverage customer data to curate personalized content and enhance user experiences. By incorporating concepts such as matrix factorization and deep autoencoders, these systems offer astonishing accuracy and scalability.

Deep learning is also revolutionizing the healthcare industry, offering groundbreaking advancements in medical image analysis and diagnosis. The application of deep neural networks in medical imaging enables early detection of diseases, accurate segmentation of organs, and precise diagnosis. Tools like Keras and Scikit-learn have facilitated the development of deep learning models for medical image analysis, leading to significant breakthroughs in fields such as radiology and pathology. We will explore how convolutional and recurrent neural networks are transforming healthcare, empowering doctors with powerful tools for improved patient care. Moreover, the entertainment and creative industries are benefiting from the creative potential of deep learning. Generative adversarial networks (GANs) are being used to create realistic images, videos, and even music. Style transfer algorithms based on deep neural networks allow artists to transform images into diverse artistic styles, unleashing their creativity. TensorFlow's implementation of GANs, known as "CycleGAN," has opened new avenues for visual artists and designers, enabling them to generate captivating and unique content.

Biography: Dr. Debasrita Chakraborty holds a Ph.D. in Computer Science from the esteemed Machine Intelligence Unit, Indian Statistical Institute, Kolkata. Having earned her M.Sc. in Physics with First Class Honours from the University of Burdwan, Dr. Chakraborty transitioned to the domain of machine learning, excelling in her career as a Senior Lead Machine Learning Engineer at Codelogicx Technologies, Kolkata. During her tenure, she played a pivotal role in pioneering projects such as Content Recommender Systems for "Storyscale", Automatic Vehicle License Plate Verification for "The 360", ID Card Extraction

and Credit Scoring for Microfinance Customers in "LPesa". Currently, Dr. Chakraborty is serving as a Chanakya Post Doctoral Fellow at the Institute of Data Engineering, Analytics, and Science Foundation (IDEAS)- Technology Innovation Hub, Kolkata. Here, she continues to explore innovative applications of machine learning, employing her expertise in deep learning, neural networks, and financial forecasting. Her proficiency extends to programming languages like Python and C, along with hands-on experience in popular tools such as TensorFlow, Keras, and Pandas. Throughout her illustrious career, Dr. Chakraborty has made significant contributions to the field of machine learning, reflected in her impressive list of research publications and conference proceedings. In addition to her research acumen, Dr. Chakraborty has delivered lectures and seminars on cutting-edge topics. Her team has won the first prize in the Hyperspectral Image Classification competition and the third prize in the DLAI3 Hackathon COVID-19 Chest X-ray challenge, both on Kaggle.

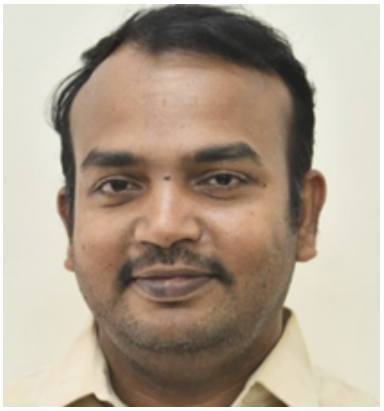
20. Arijit Sur, IIT Guwahati, India

Title: Zero Shot Learning for Computer Vision

Abstract: For decades, computer vision has remained an integral part of the scientific research community. Thanks to the rise of deep learning, modern-day computer vision finds its applications in several domains ranging from deep-sea explorations to extra-terrestrial surface mapping. A significant proportion of the impressive performance of such deep learning models can be attributed to the availability of enormous amounts of annotated data used for training the models in a supervised manner. However, this is also a limitation in practical scenarios, where it is impossible to collect annotated data for every object in the world for training the models. Zero-Shot Learning (ZSL) helps consolidate computer vision models for the real-world better, where the visual knowledge gained from a collection of a few classes of objects can be combined with attribute information of similar classes, even if novel, to recognize them when deployed in the real world. Hence, the dependency on labelled data can be reduced while retaining the performance gains of deep learning methods to a certain degree, turning ZSL into one of the most sought-after strategies of the future. Being a learning paradigm, ZSL can be applied to several computer vision applications, ranging from simple object recognition to complex tasks like human-object interaction detection.

Biography: Prof. Arijit Sur received his Ph. D. degree from the Dept. of CSE, IIT Kharagpur in 2010. Dr. Sur joined the Dept. of CSE, IIT Guwahati as an Assistant professor in 2009 and now he is a professor there. His research is mainly focused on Deep Learning approaches to solving different Computer Vision problems like image, video restoration, super-resolution, semantic segmentation, and change detection in various application domains like underwater vision, satellite, and remote sensing image analysis, and medical imaging, media forensics, etc. His group is also working on different machine learning-based problems like zero-shot learning, semi-supervised learning, robotic vision, and ML-based approaches for adaptive video streaming in a 5G environment. Dr. Sur founded a research project lab named "Multimedia Lab" in the Dept. of CSE in 2012. Currently, eight research scholars are pursuing their Ph.D. work under his guidance, and eight students have graduated. Dr. Sur has co-authored 32 top-tier journal papers and more than 50 conference papers in different premier forums. Presently he is working as an Associate Editor of Multimedia Systems Journal, Springer.

21. Venketnaresh Babu Kupili, NIT Goa, India



Title: Texture Image Classification Using Deep Neural Network and Binary Dragon Fly Optimization with a Novel Fitness Function

Abstract: Texture is one of the most significant characteristics of an image for retrieving visually similar patterns. So far, researchers utilize large number of gray scale features and several combinations of training and testing. As a result, they do not guarantee high accuracy due to mismatch between gray scale features and classifier type. With a view to develop a highly accurate system, a new approach is proposed using Binary Dragon Fly with Deep Neural Network based fitness function for texture classification (BDADNN). Contributions of the proposed BDADNN is twofold, first fusion of Fractal, GLCM and GLRLM features has been performed to incorporate border complexities as well as spatial dependencies of a texture image, then Binary Dragon fly Algorithm is applied for feature selection with a novel fitness function based on Deep Neural Network (DNN). The proposed fitness function is designed such a way that it captures maximum accuracy, relevance and mainly minimizing number of features and reduction among features. Deep Neural Network is utilized as a stack of auto encoders. Adapting five types of k-cross-validation (k == 2, 3, 4, 5, 6 and 10) protocols, we classify the texture images using BDADNN. Our results demonstrate superior performance of proposed BDADNN compared to SVM, for all cross-validation protocols (K2, K3, K4, K5 and K10) in terms of sensitivity, specificity and accuracy.

Biography: Venkatanareshbabu Kuppili, is presently working as an Assistant Professor in the department of Computer Science and Engineering, National Institute of Technology (NIT) Goa. He received M.Sc degree from University of Hyderabad in 2006, M. Tech. and Ph. D. degrees from Indian Institute of Technology Delhi in 2008 and 2014 respectively. His research interests include Data Mining, Wireless Sensor Networks, Brain Computer Interface and Medical Imaging. He has published more than 70 research articles in reputed International journals and conferences. The journal publications include reputed journals such as IEEE Transactions, IET, Elsevier, Springer, Taylor and Francis and Wiley etc. He is awarded early career research award and IEEE Senior Membership. He has handled various administrative positions such as B.Tech, M.Tech Project Coordinator, Nodel officer for Pandit Madan Mohan Malviya National Mission on Teacher Training and Spoken Tutorial scheme under MHRD at NIT Goa.

22. Rajarshi Pal, IDRBT, India

Title: Face Spoof Detection

Abstract: In a face spoofing attack, an attacker gains access to a system by presenting the face of a legitimate user to the camera. This attack exists in multiple forms such as, printed photo attack, replay attack, and mask attack. Several approaches for face spoof detection exist in literature. These approaches consider this as a two-class classification problem as to differentiate an input face as a live face or a spoofed face. These approaches use either a shallow learning (with hand-crafted features) or a deep learning framework for the classification. In this talk, we will revisit the developments in this field along with the challenges and few experimental results.

Biography: Dr. Rajarshi Pal is working as an Assistant Professor at Institute for Development and Research in Banking Technology (IDRBT), Hyderabad, India since 2011. His primary research interests include image processing, computer vision, biometrics, and cyber security. He has obtained his Ph. D. from Indian Institute of Technology, Kharagpur, India in 2011. Prior to joining in IDRBT, he has served as a Research Associate at Center for Soft Computing Research, Indian Statistical Institute, Kolkata, India.