



6TH INTERNATIONAL CONFERENCE ON APPLIED INTELLIGENCE AND INFORMATICS (AII2026)

Fostering Reproducibility of Research Results

21 - 23 OCT 2026, LONDON, UK



6th International Conference on Applied Intelligence and Informatics (AII 2026)

Conference Programme Book

October 21-23, 2026

Hybrid (In-person and Online) Conference

<https://aai-conf.org/>

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Programme Snapshot

All times are in **GMT+1 (UK time)**

Zoom Meeting:
ID: 815 3886 0121
Passcode: aii-conf

Zoom session link: <https://us02web.zoom.us/j/81538860121?pwd=j1HUTbVGb8pkmAbe3ZBvaxav4cLBV.1>

Day 1: October 21, 2026 (Conference Day 1)

08:30 – 09:00	Registration, breakfast and welcome networking	
09:00 – 09:15	Conference Inauguration	
09:15 – 10:00	*Keynote I	Professor Timothy Rittman, University of Cambridge, UK
10:00 – 10:45	*Technical Session I	Applied Intelligence I (Paper IDs: 14, 15, 20)
10:45 – 11:00	Coffee Break	
11:00 – 12:00	*Technical Session II	Healthcare AI (Paper IDs: 11, 28, 46, 48)
12:00 – 14:00	Working Lunch	
12:00 – 14:00	Online Technical Session I	Pattern Recognition (Paper IDs: 10, 44, 49, 47, 87, 25, 7, 27)
14:00 – 16:00	*AI4All Workshop	International Workshop on Applied and Responsible Artificial Intelligence (AI4All-ARAI)
16:00 – 16:15	Coffee Break	
16:15 – 17:00	*Technical Session III	Data, Privacy & Analytics (Paper IDs: 103, 105, 106)
17:00 – 18:00	*Keynote II	Professor Jason Moore, Cedars-Sinai Medical Center, USA
18:30 – 21:30	All 2026 Banquet	
21:30	Close of Day 1	

Day 2: October 22, 2026 (Conference Day 2)

08:30 – 09:00	Registration, breakfast and networking	
09:00 – 10:00	*Technical Session IV	Explainable, Neuro-AI & Inclusive AI (Paper IDs: 26, 42, 102, 107)
10:00 – 10:15	Coffee Break	
10:15 – 11:15	*Keynote III & Keynote IV	Professor Amir Hussain, King Fahd University of Petroleum and Minerals, Saudi Arabia
11:15 – 12:15		Professor Sir Aziz Sheikh OBE, University of Oxford, UK
12:15 – 14:30	Working Lunch	
12:15 – 14:30	Online Technical Session II	Agentic AI, Security & Analytics (Paper IDs: 5, 13, 30, 33, 21, 36, 39, 40, 41)
14:30 – 16:30	*Panel Discussion	In the Age of AI — How to Stay Relevant, Responsible and Human (Panellists: Prof Sir Aziz Sheikh, Prof Amir Hussain, Prof David Brown, and Prof Matthew Bellgard)
16:30 – 16:45	Coffee Break	
16:45 – 17:30	Closing Ceremony + Awards + Next All 2027 Announcement	
17:30	Close of Day 2	

Day 3: October 23, 2026 (Conference Day 3)

09:00 – 17:00	Networking	
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*: Hybrid session (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)

Detailed Programme

All times are in **UK time (GMT+1)**

Day 01: Wednesday, 21 October 2026	
08:30 – 09:15 Welcome Session	
08:30 – 09:00	Registration, conference kit collection, breakfast and welcome networking
09:00 – 09:15	Conference Inauguration
09:15 – 10:00 Keynote Session I	
Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf	
09:15 – 10:00	Keynote Speaker: Professor Timothy Rittman , University of Cambridge, UK Title: Open data and open science for translational AI for dementia Chair: Professor Md Atiqur Rahman Ahad , University of East London, UK
10:00 – 10:45 Hybrid Technical Session I: Applied Intelligence I	
Paper IDs: 14, 15, 20 Chair: Dr Seyed Ali Ghorashi , University of East London, UK	
10:00 – 10:15	Paper ID: 0014 Paper title: Unsupervised Quantum Kernel Learning of Symmetry Protected Topological Phases via Geometric Tensor Weighting Authors: Mejbah Ahammad, Md. Ashraful Babu, M. Mostafizur Rahman, Md. Fayz-Al-Asad, Tashin Islam Presenter: M Mostafizur Rahman, American International University – Bangladesh, Bangladesh
10:15 – 10:30	Paper ID: 0015 Paper title: Capacity-Constrained Multi-Robot Task Allocation via Quantum Approximate Optimisation: A Reproducible Benchmark on Solomon VRPTW C101 Authors: Sandeep Gupta, Sazzad Hossain, Akmal Akhatov, Nurmamatov Mekhriddin, Kanad Ray Presenter: Kanad Ray, Amity Cognitive Computing and Brain Informatics Centre, India
10:30 – 10:45	Paper ID: 0020 Paper title: Explainable Variational Quantum Policy Gradient: SHAP-Based Interpretability of Quantum Reinforcement Learning Agents on CartPole Authors: Sandeep Gupta, Sazzad Hossain, Akmal Akhatov, Nurmamatov Mekhriddin, Kanad Ray Presenter: Kanad Ray, Amity Cognitive Computing and Brain Informatics Centre, India
10:45 – 11:00 Coffee Break	
11:00 – 12:00 Hybrid Technical Session II: Healthcare AI	
Paper IDs: 11, 28, 46, 48 Chair: Professor Kanad Ray , Amity Cognitive Computing and Brain Informatics Centre, India	
11:00 – 11:15	Paper ID: 0048 Paper title: Assessing Dysarthric Speech Intelligibility via Generative Augmentation and Self-Supervised Linguistic Representations Authors: Davide Lillini, Carlo Aironi, Lucia Migliorelli, Leonardo Gabrielli, Stefano Squartini Presenter: Davide Lillini, Università Politecnica delle Marche, Italy

11:15 – 11:30	Paper ID: 0028 Paper title: RetinaFusionNet: Gated Multimodal Fusion for Classifying Carotid Intima-Media Thickness Authors: Mahir Shadid, Rashed Mustafa Presenter: Rashed Mustafa, University of Chittagong, Bangladesh
11:30 – 11:45	Paper ID: 0046 Paper title: Systematic Evaluation of Data Augmentation Strategies for Ordinal BI-RADS Classification in Breast Ultrasound: A Benchmark on BUS-BRA Authors: Hadeel Saad Alghamdi, Mufti Mahmud, Abdullah Faisal Al-Battal, Ammar Alsheghri Presenter: Hadeel Saad Alghamdi, King Fahd University of Petroleum and Minerals, Saudi Arabia
11:45 – 12:00	Paper ID: 0011 Paper title: An Explainable Cleanlab-Guided Uncertainty-Based Active Learning Framework for Data-Efficient Parkinson's Disease Classification Authors: Md. Shakil Ahmed, Shakila Shafiq, M Shamim Kaiser Presenter: M Shamim Kaiser, Jahangirnagar University, Bangladesh
12:00 – 14:00 Working Lunch and Networking	
12:00 – 14:00 Online Technical Session I: Pattern Recognition Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf Paper IDs: 10, 44, 49, 47, 87, 25, 7, 27 Chair: Professor Shamim Al Mamun, Jahangirnagar University, Bangladesh	
12:00 – 12:15	Paper ID: 0010 Paper title: Knowing When Not to Act: Toward Capability-Aware Healthcare AI Authors: Marzia Hoque Tania Presenter: Marzia Hoque Tania, University of New South Wales, Australia
12:15 – 12:30	Paper ID: 0044 Paper title: CARE-Lung: Calibrated, Cross-Validated Cycle-to-Patient Aggregation with Conformal Referral for Respiratory Sound Screening Authors: Arnob Aich Anurag, Shamiul Islam, Nuren Tasnim Risha, Md. Sadman Hossain, Trisha Sarker, Sifat Rahman Ahona, Juena Ahmed Noshin Presenter: Arnob Aich Anurag, American International University - Bangladesh, Bangladesh
12:30 – 12:45	Paper ID: 0049 Paper title: A Comparative Evaluation of Machine Learning, Deep Learning, and Vision Transformer Models for Alzheimer's Disease Classification Authors: Noushath Shaffi, Vimbi Viswan, Abdelhamid Abdesselam, Rachid Hedjam Presenter: Noushath Shaffi, Sultan Qaboos University, Oman
12:45 – 13:00	Paper ID: 0047 Paper title: An Assessment of Quantum Principal Component Analysis Authors: Mehjabin Khatoon, Niha Kamal Basha Presenter: Mehjabin Khatoon, Jamia Millia Islamia, India
13:00 – 13:15	Paper ID: 0087 Paper title: Transfer Learning in Genetic Algorithms for Combinatorial Optimization Using Fitness Lineage Authors: George Mweshi, Nelishia Pillay, Thambo Nyathi Presenter: Nelishia Pillay, University of Pretoria, South Africa

13:15 – 13:30	Paper ID: 0025 Paper title: Evaluating Few-Shot Learning for Cherry Leaf Disease Classification in Real-World Agricultural Settings Authors: Dostonbek Nazirzhonov, Md Easin Arafat, Nazrul Islam, Utkarsh Mall Presenter: <i>Dostonbek Nazirzhonov, Eötvös Loránd University, Hungary</i>
13:30 – 13:45	Paper ID: 0007 Paper title: Patient-Guided Attention Gate for False-Negative-Aware Melanoma Detection Using Hybrid CNN-ViT Architecture on ISIC 2024 SLICE-3D Authors: Md Kamrul Islam, Md Naimul Islam, Mizanur Rahman, Sanjida Afrin, Hasan Sarwar and Md. Saef Ullah Miah Presenter: <i>Md Kamrul Islam, Daffodil International University, Bangladesh</i>
13:45 – 14:00	Paper ID: 0027 Paper title: ColourMag: A Learning-Based Colour Magnification Framework for Remote Heart Rate Estimation Authors: Zakia Batool Turabee, David J. Brown, Mufti Mahmud, Andreas Oikonomou, Muhammad Arifur Rahman, Andrew Buron, Nicholas Shopland Presenter: <i>Zakia Turabee, Nottingham Trent University, UK</i>
14:00 – 16:00 International Workshop on Applied and Responsible Artificial Intelligence (AI4AII-ARAI) <i>Chairs: Professor Md Atiqur Rahman Ahad, University of East London, UK</i> <i>Dr Tahera Hossain, Nagoya University, Japan</i> <i>Dr Shahera Hossain, Ravensbourne University London, UK</i> <i>Dr Zia Ush Shamszaman, King's College London, UK</i>	
14:00 – 14:10	Introduction to the International Workshop on Applied and Responsible Artificial Intelligence (AI4AII-ARAI) <i>Professor Md Atiqur Rahman Ahad, University of East London, UK</i> <i>Dr Tahera Hossain, Nagoya University, Japan</i> <i>Dr Shahera Hossain, Ravensbourne University London, UK</i> <i>Dr Zia Ush Shamszaman, King's College London, UK</i>
14:10 – 16:00	<u>Presentation order will be determined by Chairs. Authors in <i>Bold Italic</i> are presenters</u> Abstract ID 110: <i>Nafisa Salsabil Zaman</i>, Matthias Rolf, Nigel Thomas Crook. OccuBias: A Multi-Level Benchmark for Occupational Gender Bias in Instruction-Tuned Language Models. Abstract ID 112: <i>Zakir Ahmed Nuhel</i>. Explainable Morphology-Aware AI for Linking Chemical Structures with Cell Painting Phenotypes in Drug Discovery. Abstract ID 113: <i>Alex Murray</i>. Explanation Consistency as a Precondition for Responsible AI: Cross-Model Evidence from U.S. Recession Nowcasting. Abstract ID 114: <i>Lanre Shittu</i>, Sunday Adeola Ajagbe, Gabriel Tosin Ayodele. Leakage-Controlled and Resource-Efficient Machine Learning for Multi-Class Sleep Disorder Classification. Abstract ID 115: <i>Belema Utomvie</i>, Md Atiqur Rahman Ahad. A Study on the use of Lightweight Architectures for antimicrobial resistance (AMR) Detection. Abstract ID 116: <i>Ifeanyi Ronald Obadoni</i>. Comparative Evaluation and Statistical Validation of CNN, Residual, and Vision Transformer Models for Automated Surface Defect Classification in Hot-Rolled Steel Strips. Abstract ID 120: <i>Damilola Temilade Idowu</i>. Traceable Report Generation from Breast Ultrasound: A Concept-Bottleneck Framework with Lexicon-Constrained Decoding.

Abstract ID 122: *Gideon Surakat*, Md Atiqur Rahman Ahad. Explainable and Reproducible Single-Cell Phenotyping for Rapid Antimicrobial Susceptibility Testing.

Abstract ID 123: *Fahim Bin Omar*, Md Zasim Uddin, Md Atiqur Rahman Ahad. Confidently Wrong: A Silent Failure Mode in Deep Learning for Microscopy-Based Antimicrobial Resistance Classification.

Abstract ID 124: *Md Towhedur Rahman*, Shaheen Khatun, Shahera Hossain, Riasat Islam, Md Atiqur Rahman Ahad. AI-Driven Wearable Framework for Predicting Wearing-Off in Parkinson's Disease: Comparison of Previous Methods.

Abstract ID 125: *Mabel St Germaine*, Yang Li, Md Atiqur Rahman Ahad. AI Mobilisation Implications for Business Strategy – Importance of Data Analytics knowledge at Corporate-Level.

Abstract ID 126: *Puspita Das*, Md Atiqur Rahman Ahad. Deep Learning: Computational Efficiency and Biological Trustworthiness in Single-cell Bacterial Antibiotic Resistance Detection.

Abstract ID 127: *Afroza Rahman*, Miraz Rahman, Seyed Ali Ghorashi, Md Atiqur Rahman Ahad. Multimodal Swin Transformer with Cellular Phenotypic Features for Single Cell Ciprofloxacin Response Classification.

16:00 – 16:15 Coffee Break

16:15 – 17:00 Hybrid Technical Session III: Data, Privacy & Analytics

Paper IDs: 103, 105, 106

Chair: Dr Hadeel Saad Alghamdi, King Fahd University of Petroleum and Minerals, Saudi Arabia

Paper ID: 0103

16:15 – **Paper title:** Determination of PM2.5 from distant views: Across the miles with machine learning

16:30 **Authors:** Sarbani Palit, Sagarnil Chakraborty, Joydip Rakshit, Priyasha Haldar, Anushka Mukherjee

Presenter: *Sarbani Palit, Indian Statistical Institute, Kolkata, India*

Paper ID: 0105

16:30 – **Paper title:** Federated Learning for Early Prediction of Cardiovascular Disease in Privacy-Constrained Healthcare Environments

16:45 **Authors:** Nitya Puspaceno, Muhammad Arifur Rahman, Mufti Mahmud, Nicholas Shopland, Andrew Burton, and David J. Brown

Presenter: *Nitya Puspaceno, Nottingham Trent University, UK*

Paper ID: 0106

16:45 – **Paper title:** Mapping Fiscal Landscapes: Understanding of Public Sector Finances through Data Visualisation

17:00 **Authors:** Abhishek Shrikant Jangam, Muhammad Arifur Rahman, Nicholas Shopland, Taha Osman, and David J. Brown

Presenter: *Muhammad Arifur Rahman, Nottingham Trent University, UK*

17:00 – 18:00 Keynote Session II

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

Keynote Speaker: **Professor Jason Moore**, Cedars-Sinai Medical Center, USA

17:00 – **Title:** **Agentic AI for Autonomous Data Science**

18:00

Chair: *Dr Mohammad Arifur Rahman, Nottingham Trent University, UK*

18:30 – 21:30 AII 2026 Banquet

Day 02: Thursday, 22 October 2026	
08:30 – 09:00 Welcome Session	
08:30 – 09:00	Registration, conference kit collection, breakfast and welcome networking
09:00 – 10:00 Hybrid Technical Session IV: Explainable, Neuro-AI & Inclusive AI <i>Paper IDs: 26, 42, 102, 107</i> <i>Chair: Professor Sarbani Palit, Indian Statistical Institute, Kolkata, India</i>	
09:00 – 09:15	Paper ID: 0026 Paper title: Evidence from Within: Explainable YOLOv8 for Reproducible Brain Tumour Localisation Authors: Connor McCabe, Dost Muhammad, Malika Bendechache Presenter: <i>Dost Muhammad, University of Galway, Ireland</i>
09:15 – 09:30	Paper ID: 0042 Paper title: Modeling progressive neuronal ablation in biomimetic hardware Spiking Neural Networks Authors: Sam Zahedi Ghasabei, Federico Barban, Marta Caré, Timotheé Levi, Michela Chiappalone Presenter: <i>Sam Zahedi Ghasabei, University of Genoa, Italy</i>
09:30 – 09:45	Paper ID: 0102 Paper title: Generative AI for Inclusive Higher Education: Evaluating an inclusive education toolkit for improving participation in Bangladeshi HE and TVET Authors: David J. Brown, Mufti Mahmud, Nicholas Shopland, Andrew Burton, Muhammad Arifur Rahman, M Mostafizur Rahman, M Shamim Kaiser, Md. Saiful Islam, Md Saef Ullah Miah, Akarsh K. Nair Presenter: <i>Akarsh K Nair, Nottingham Trent University, UK</i>
09:45 – 10:00	Paper ID: 0107 Paper title: Explainable Multi-model Attention-based Deep Learning Algorithm for Brain Tumor Segmentation Authors: Nayon Karmoker, Shrawman Majumder Rudra, Fahima Tabassum, Risala Tasin Khan, M Shamim Kaiser Presenter: <i>Risala Tasin Khan, Jahangirnagar University, Bangladesh</i>
10:00 – 10:15 Coffee Break	
10:15 – 11:15 Keynote Session III <i>Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf</i>	
10:15 – 11:15	Keynote Speaker: Professor Amir Hussain , King Fahd University of Petroleum and Minerals, Saudi Arabia Title: <u>Trustworthy AI: Real-world Use Cases, Challenges and Opportunities</u> Chair: Professor David Brown , Nottingham Trent University, UK
11:15 – 12:15 Keynote Session IV <i>Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf</i>	
11:15 – 12:15	Keynote Speaker: Professor Sir Aziz Sheikh OBE , University of Oxford, UK Title: <u>Transforming Health Through the Creation of Learning Health Systems: Opportunities and Challenges</u> Chair: Professor Mufti Mahmud , King Fahd University of Petroleum and Minerals, Saudi Arabia

12:15 – 14:30 Working Lunch	
12:15 – 14:30 Online Technical Session II: Agentic AI, Security & Analytics Paper IDs: 5, 13, 30, 33, 21, 36, 39, 40, 41 <i>Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf</i> <i>Chair: Dr Md Saef Ullah Miah, American International University - Bangladesh, Bangladesh</i>	
12:15 – 12:30	Paper ID: 0005 Paper title: Agentic-DVC: Autonomous Software Risk Mitigation Authors: Sadman Sakib, Aritri Roy Priota, Hossain Mohammad Sami, Abhijit Bhowmik Presenter: Sadman Sakib, American International University - Bangladesh, Bangladesh
12:30 – 12:45	Paper ID: 0013 Paper title: Usage and Perceptions of Generative AI in Learning among University Students in Bangladesh Authors: K. M. Tahsin Kabir, Koushik Biswas Arko, Arizit Chaki Artha, Md. Fahim Kabir Chowdhury, Md. Mortuza Ahmmed, Md. Ashraful Babu, M. Mostafizur Rahman Presenter: K. M. Tahsin Kabir, Asian University of Bangladesh, Bangladesh
12:45 – 13:00	Paper ID: 0030 Paper title: Disaster Classification and Progression Detection from Social Media Data Using Deep Learning Authors: Md Saimul Haque Shanto, Suzad Mohammad, Ibna Masud Rana Parvej, Manzur Kabir Ayon, Sadia Sharmin Presenter: Md Saimul Haque Shanto, Bangladesh University of Engineering and Technology, Bangladesh
13:00 – 13:15	Paper ID: 0033 Paper title: An Explainable Hybrid Machine Learning Framework for Smart Irrigation Prediction and Anomaly-Aware Decision Support Authors: Md Ashfi Ar Raihan, Sabrina Islam Tesa, Antu Chakrabarty, Mhamud Hasan Kwoshick, Tawfiqul Hasan, Sultanul Arifeen Hamim, Md. Mazid-Ul-Haque, Abhijit Bhowmik, Md Manirul Islam Presenter: Md Ashfi Ar Raihan, American International University - Bangladesh, Bangladesh
13:15 – 13:30	Paper ID: 0021 Paper title: Human Interpretive Presence in AI-Assisted Qualitative Research: A Reproducible Workflow for Social and Emotional Learning (SEL) Authors: Anat Korem, Sigal Chen Presenter: Anat Korem, Levinsky-Wingate Academic College, Israel
13:30 – 13:45	Paper ID: 0036 Paper title: An explainable ensemble deep learning model for multiclass skin disease classification using dermoscopic images Authors: Ekramul Hasib, Touhidul Islam Masfi, S M Abdullah Shafi, Abhijit Bhowmik, Md. Saef Ullah Miah, S. A. M. Manzur H. Khan Presenter: Ekramul Hasib, American International University - Bangladesh, Bangladesh
13:45 – 14:00	Paper ID: 0039 Paper title: Improving Underwater Marine Species Classification through Imbalance-Aware Learning and Cross-Dataset Evaluation Authors: Md Sazzad Hossain, Mosa. Farjana Eti, Md Saimul Haque Shanto, and Suzad Mohammad Presenter: Mosa. Farjana Eti, Institute of Science and Technology, Bangladesh

14:00 – 14:15	Paper ID: 0040 Paper title: Incongruity-Aware Sarcasm Detection Authors: Obydullah Sayed, M. Showaib Rahman Tanveer, M. Samirul Islam, Saiful Azad, Sudip Ghoshal, Shankha Shubhra Sarkar, and Tanpia Tasnim Presenter: Obydullah Sayed, Green University of Bangladesh, Bangladesh
14:15 – 14:30	Paper ID: 0041 Paper title: Calcification-Informed BI-RADS Categorization of Mammograms: A Combined Detection and Classification Approach Authors: Debapriya Chakraborty, Uddalak Mukhopadhyay, Sarbani Palit, Ujjwal Bhattacharya Presenter: Debapriya Chakraborty, Indian Statistical Institute - Kolkata, India
14:30 – 16:30	Panel Discussion on “In the Age of AI — How to Stay Relevant, Responsible and Human” <i>Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf</i> Moderators: Professor Mufti Mahmud, King Fahd University of Petroleum and Minerals, Saudi Arabia and Professor Md Atiqur Rahman Ahad, University of East London, UK Panellists: Professor Sir Aziz Sheikh OBE, University of Oxford, UK Professor Amir Hussain, King Fahd University of Petroleum and Minerals, Saudi Arabia Professor David Brown, Nottingham Trent University, UK Professor Matthew Bellgard, University of East London, UK
14:30 – 14:45	Introduction to the Panel and the Panellists
14:45 – 15:45	Panel discussion on: 1. What will an AI-shaped career actually look like? 2. What should young people learn now? 3. How do you distinguish yourself when everybody has access to AI? 4. What happens to research and academic careers? 5. Career progression, leadership and opportunity 6. Responsible AI and careers with societal impact
15:45 – 16:30	Open Discussion, Q&A and Closing
16:30 – 16:45	Coffee Break
16:45 – 17:30	Closing Ceremony Closing Ceremony, Awards, Next AII 2027 Announcement Chair: Professor Mufti Mahmud, King Fahd University of Petroleum and Minerals, Saudi Arabia
16:45 – 17:05	All 2026 Awards
17:05 – 17:20	Announcement of AII 2027
17:20 – 17:30	Closing Remarks
Day 03: Friday, 23 October 2026	
09:00 – 17:00	Networking Chair: Professor Md Atiqur Rahman Ahad, University of East London, UK

Keynote Speakers

Day 01: Wednesday, 21 October 2026, 09:15 – 10:00 (GMT+1)
Keynote I (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)



Speaker: *Dr Tim Rittman, University of Cambridge, UK*

Chair: *Professor Md Atiqur Rahman Ahad, University of East London, UK*

Title: *Open data and open science for translational AI for dementia*

Abstract: Using AI to help dementia diagnosis and treatment can potentially improve patient care, with applications across all countries and clinical settings. Training accurate and effective AI models for medical applications needs a large amount of data, and sharing of expertise in data curation and model development. The field of neuroimaging has led many such open science efforts that have benefited efforts to develop AI methods for diagnosis and prognosis in dementia. Translating these advances into the clinic requires careful consideration of protecting intellectual property, potentially at odds with the principles of open science. This talk will discuss these challenges, particularly focusing on AI neuroimaging for dementia, and how researchers and clinicians need to work together to ensure scientific advances achieve real world patient benefit.

Biography: Timothy Rittman is an Alzheimer's Research UK Senior Fellow, Senior Clinical Research Associate at the University of Cambridge and Honorary Consultant Neurologist at Addenbrooke's Hospital. His research centres around neurodegenerative tauopathies, combining neuroimaging, cognitive assessments and neuropathology to understand how these diseases affect the whole brain. He also has an interest in translating methods from artificial intelligence and big data for use in memory clinics, and leads the Quantitative MRI in NHS Memory Clinics (QMIN-MC) study collecting real world data for validation of AI models. Tim co-leads the DEMON dementia network's Imaging Working group and is an adviser to the World Young Leaders in Dementia. He is a consultant in the Addenbrooke's Memory Clinic, and leads a clinic for people with Progressive Supranuclear Palsy and Corticobasal Degeneration, in addition to co-leading a dementia genetics clinic.

Day 01: Wednesday, 21 October 2026, 17:00 – 18:00 (GMT+1)
Keynote II (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)



Speaker: *Prof Jason Moore, Cedars-Sinai Medical Center, USA*

Chair: *Dr Mohammad Arifur Rahman, Nottingham Trent University, UK*

Title: *Agentic AI for autonomous data science*

Abstract: Data science has traditionally been a discipline requiring specialized training in statistics, computer science, and machine learning. Recent advances in agentic AI are rapidly changing this paradigm. Teams of AI agents can now collaborate to generate hypotheses, identify and retrieve relevant data, perform data cleaning and preparation, execute machine learning analyses, interpret results, and generate human-readable reports. These capabilities have the potential to democratize data science and accelerate scientific discovery. In this presentation, we will introduce a framework for autonomous data science powered by agentic AI and demonstrate its application to extracting insights from complex biomedical datasets. We will also discuss the emerging science of agent engineering and experimentation, including the design, evaluation, and optimization of agent teams, models, skills, tools, and hyperparameters needed to build reliable, efficient, and trustworthy autonomous data science systems.

Biography: Dr. Jason Moore is Chair of the Department of Computational Medicine at Cedars-Sinai Medical Center where he serves as Director of the Center for Artificial Intelligence Research and Education. He leads an active research program focused on the development and application of AI algorithms for the analysis of biomedical data. Recent work focuses on methods for automated machine learning (AutoML) and agentic AI with a goal of democratizing AI in healthcare. He is an elected fellow of the American College of Medical Informatics, the American Medical Informatics Association, the International Academy of Health Sciences Informatics, and the American Statistical Association.

Day 02: Thursday, 22 October 2026, 10:15 – 11:15 (GMT+1)
Keynote III (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)



Speaker: *Prof Amir Hussain, King Fahd University of Petroleum and Minerals, Saudi Arabia*

Chair: *Professor David Brown, Nottingham Trent University, UK*

Title: *Trustworthy AI: Real-world Use Cases, Challenges and Opportunities*

Abstract: TBC

Biography: Professor Amir Hussain received a BEng (First-Class Honours with Distinction) and a PhD in Electronic and Electrical Engineering from the University of Strathclyde, Glasgow, UK, in 1992 and 1997, respectively. Following a UK Government (UKRI EPSRC-funded) Postdoctoral Fellowship at the University of the West of Scotland, UK (1996–1998), and a Research Lectureship at the University of Dundee, UK (1998–2000), he joined the University of Stirling, UK, in 2000, where he was appointed Professor (Personal Chair) of Cognitive Computing in 2012. He subsequently served as Professor of Trustworthy AI and Founding Director of the Centre of AI and Robotics at Edinburgh Napier University, UK (2018–2026), before joining King Fahd University of Petroleum and Minerals (KFUPM), KSA, in 2026 as Chair Professor of AI. He is a Visiting Professor of AI and Health at the Nuffield Department of Primary Care Health Sciences and a Visiting Fellow of Kellogg College at the University of Oxford, UK. He also holds distinguished appointments at several other leading institutions. His interdisciplinary research advances cognitively inspired, trustworthy, and responsible AI systems, spanning from causal and neuro-symbolic AI foundations to safe, ethical, equitable and regulatory-compliant deployment across digital health, assistive technologies, critical infrastructure and industrial systems. A Clarivate Highly Cited Researcher in the Cross-Field category - ranking in the top 0.1% of scientists globally whose influential work significantly impacts multiple disciplines - Professor Hussain has authored around 750 publications, including over 400 journal papers and 30+ books, with over 45,000 citations and more than 45 doctoral students supervised to completion. He has led major national and international research programmes and co-founded globally successful deep-tech spinouts. He serves as an AI advisor to governments and industry. Professor Hussain is the Founding Editor-in-Chief of Cognitive Computation (Springer Nature) and serves on the editorial boards of Information Fusion (Elsevier) and multiple leading IEEE Transactions, including those on Artificial Intelligence, Neural Networks and Learning Systems, Systems, Man, and Cybernetics: Systems, and Emerging Topics in Computational Intelligence. He regularly chairs flagship global conferences, including IEEE WCCI 2020, IEEE SWC 2023, and the forthcoming IEEE CEC 2027.

Day 02: Thursday, 22 October 2026, 11:15 – 12:15 (GMT+1)
Keynote IV (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)



Speaker: *Prof Sir Aziz Sheikh OBE, University of Oxford, UK*

Chair: *Professor Mufti Mahmud, King Fahd University of Petroleum and Minerals, Saudi Arabia*

Title: *Transforming Health Through the Creation of Learning Health Systems: Opportunities and Challenges*

Abstract: Healthcare is a laggard when compared to many other sectors in terms of moving into the digital era. In this presentation, I will discuss the associated major opportunities to advance health through digitising health systems, reflect on progress made over recent decades and highlight key remaining challenges. I will argue that the creation of learning health systems offers an unprecedented opportunity to integrate service delivery and research and through so doing transform health processes and outcomes.

Biography: Professor Sir Aziz Sheikh OBE is Nuffield Professor of Primary Care Health Sciences, Head of the Nuffield Department of Primary Care Health Sciences and Pro-Vice-Chancellor at the University of Oxford. He is Professorial Fellow at Harris Manchester College, University of Oxford and Honorary Consultant with the UK Health Security Agency and Public Health Scotland.

He was previously Chair of Primary Care Research and Development, Director of the Usher Institute and Dean of Data at the University of Edinburgh. He has played important advisory roles to a number of governments, inter-governmental bodies, including the World Bank, World Health Organization and the World Innovation Summit for Health, and leading scientific bodies including the Academy of Medical Sciences and the Royal Society.

Aziz has worked for over 25 years on digitising health systems, securely linking health and cross-sectoral data and then using these data to inform and influence health policy, improve the safety and quality of care, and develop personalised risk assessments.

He has been awarded fellowships from 10 learned societies, including most recently the US' National Academy of Medicine.

Aziz was made an Officer of the Order of the British Empire for 'Services to Medicine and Health Care' in 2014 and a Knight Bachelor in 2022 for 'Services to COVID-19 Research and Policy'.

Panel Discussion

Day 02: Thursday, 22 October 2026, 14:30 – 16:30 (GMT+1)

Panel Discussion (Zoom Meeting ID: 815 3886 0121, Passcode: aii-conf)

Title: In the Age of AI — How to Stay Relevant, Responsible and Human

Moderators:

Professor Mufti Mahmud, King Fahd University of Petroleum and Minerals, Saudi Arabia

Professor Md Atiqur Rahman Ahad, University of East London, UK

Panellists:

Professor Sir Aziz Sheikh OBE, University of Oxford, UK

Professor Amir Hussain, King Fahd University of Petroleum and Minerals, Saudi Arabia

Professor David Brown, Nottingham Trent University, UK

Professor Matthew Bellgard, University of East London, UK

Programme:

14:30 – 14:45 Introduction to the Panel and the Panellists

14:45 – 15:45 Panel discussion

15:45 – 16:30 Open Discussion, Q&A and Closing

Panel discussion topics:

1. What will an AI-shaped career actually look like?
2. What should young people learn now?
3. How do you distinguish yourself when everybody has access to AI?
4. What happens to research and academic careers?
5. Career progression, leadership and opportunity
6. Responsible AI and careers with societal impact

6th International Conference on Applied Intelligence and Informatics (AII 2026)

Abstracts of Accepted Papers

October 21-23, 2026

London, UK

<https://aii-conf.org/>

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Day 1: Wednesday, 21 October 2026

10:00 – 10:45 Hybrid Technical Session I: Applied Intelligence I

List of Papers

10:00 – 10:45 Hybrid Technical Session I: Applied Intelligence I

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

*Chair: **Dr Seyed Ali Ghorashi**, University of East London, UK*

Paper ID: 0014

Paper title: Unsupervised Quantum Kernel Learning of Symmetry Protected Topological Phases via Geometric Tensor Weighting

Authors: Mejbah Ahammad, Md. Ashraful Babu, M. Mostafizur Rahman, Md. Fayz-Al-Asad, Tashin Islam

Presenter: *M Mostafizur Rahman*

Paper ID: 0015

Paper title: Capacity-Constrained Multi-Robot Task Allocation via Quantum Approximate Optimisation: A Reproducible Benchmark on a Solomon VRPTW C101-Derived Instance

Authors: Sandeep Gupta, Sazzad Hossain, Akmal Akhatov, Nurmamatov Mekhriddin, Kanad Ray

Presenter: *Kanad Ray*

Paper ID: 0020

Paper title: Explainable Variational Quantum Policy Gradient: SHAP-Based Interpretability of Quantum Reinforcement Learning Agents on CartPole

Authors: Sandeep Gupta, Sazzad Hossain, Akmal Akhatov, Nurmamatov Mekhriddin, Kanad Ray

Presenter: *Kanad Ray*

Paper ID 0014

Unsupervised Quantum Kernel Learning of Symmetry Protected Topological Phases via Geometric Tensor Weighting

Mejbah Ahammad¹, Md. Ashraful Babu², M. Mostafizur Rahman³, Md. Fayz-Al-Asad³, Tashin Islam¹

¹ Department of Computer Science, American International University-Bangladesh, Dhaka-1229, Bangladesh

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³ Department of Mathematics, American International University-Bangladesh, Dhaka-1229, Bangladesh

Abstract

We propose an unsupervised quantum kernel learning framework for identifying symmetry-protected topological phases without labeled training data. Instead of using the margin-optimization stage of a supervised quantum support vector machine, the method performs spectral clustering on a fidelity kernel constructed from parameterized quantum states. The central idea is to incorporate quantum geometry directly into the kernel: for each point in the Hamiltonian parameter manifold, a hardware-efficient circuit generates the corresponding statevector, pairwise squared overlaps define the empirical fidelity kernel, and a diagonal Fubini–Study metric estimate is obtained from shifted neighboring parameter points. The determinant of this metric is then normalized and used as a curvature-informed weight, yielding a geometry-weighted kernel that emphasizes regions where the quantum state changes rapidly. Singular-value decomposition of the weighted kernel provides a low-dimensional spectral embedding, while the normalized eigengap is used to validate the expected three-sector structure before applying k-means clustering. Numerical experiments on an extended Su–Schrieffer–Heeger parameter grid show that the proposed geometry-weighted spectral clustering separates the reference topological sectors more effectively than the unweighted fidelity kernel and classical clustering baselines. The framework therefore links quantum-geometric sensitivity with kernel-based unsupervised learning and offers a transparent route for phase discovery when annotated phase labels are unavailable.

Keywords: Quantum machine learning, Quantum geometric tensor, Symmetry-protected topological phases, Spectral clustering, Quantum kernels

Paper ID 0015

Capacity-Constrained Multi-Robot Task Allocation via Quantum Approximate Optimisation: A Reproducible Benchmark on a Solomon VRPTW C101-Derived Instance

Sandeep Gupta^{1,2}, Sazzad Hossain³, Akmal Akhatov⁴, Nurmamatov Mekhriddin⁵, Kanad Ray^{6,7}

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Abstract

Assigning tasks to robots under per-robot capacity limits is a combinatorially hard coordination problem central to logistics and warehouse automation. Quantum variational solvers have recently attracted attention for such problems, yet rigorous benchmarks with full reproducibility remain scarce. We address this gap with three contributions. First, a slack-free Quadratic Unconstrained Binary Optimisation (QUBO) formulation for capacity-constrained MRTA that encodes coverage and capacity simultaneously as equality constraints, requiring only NK binary variables with no ancilla overhead. Second, a closed-form sufficient condition for the penalty coefficient ($\lambda > c_{\text{opt}}/N$), with $\lambda = c_{\text{greedy}}$ as a parameter-free, $O(NK \log N)$ computable choice. Third, the first fully reproducible Quantum Approximate Optimisation Algorithm (QAOA)-based MRTA benchmark derived from Solomon VRPTW C101 spatial coordinates (customer locations and depot only; time windows, route sequencing, and service durations are not modelled—the problem is capacity-constrained task assignment). Across depths $p \in \{1, 2, 3\}$ on a 16-qubit instance, QAOA achieves 100% constraint satisfaction; $p = 2$ attains approximation ratio $r = 1.0047$ (mean 1.0051 ± 0.0008 over ten seeds), outperforming both greedy ($r = 1.016$) and random ($r = 1.007$) baselines. All artefacts are deposited on Zenodo [1].

Keywords: Quantum Approximate Optimisation Algorithm, Multi-Robot Task Allocation, QUBO, Ising Hamiltonian, Capacity Constraints, Near-Term Quantum Computing, Dynamic Penalty Scaling, Reproducibility

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Paper ID 0020

Explainable Variational Quantum Policy Gradient: SHAP-Based Interpretability of Quantum Reinforcement Learning Agents on CartPole

Sandeep Gupta^{1,2}, Sazzad Hossain³, Akmal Akhatov⁴, Nurmamatov Mekhriddin⁵, Kanad Ray^{6,7}

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Abstract

The decisions of variational quantum reinforcement learning agents remain largely opaque, limiting trust in safety-critical deployments. We present the first application of SHapley Additive exPlanations (SHAP) to a Variational Quantum Policy Gradient (VQPG) agent trained on CartPole-v1. Our 4-qubit hybrid quantum-classical policy uses only 46 trainable parameters and achieves a mean evaluation score of 496.4 ± 8.1 over ten independent seeds (maximum 500.0), compared to 249.7 ± 38.6 for a standard Deep Q-Network (DQN) with 9 220 parameters and 412.3 ± 67.9 for a parameter-matched Tiny-MLP (30 parameters, identical training budget). SHAP analysis identifies Pole Angular Velocity as the dominant decision feature (mean $| \phi | = 0.2859$, approximately $7\times$ the next feature), consistent with classical control theory for inverted pendulum stabilisation. This attribution is stable across five independently sampled background sets (coefficient of variation 3.1%), confirming the reliability of the explanation. We emphasise that all results are obtained under noiseless simulation; no claim of quantum advantage in the complexity-theoretic sense is made. The complete experimental package is deposited on Zenodo [1] under CC-BY 4.0.

Keywords: Variational Quantum Policy Gradient, Quantum Reinforcement Learning, SHAP, Explainable AI, CartPole, PennyLane, Parameter Efficiency, Near-Term Quantum Computing, Reproducibility

Day 1: Wednesday, 21 October 2026

11:00 – 12:00 Hybrid Technical Session II: Healthcare AI

List of Papers

11:00 – 12:00 Hybrid Technical Session II: Healthcare AI

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

*Chair: **Professor Kanad Ray**, Amity Cognitive Computing and Brain Informatics Centre, India*

Paper ID: 0048

Paper title: Assessing Dysarthric Speech Intelligibility via Generative Augmentation and Self-Supervised Linguistic Representations

Authors: Davide Lillini, Carlo Aironi, Lucia Migliorelli, Leonardo Gabrielli, Stefano Squartini

Presenter: *Davide Lillini*

Paper ID: 0028

Paper title: RetinaFusionNet: Gated Multimodal Fusion for Classifying Carotid Intima-Media Thickness

Authors: Mahir Shadid, Rashed Mustafa

Presenter: *Rashed Mustafa*

Paper ID: 0046

Paper title: Systematic Evaluation of Data Augmentation Strategies for Ordinal BI-RADS Classification in Breast Ultrasound: A Benchmark on BUS-BRA

Authors: Hadeel Saad Alghamdi, Mufti Mahmud, Abdullah Faisal Al-Battal, Ammar Alsheghri

Presenter: *Hadeel Saad Alghamdi*

Paper ID: 0011

Paper title: An Explainable Cleanlab-Guided Uncertainty-Based Active Learning Framework for Data-Efficient Parkinson's Disease Classification

Authors: Md. Shakil Ahmed, Shakila Shafiq, M Shamim Kaiser

Presenter: *M Shamim Kaiser*

Paper ID 0048

Assessing Dysarthric Speech Intelligibility via Generative Augmentation and Self-Supervised Linguistic Representations

Davide Lillini¹, Carlo Aironi¹, Lucia Migliorelli², Leonardo Gabrielli¹, Stefano Squartini¹

¹ Department of Information Engineering, Università Politecnica delle Marche, Ancona, Italy

² Department of Political Science, Università degli Studi di Teramo, Teramo, Italy

Abstract

The development of robust automated systems for assessing speech intelligibility levels in patients with dysarthria is currently hindered by the scarcity of labeled pathological datasets. This study proposes a novel framework addressing this limitation by integrating self-supervised learning with generative data augmentation. We employ Wav2Vec 2.0, a pre-trained self-supervised speech model, to extract and analyze contextualized representations, aligned with both grapheme and phoneme targets, systematically identifying which linguistic units serve as the most effective biomarkers for binary intelligibility classification. To address data scarcity, we employ StyleTTS-2, a diffusion-based generative model, to generate synthetic dysarthric speech samples conditioned on reference audio from the TORGO dataset and text prompts from the UA-Speech dataset. Experimental results demonstrate that contextualized representations yield superior classification accuracy compared to approaches operating on full word- or utterance-level audio. Significantly higher performance is observed on units most degraded by dysarthric impairment, validating the proposed fine-grained approach. Furthermore, synthetic data augmentation proved to enhance model robustness, effectively mitigating data scarcity issues.

Keywords: Dysarthria assessment, Speech Intelligibility, Generative Speech Augmentation, Self-Supervised Representation, Text-to-Speech algorithms

Paper ID 0028

RetinaFusionNet: Gated Multimodal Fusion for Classifying Carotid Intima-Media Thickness

*Mahir Shadid¹, Rashed Mustafa²**¹ International Islamic University Chittagong, Chittagong, Bangladesh**² University of Chittagong, Chittagong, Bangladesh*

Abstract

Retinal fundus ultrasound-derived CIMT is well-established as a reliable surrogate measure of subclinical atherosclerosis and cardiovascular risk, but its acquisition demands specialized equipment and expertise, limiting its scalability for mass screening. Retinal fundus image analysis and demography can be considered promising complementary methods to predict carotid IMT. In this study, RetinaFusionNet is presented, a novel multimodal deep learning framework combining bilateral fundus images and demography through a learned gating system that adaptively modifies demographic data prior to fusion. All experiments were performed using the publicly available China-Fundus-CIMT dataset containing 2,903 patients according to its officially released patient-level train, validation, and test split. EfficientNet-B0, ResNet50, and DenseNet 121 were investigated in a common-weights dual-eye architecture including automated retina cropping, advanced data augmentation, label smoothing, class weighted loss, horizontal flip test-time augmentation, optimized thresholds on validation, and early stopping. The best gated model, EfficientNet-B0, reached an accuracy of 89.00% and ROC-AUC of 94.94% (95% bootstrap confidence interval: 90.32%-98.38%). The matched ungated models obtained ROC-AUC values of 92.42%, 94.11%, and 88.38% for EfficientNet-B0, ResNet50, and DenseNet121, respectively. The probability averaged from the three gated backbones obtained an ROC-AUC of 93.68%, in contrast to 93.08% of the respective ungated ensemble. These findings demonstrate the possibility of multimodal retinal analysis with demographic fusion for risk classification of non-invasive CIMT, but with caution due to the limited 100-patient test set.

Keywords: Carotid intima-media thickness, Fundus imaging, Multimodal learning, Deep learning, Medical image classification, RetinaFusionNet, Cardiovascular risk prediction

Paper ID 0046

Systematic Evaluation of Data Augmentation Strategies for Ordinal BI-RADS Classification in Breast Ultrasound: A Benchmark on BUS-BRA

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⁵ Department of Mechanical Engineering, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

Abstract

Correct classification of breast ultrasound lesions into Breast Imaging Reporting and Data System (BI-RADS) categories 2–5 is clinically important yet technically challenging, particularly for the diagnostically ambiguous BI-RADS 3 category and the under-represented BI-RADS 5 category. Although data augmentation is widely used to improve deep learning models in medical imaging, its impact on full-range ordinal BI-RADS classification has not been systematically benchmarked on a public dataset. In this work, we compare six augmentation strategies—baseline, geometric, intensity, ultrasound-specific, modern, and combined—using EfficientNet-B3 and ResNet-50 trained with ordinal Earth Mover Distance (EMD) loss on the BUS-BRA dataset containing 1,875 ultrasound images from 1,064 patients. Experiments were evaluated using patient-grouped five-fold cross-validation to prevent patient-level information leakage and assessed using accuracy, macro-F1, mean absolute error (MAE), and category-specific F1 scores. For EfficientNet-B3, combined augmentation achieved the strongest overall performance (accuracy 0.602, macro-F1 0.587, MAE 0.451), whereas modern augmentation produced the highest F1 score for the minority BI-RADS 5 category. Cross-backbone evaluation further showed that augmentation effectiveness depends on network architecture, with EfficientNet-B3 benefiting consistently from all augmentation strategies, while ultrasound-specific and combined augmentation exhibited greater variability for ResNet-50. These results show that augmentation strategy should be selected according to both the target architecture and the clinically prioritised BI-RADS category rather than overall performance alone.

Keywords: Breast ultrasound, BI-RADS classification, Data augmentation, Ordinal classification, Deep learning, EfficientNet, BUS-BRA

Paper ID 0011

An Explainable Cleanlab-Guided Uncertainty-Based Active Learning Framework for Data-Efficient Parkinson's Disease Classification

Md. Shakil Ahmed^{1,2}, Shakila Shafiq³, M Shamim Kaiser¹

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² Department of Computer Science & Engineering, Bangladesh University of Business and Technology, Bangladesh

³ Department of Computer Science & Engineering, National Institute of Textile Engineering and Research, Bangladesh

Abstract

Parkinson's Disease (PD) is a progressive neurodegenerative disorder whose early diagnosis is challenging due to dependence on expert-driven clinical assessment and the limited availability of labeled medical data. To address this issue, this study proposes a Cleanlab-Guided Uncertainty-Based Active Learning (AL) framework for voice-based PD detection using high-dimensional acoustic features. The proposed approach iteratively selects the most informative and uncertain samples from an unlabeled pool, significantly reducing annotation cost while maintaining strong classification performance. Experimental results on a benchmark PD voice dataset demonstrate that the model achieves 94.0% accuracy, 94.0% F1-Score, and 88.1% MCC, with rapid convergence within eight AL rounds. A comprehensive ablation study is conducted to evaluate the contribution of different feature groups, revealing that TQWT and MFCC features are the most critical, where their removal leads to notable performance degradation, particularly a significant drop in MCC. Furthermore, a comparative analysis with state-of-the-art Semi-Supervised Learning models demonstrates that the proposed framework consistently outperforms existing methods. To enhance interpretability, SHAP and LIME are employed for global and local explanations, respectively, providing insights into feature importance and model decision behavior. Overall, the integration of uncertainty-driven AL with explainable AI offers a scalable, cost-effective, and reliable framework for early PD detection in data-scarce clinical environments.

Keywords: Parkinson's Disease, Active Learning, Cleanlab, Uncertainty Sampling, Voice-Based Diagnosis, Explainable AI

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Day 1: Wednesday, 21 October 2026

12:00 – 14:00 Online Technical Session I: Pattern Recognition

List of Papers

12:00 – 14:00 Online Technical Session I: Pattern Recognition

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

*Chair: **Professor Shamim Al Mamun**, Jahangirnagar University, Bangladesh*

Paper ID: 0010

Paper title: Knowing When Not to Act: Toward Capability-Aware Healthcare AI

Authors: Marzia Hoque Tania

Presenter: *Marzia Hoque Tania*

Paper ID: 0044

Paper title: CARE-Lung: Calibrated, Cross-Validated Cycle-to-Patient Aggregation with Conformal Referral for Respiratory Sound Screening

Authors: Arnob Aich Anurag, Shamiul Islam, Nuren Tasnim Risha, Md. Sadman Hossain, Trisha Sarker, Sifat Rahman Ahona, Juena Ahmed Noshin

Presenter: *Arnob Aich Anurag*

Paper ID: 0049

Paper title: A Comparative Evaluation of Machine Learning, Deep Learning, and Vision Transformer Models for Alzheimer's Disease Classification

Authors: Noushath Shaffi, Viswan Vimbi, Abdelhamid Abdesselam, Rachid Hedjam

Presenter: *Noushath Shaffi*

Paper ID: 0047

Paper title: An Assessment of Quantum Principal Component Analysis

Authors: Mehjabin Khatoon, Niha Kamal Basha

Presenter: *Mehjabin Khatoon*

Paper ID: 0087

Paper title: Transfer Learning in Genetic Algorithms for Combinatorial Optimization Using Fitness Lineage

Authors: George Mweshi, Nelishia Pillay, Thambo Nyathi

Presenter: *Nelishia Pillay*

Paper ID: 0025

Paper title: Evaluating Few-Shot Learning for Cherry Leaf Disease Classification in Real-World Agricultural Settings

Authors: Dostonbek Nazirzhonov, Md Easin Arafat, Nazrul Islam, Utkarsh Mall

Presenter: *Dostonbek Nazirzhonov*

Paper ID: 0007

Paper title: Patient-Guided Attention Gate for False-Negative-Aware Melanoma Detection Using Hybrid CNN-ViT Architecture on ISIC 2024 SLICE-3D

Authors: Md Kamrul Islam, Md Naimul Islam, Mizanur Rahman, Sanjida Afrin, Hasan Sarwar, Md. Saef Ullah Miah

Presenter: *Md Kamrul Islam*

Paper ID: 0027

Paper title: ColourMag: A Learning-Based Colour Magnification Framework for Remote Heart Rate Estimation

Authors: Zakia Batool Turabee, David J. Brown, Mufti Mahmud, Andreas Oikonomou, Muhammad Arifur Rahman, Andrew Burton, Nicholas Shopland

Presenter: *Zakia Turabee*



Paper ID 0010

Knowing When Not to Act: Toward Capability-Aware Healthcare AI

*Marzia Hoque Tania**Centre for Big Data Research in Health, University of New South Wales, Sydney, Australia*

Abstract

The growing adoption of AI in healthcare has increasingly shifted research from improving predictive performance toward ensuring trustworthy clinical deployment. Advances in uncertainty quantification, confidence calibration, out-of-distribution detection, selective prediction, and human–AI collaboration have substantially improved the ability to determine whether a prediction should be trusted. A complementary question, however, has received comparatively less attention: when should an AI system participate in clinical decision making? Addressing this question shifts the focus from evaluating prediction reliability to estimating the operational capability of an AI–clinical interaction. In this paper, a conceptual formulation based on four levels of abstraction—interaction, capability, competence, and operational admissibility—is developed to motivate the notion of an Operational Capability Set, representing the evolving domain over which AI participation is operationally admissible. This formulation provides a common perspective for interpreting uncertainty estimation, confidence calibration, out-of-distribution detection, selective prediction, and related approaches as complementary sources of evidence for capability estimation. It also highlights connections between trustworthy healthcare AI, computational metacognition, and meta-learning, providing a conceptual basis for future research on adaptive and trustworthy healthcare AI.

Keywords: Metacognition, Trustworthy AI, Clinical Decision Support

Paper ID 0044

CARE-Lung: Calibrated, Cross-Validated Cycle-to-Patient Aggregation with Conformal Referral for Respiratory Sound Screening

Arnob Aich Anurag, Shamiul Islam, Nuren Tasnim Risha, Md. Sadman Hossain, Trisha Sarker, Sifat Rahman Ahona, Juena Ahmed Noshin

Department of Computer Science, American International University-Bangladesh (AIUB), Dhaka, Bangladesh

Abstract

Screening systems for respiratory sounds are typically tested on a small held-out split for a single analysis, so model rankings carry a variance that is rarely quantified and are rarely checked against any baseline stronger than chance. To address this we developed CARE-Lung, a patient-level screening pipeline for the ICBHI 2017 respiratory sound dataset. The system works in four steps: it calibrates a classifier that flags abnormal sounds in short breathing cycles, summarises each patient's cycles into a compact statistical profile, estimates from that profile how likely the patient is to be abnormal, and adds a safety net that can flag uncertain cases as refer rather than forcing a binary call. Instead of testing on 26 patients, we evaluate all 126 through patient-level cross-validation and report patient-grouped bootstrap intervals throughout. CARE-Lung reaches AUROC 0.832 (95% CI 0.758–0.897), PR-AUC 0.958 and sensitivity 0.720, with calibration error dropping more than threefold against a count-ratio baseline. Three controls then bound that result. Predicting every patient abnormal already gives 0.794 accuracy and 0.885 F1, above CARE-Lung's 0.730 and 0.809, so those are the wrong headline metrics. A baseline using the recording device alone and no audio reaches AUROC 0.784, and the paired difference against CARE-Lung is +0.047 with a 95% interval of $[-0.047, +0.141]$, so the acoustic pipeline cannot be shown to beat knowing which stethoscope was used. With device held constant, AUROC falls to 0.707. What survives is the methodology rather than the headline: within a single device, distributional aggregation still beats hard counting, calibration still improves threefold, and referral still cuts selective risk from 0.375 to 0.100. The main remaining source of error is the microphone used to collect the data rather than the patients themselves.

Keywords: Respiratory sound analysis, COPD screening, Device confounding, Calibration, Cross-validation, Conformal prediction, Uncertainty quantification

Paper ID 0049

A Comparative Evaluation of Machine Learning, Deep Learning, and Vision Transformer Models for Alzheimer's Disease Classification

Noushath Shaffi¹, Viswan Vimbi², Abdelhamid Abdesselam¹, Rachid Hedjam³

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² Department of Information Technology, University of Technology and Applied Sciences-Sohar, Sultanate of Oman

³ Department of Computer Science, Bishop's University, Sherbrooke, QC, Canada

Abstract

Alzheimer's Disease (AD) is an area profusely investigated by Artificial Intelligence (AI) research. The complexity of AD feature characterization necessitates the application of AI models for an accurate diagnosis. Several AI techniques have been used in the detection and diagnosis of AD. Despite AI advancements for AD detection, the complexity of brain imaging, especially in MRI scans, poses unique challenges. This complexity has led to exploring newer architectures like vision transformers (VT). This has brought a paradigm shift in computer vision architecture, providing a unique and innovative alternative to traditional convolutional neural networks (CNN). This paper presents a comparative evaluation of AD classification using traditional and deep machine learning classifiers including VTs. The results indicate an increase in accuracy of around 5% for VT architectures compared to traditional AI models.

Keywords: Machine Learning, Deep Learning, Vision Transformers, Alzheimer's Disease, CNN

Paper ID 0047

An Assessment of Quantum Principal Component Analysis

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¹ Faculty of Engineering and Technology, Jamia Millia Islamia, Jamia Nagar, New Delhi 110025, India

² Vellore Institute of Technology, Vellore Campus, Vellore, Tamil Nadu 632014, India

Abstract

QPCA (Quantum Principal Component Analysis) is an algorithm that performs operations on a quantum dataset based on traditional PCA. Initially proposed for the simulation of the density matrix, it focuses on quantum system assessment utilizing the states of quantum. QPCA basically derives the principal components estimation from a dataset, whose execution period for certain terms is faster exponentially. The dataset representation assumptions are in the form of a density (or covariance) matrix, and quantum computers can prepare copies of it efficiently. The logical calculations of QPCA are helpful in cases like quantum machine learning, big data, and eigenvector estimations in polylogarithmic time. QPCA is an accelerated version of PCA, that is theoretical and scalable quantum hardware is awaited.

Keywords: Quantum, Quantum Computing, Quantum states, Tomography, PCA



Paper ID 0087

Transfer Learning in Genetic Algorithms for Combinatorial Optimization Using Fitness Lineage

*George Mweshi, Nelishia Pillay, Thambo Nyathi**Department of Computer Science, University of Pretoria, Pretoria, South Africa*

Abstract

Transfer learning improves the efficiency and performance of evolutionary algorithms, delivering higher-quality solutions while reducing computational time and resources. Transfer learning in genetic algorithms works by transferring knowledge from a source genetic algorithm trained on solving simpler problems, to a target genetic algorithm for solving more complex problems. Transfer learning in genetic algorithms is challenging as transferring knowledge, i.e., chromosomes representing solutions, is not effective as the target genetic algorithms will be solving a different problem instance. This study examines transferring problem-independent knowledge, namely, knowledge regarding the search. Machine learning, namely, predictors, are used to transfer knowledge regarding whether an element of the population will lead to a local optimum or not. The paper introduces the concept of fitness lineage to identify local optima. The proposed approach is evaluated for combinatorial optimisation using two problem domains, namely, the examination timetabling problem (ETP) and the capacitated vehicle routing problem (CVRP). For both problems, knowledge is collected from the source genetic algorithms solving simpler problem instances to the target genetic algorithms solving more complex problems. The knowledge transferred is a predictor to identify local optima. The genetic algorithms with transfer learning (GATL) outperformed the genetic algorithms without transfer learning (GA) for all problem instances for both problems. Furthermore, the proposed approach outperformed previous work using machine learning to transfer knowledge in genetic algorithms.

Keywords: Knowledge Transfer, Genetic Algorithms, Fitness Lineage, Predictors, Examination Timetabling, Capacitated Vehicle Routing

Paper ID 0025

Evaluating Few-Shot Learning for Cherry Leaf Disease Classification in Real-World Agricultural Settings

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³ Department of Information and Communication Technology, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh

⁴ Department of Computer Vision, Mohamed bin Zayed University of Artificial Intelligence, Abu Dhabi, UAE

Abstract

We address the challenge of limited data and domain shift in plant disease recognition by introducing a 400-image cherry leaf dataset spanning four disease categories, collected on real farms in Kyrgyzstan. Images exhibit natural lighting variation, background clutter, and Uzbek-language class labels, providing a realistic test bed for few-shot and zero-shot methods. We evaluate fine-tuning, Prototypical Networks, k-NN, and zero-shot CLIP using ResNet50 and ViT-B/16 backbones in 4-way 1-shot and 5-shot settings. Fine-tuning ResNet50 achieves the best performance (81.32% in 5-shot), while Prototypical Networks and k-NN offer stable, competitive results. ViT-B/16 and CLIP degrade under low-shot conditions and non-English labels; zero-shot CLIP drops from 40.50% with English prompts to 28.75% with Uzbek prompts, quantifying language bias in a real agricultural deployment scenario. These results establish practical baselines for robust recognition in real-world, data-scarce agricultural settings.

Keywords: Few-shot Learning, Plant Disease Classification, Computer Vision in Agriculture, Cross-Lingual Learning, Vision Transformer

Paper ID 0007

Patient-Guided Attention Gate for False-Negative-Aware Melanoma Detection Using Hybrid CNN-ViT Architecture on ISIC 2024 SLICE-3D

Md Kamrul Islam¹, Md Naimul Islam², Mizanur Rahman³, Sanjida Afrin⁴, Hasan Sarwar⁵, Md. Saef Ullah Miah⁶

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Abstract

Automated melanoma detection in total body photography (TBP) datasets presents a dual challenge: extreme class imbalance (0.1% malignant prevalence) and the inherent difficulty of distinguishing malignant from benign lesions without patient-population context. We propose a hybrid EfficientNet-B4 and Vision Transformer (ViT-B/16) architecture with a novel Patient-Guided Attention Gate (PGAG) that dynamically conditions convolutional local-texture features and transformer global-structure features using a computational operationalisation of the clinical ugly duckling sign. A 7-dimensional patient-context deviation vector, computed via leave-one-out intra-patient ViT embedding statistics to prevent self-inclusion leakage, conditions the gate, enabling each lesion to be evaluated relative to its patient's own lesion population. Combined with an asymmetric false-negative-aware focal loss ($\gamma^+ = 4.0$, $\gamma^- = 1.0$), the proposed model achieves a partial AUC (pAUC, $\text{FPR} \leq 0.20$) of 0.1892 on the ISIC 2024 SLICE-3D validation set, exceeding the competition winner (EVA02+GBDT, pAUC = 0.1755) by 7.8%, with ROC-AUC of 0.9493 and PR-AUC of 0.0954. Gate analysis reveals a significant positive correlation between the ugly duckling score and ViT-branch gate weight ($r = 0.6424$, $p < 10^{-10}$), though the gate's absolute reliance on ViT features remains small (< 0.03) for both classes, with CNN features dominating fusion overall. Ablation demonstrates a 9.1 percentage-point false-negative-rate reduction over the CNN-only baseline. McNemar's test confirms significantly higher accuracy than baseline architectures across the full validation set ($\chi^2 = 953.30$, $p = 2.54 \times 10^{-209}$ vs. A1; $\chi^2 = 2175.07$, $p \approx 0$ vs. A3), though this difference is not significant when restricted to the 77 malignant validation lesions alone ($p > 0.05$); a Wilcoxon signed-rank test confirms significantly higher malignant scores overall ($W = 40,015,302$, $p \approx 0$).

Keywords: melanoma detection, vision transformer, convolutional neural network, attention gate, ugly duckling sign, class imbalance, partial AUC, false-negative reduction, ISIC 2024, skin cancer

Paper ID 0027

ColourMag: A Learning-Based Colour Magnification Framework for Remote Heart Rate Estimation

Zakia Batool Turabee¹, David J. Brown¹, Mufti Mahmud^{2,3,4}, Andreas Oikonomou¹, Muhammad Arifur Rahman¹, Andrew Burton¹, Nicholas Shopland¹

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Abstract

Heart rate (HR) is a well-established physiological marker of increased distress in children with Autism Spectrum Condition (ASC), which often rises prior to a meltdown. The use of wearable sensors in children can cause sensory discomfort, while behaviour-based monitoring alone often detects distress only near the onset of a meltdown, limiting the window of time for intervention. This paper presents ColourMag, a learning-based colour magnification framework for non-invasive HR estimation from facial video. The framework separates shape and colour information using a dual-path encoder and applies a learned temporal magnification mechanism to enhance subtle, pulse-driven chrominance variations that are imperceptible to the human eye. The proposed approach is evaluated on two publicly available datasets, UBFC-rPPG and PURE, under both a subject-wise fixed train/test split and Leave-One-Subject-Out (LOSO) cross-validation. The results show reasonable performance under fixed-split evaluation, while LOSO reveals its limitations. Ablation studies confirm the contribution of key architectural components and Grad-CAM-based explainability analysis further shows that the model attends to physiologically relevant facial regions, such as the cheeks and forehead, consistent with established remote rPPG principles. This work establishes a generalisable base model for remote HR estimation, motivated by the broader goal of enabling early detection of emotional dysregulation in children with ASC.

Keywords: Autism, Challenging behaviours, Emotional dysregulation, Remote HR Estimation, Machine Learning

Day 1: Wednesday, 21 October 2026

16:15 – 17:00 Hybrid Technical Session III: Data, Privacy & Analytics

List of Papers

16:15 – 17:00 Hybrid Technical Session III: Data, Privacy & Analytics

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

*Chair: **Dr Hadeel Saad Alghamdi**, King Fahd University of Petroleum and Minerals, Saudi Arabia*

Paper ID: 0103

Paper title: Determination of PM2.5 from distant views: Across the miles with machine learning

Authors: Sarbani Palit, Sagarnil Chakraborty, Joydip Rakshit, Priyasha Haldar, Anushka Mukherjee

Presenter: *Sarbani Palit*

Paper ID: 0105

Paper title: Federated Learning for Early Prediction of Cardiovascular Disease in Privacy-Constrained Healthcare Environments

Authors: Nitya Puspaceno, Muhammad Arifur Rahman, Mufti Mahmud, Nicholas Shopland, Andrew Burton, David J. Brown

Presenter: *Nitya Puspaceno*

Paper ID: 0106

Paper title: Mapping Fiscal Landscapes: Understanding of Public Sector Finances through Data Visualisation

Authors: Abhishek Shrikant Jangam, Muhammad Arifur Rahman, Nicholas Shopland, Taha Osman, David J. Brown

Presenter: *Muhammad Arifur Rahman*

Paper ID 0103

Determination of PM_{2.5} from distant views: Across the miles with machine learning

Sarbani Palit¹, Sagarnil Chakraborty¹, Joydip Rakshit², Priyasha Haldar³, Anushka Mukherjee⁴

¹ Indian Statistical Institute, Kolkata, India

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³ Visva-Bharati, Santiniketan, India

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Abstract

Monitoring of air quality and especially the level of PM_{2.5} (particulate matter of size 2.5 μm or less) is of great importance as it poses a serious health hazard. As monitoring stations are expensive to set up and maintain, image-based approaches have gained popularity on account of their cost-effectiveness and versatility. However, the current image-based approaches usually compute a single PM_{2.5} level from an input image making an underlying assumption of a constant level of PM_{2.5} across the entire distance captured by the image. This work proposes a novel approach which, for the first time, attempts to determine the PM_{2.5} level at different depths or distances from the camera. This is achieved by making a judicious choice of two different Regions of Interest (ROI) from different views captured by the camera. Such an approach is consistent with the physical phenomenon of visibility degradation with distance. Extensive experiments to assess the viability of the proposed approach have been presented with initial results being extremely promising. It may be emphasized in no uncertain times that this work is unique in that it is able to correctly capture the different PM_{2.5} concentrations at two different locations using a single camera and multiple views. The use of a simple machine learning model makes the approach computationally simple yet able to make accurate predictions.

Keywords: Image, Particulate Matter, Region of Interest

Paper ID 0105

Federated Learning for Early Prediction of Cardiovascular Disease in Privacy-Constrained Healthcare Environments

Nitya Puspaceno¹, Muhammad Arifur Rahman¹, Mufti Mahmud², Nicholas Shopland¹, Andrew Burton¹, David J. Brown¹

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Abstract

Cardiovascular disease remains a major contributor to global morbidity, while clinical data sharing across institutions is constrained by privacy regulations such as the GDPR. This retrospective proof-of-concept study investigates whether federated learning (FL) can support collaborative cardiovascular risk prediction without transferring raw patient records across institutional boundaries. Using 46,520 records from the MIMIC-III database, partitioned at the patient level, a centralised neural network is compared with Federated Averaging (FedAvg) and Federated Proximal (FedProx) across three simulated hospital clients under IID and Non-IID distributions. The findings show that federated models achieve predictive performance comparable to centralised training and remain robust under heterogeneous data distributions. Calibration analysis further indicates that distributed aggregation preserves reliable risk estimates for clinical screening. Validation-based operating-point optimisation demonstrates that the models can prioritise high screening sensitivity without additional communication overhead. While local data retention supports data minimisation and reduces cross-institutional data transfer, it does not provide formal privacy guarantees such as differential privacy. Overall, the findings demonstrate the feasibility of FL for privacy-conscious cardiovascular risk prediction and provide a foundation for future evaluation in real-world multi-institutional clinical settings.

Keywords: Federated learning, Cardiovascular disease, Privacy-preserving ML, Non-IID data, FedProx, Decision thresholds, Calibration

Paper ID 0106

Mapping Fiscal Landscapes: Understanding of Public Sector Finances through Data Visualisation

Abhishek Shrikant Jangam, Muhammad Arifur Rahman, Nicholas Shopland, Taha Osman, David J. Brown

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Abstract

In an era of data-driven decision-making, transforming complex financial datasets into clear, actionable insights is essential for effective public-sector financial management. This paper explores the use of advanced data visualisation techniques to enhance transparency, accountability, and decision-making in public finance. Following a review of big data and visualisation literature, the study identifies limitations of traditional approaches for representing complex public-sector financial data. Using the Design Science Research framework, Tableau's advanced features, including Viz Extensions and Story Points, are applied to develop interactive financial dashboards through a systematic and iterative process. UK public-sector finance datasets from authoritative government sources are processed through an ETL pipeline to visualise key indicators, including revenue, expenditure, and fiscal balance. The dashboards incorporate WCAG guidelines and user-centred design principles to support diverse users. The resulting multi-page Tableau solution combines interactive visualisations with Story Points to communicate complex financial narratives effectively. Its effectiveness is evaluated in terms of decision-making support and its potential to improve transparency and accountability in public financial management. By integrating advanced visualisation techniques with accessible, user-centred design, the study provides a practical framework for evidence-based financial analysis and governance.

Keywords: Big Data, Data Visualisation, ETL Process, Public Sector Finance, Tableau Viz Extensions, Interactive Dashboards

Day 2: Thursday, 22 October 2026

09:00 – 10:00 Hybrid Technical Session IV: Explainable, Neuro-AI & Inclusive AI

List of Papers

09:00 – 10:00 Hybrid Technical Session IV: Explainable, Neuro-AI & Inclusive AI

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

*Chair: **Professor Sarbani Palit**, Indian Statistical Institute, Kolkata, India*

Paper ID: 0026

Paper title: Evidence From Within: Explainable YOLOv8 for Reproducible Brain Tumour Localisation

Authors: Connor Mc Cabe, Dost Muhammad, Malika Bendeche

Presenter: *Dost Muhammad*

Paper ID: 0042

Paper title: Modeling progressive neuronal ablation in biomimetic hardware Spiking Neural Networks

Authors: Sam Zahedi Ghasabei, Federico Barban, Marta Carè, Timothée Levi, Michela Chiappalone

Presenter: *Sam Zahedi Ghasabei*

Paper ID: 0102

Paper title: Generative AI for Inclusive Higher Education: Evaluating an inclusive education toolkit for improving participation in Bangladeshi HE and TVET

Authors: David J. Brown, Mufti Mahmud, Nicholas Shopland, Andrew Burton, Muhammad Arifur Rahman, M Mostafizur Rahman, M Shamim Kaiser, Md. Saiful Islam, Md Saef Ullah Miah, Akarsh K. Nair

Presenter: *Akarsh K Nair*

Paper ID: 0107

Paper title: Explainable Multi-model Attention-based Deep Learning Algorithm for Brain Tumor Segmentation

Authors: Nayon Karmoker, Shrawman Majumder Rudra, Fahima Tabassum, Risala Tasin Khan, M. Shamim Kaiser

Presenter: *Risala Tasin Khan*

Paper ID 0026

Evidence From Within: Explainable YOLOv8 for Reproducible Brain Tumour Localisation

Connor Mc Cabe¹, Dost Muhammad^{2,3}, Malika Bendeckache³

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Abstract

Accurate brain tumour segmentation is insufficient for clinical decision support if the model cannot show whether its prediction is based on tumour-relevant evidence. Post-hoc methods such as Grad-CAM and Score-CAM are widely used in medical imaging, but their heatmaps are not optimised for tumour-mask alignment and may be diffuse or spatially imprecise. This paper proposes an explainable YOLOv8-based framework for efficient whole tumour localisation on multi-modal BraTS2020 MRI slices. The framework combines a reproducible H5-to-YOLO conversion pipeline, YOLOv8n-seg for single-class tumour localisation, and a native evidence head attached to internal YOLOv8 feature representations. Unlike post-hoc CAM methods, the evidence head is trained to generate tumour-relevant spatial evidence directly from the model feature space. The native evidence maps are compared with Grad-CAM and Score-CAM on tumour-positive test samples using Dice, IoU, energy inside the tumour mask, pointing-game accuracy, and Hausdorff distance. The proposed method achieves higher Dice and IoU, stronger pointing-game performance, and lower boundary disagreement than both CAM baselines. Its maximum activation falls inside the tumour mask in 84% of test cases, compared with 38% for Grad-CAM and Score-CAM. Qualitative results further show compact tumour-centred evidence maps, while the CAM baselines are less precise or more diffuse. These findings show that explanation quality in medical segmentation should be evaluated as a measurable spatial property. The proposed framework provides an efficient and reproducible explanation-by-design approach for interpretable YOLO-style brain tumour localisation.

Keywords: Applied intelligence, Explainable artificial intelligence, Medical informatics, Reproducible AI, Brain tumour localisation, YOLOv8 segmentation, Native evidence learning, BraTS2020, Magnetic resonance imaging, Heatmap alignment

Paper ID 0042

Modeling progressive neuronal ablation in biomimetic hardware Spiking Neural Networks

Sam Zahedi Ghasabei¹, Federico Barban^{1,2}, Marta Carè², Timothée Levi³, Michela Chiappalone^{1,2}

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³ University of Bordeaux, Talence Cedex, 33405 France

Abstract

Biomimetic Spiking Neural Networks (SNNs) provide a powerful framework to investigate how neuronal loss reshapes population-level dynamics under controlled and reproducible conditions. In this study, we employed a previously optimized biomimetic SNN, implemented on the real-time FPGA-based BioemuS platform, to investigate the effects of progressive neuronal ablation. Selected neurons were functionally removed by suppressing their incoming and outgoing synaptic interactions. Two ablation strategies were compared: random, representing distributed neuronal loss, and fixed-center, representing a focal lesion-like perturbation. Network activity and organization were assessed through firing and bursting measures, together with graph-theoretical descriptors of residual structural synaptic connectivity. The comparison between distributed and spatially structured ablation showed that neuronal loss cannot be interpreted only as a quantitative reduction of active units. Rather, the spatial organization of the perturbation plays a central role in shaping the residual functional state of the network. These findings support the use of real-time hardware biomimetic SNNs as controllable models to study how neural-like systems respond to structural damage. Such a framework is relevant not only for neuroengineering, but also for the design of increasingly biomimetic artificial systems, where real-time, robustness, resilience, and functional reorganization after perturbation are becoming key computational properties.

Keywords: Structural connectivity, Network dynamics, SNN, Structural perturbation

Paper ID 0102

Generative AI for Inclusive Higher Education: Evaluating an inclusive education toolkit for improving participation in Bangladeshi HE and TVET

David J. Brown¹, Mufti Mahmud^{2,3,4}, Nicholas Shopland¹, Andrew Burton¹, Muhammad Arifur Rahman¹, M Mostafizur Rahman⁵, M Shamim Kaiser⁶, Md. Saiful Islam⁷, Md Saef Ullah Miah⁵, Akarsh K. Nair¹

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⁶ Institute of Information Technology, Jahangirnagar University, Bangladesh

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Abstract

Generative Artificial Intelligence (GenAI) has the potential to improve accessibility and learner support within higher education. However, its successful adoption requires appropriate institutional governance, capacity building, and ethical implementation. While existing studies have primarily focused on the educational applications of GenAI, comparatively little evidence exists on how collaborative capacity-building initiatives promote responsible and inclusive institutional adoption. This paper presents a mixed-methods evaluation of a British Council Going Global Partnerships project that extended an Inclusive Education Toolkit through the integration of ethical GenAI guidance, accessibility-aware teaching practices, and institution-specific co-design activities for Higher Education (HE) and Technical and Vocational Education and Training (TVET) institutions in Bangladesh. The evaluation combined post-project survey responses from 43 participants with institution-specific adaptation strategies developed during collaborative workshops. The findings indicate strong participant agreement regarding the relevance of the toolkit (88.4%), the usefulness of the ethical GenAI guidance (83.7%), institutional applicability (83.7%), and intentions to implement changes in future professional practice (97.7%). Furthermore, participating institutions translated the toolkit into locally relevant governance frameworks, accessibility initiatives, learner-support mechanisms, and responsible AI implementation strategies. The findings demonstrate that combining collaborative capacity building with practical educational resources can strengthen both professional development and institution-level readiness for responsible GenAI adoption. The proposed approach offers a flexible framework that can support responsible and inclusive AI adoption across diverse higher education and TVET contexts.

Keywords: Generative Artificial Intelligence, Inclusive Education, Higher Education, Ethical AI, Accessibility, Capacity Building

Paper ID 0107

Explainable Multi-model Attention-based Deep Learning Algorithm for Brain Tumor Segmentation

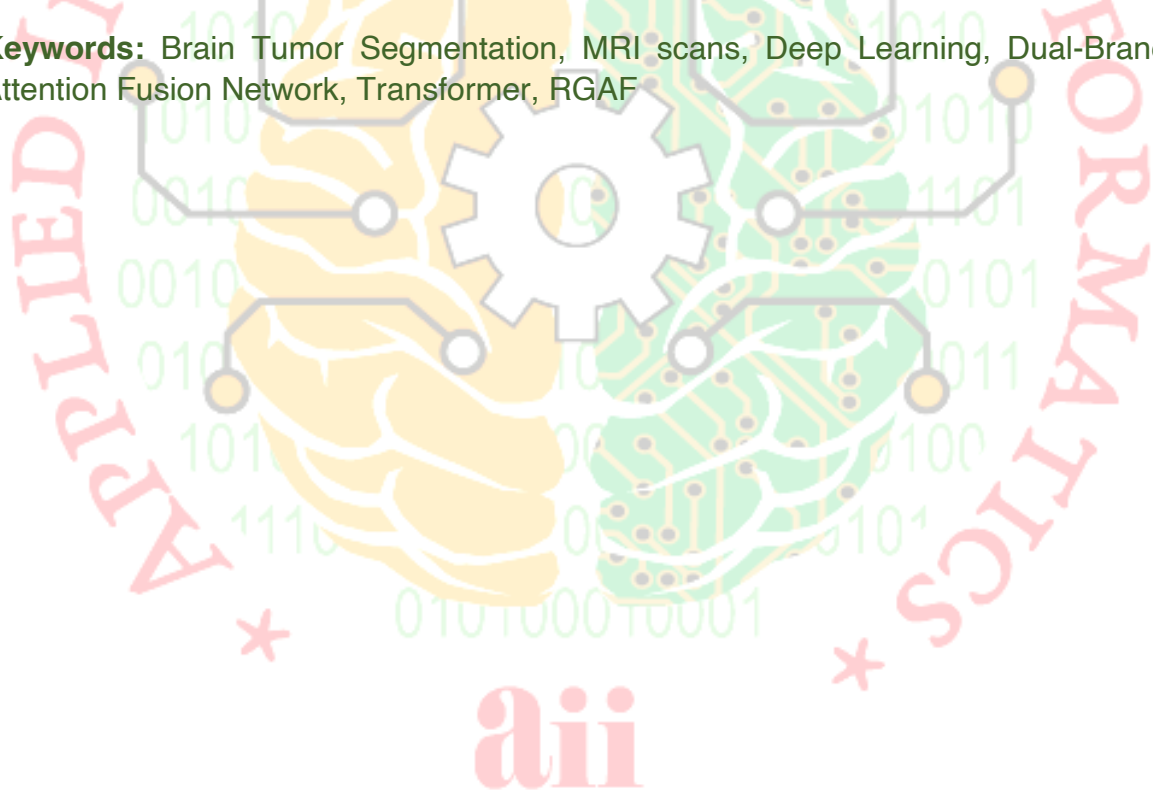
Nayon Karmoker, Shrawman Majumder Rudra, Fahima Tabassum, Risala Tasin Khan, M. Shamim Kaiser

Institute of Information Technology, Jahangirnagar University, Savar, Dhaka

Abstract

MRI-based brain tumor segmentation is essential for diagnosis, treatment planning, and monitoring. Despite advances in deep learning, combining long-range context with precise tumor boundaries remains difficult. We propose a Dual-Branch Attention Fusion Network that integrates an attention-enhanced U-Net for local detail with a Vision Transformer for global context. A Region-Guided Attention Fusion (RGAF) module adaptively combines both branches, while Explainable AI (XAI) highlights regions influencing segmentation. On BraTS2020, the framework achieves an average Dice score of 0.870 with low 95th-percentile Hausdorff distances, providing a robust and interpretable approach for AI-assisted brain tumor analysis.

Keywords: Brain Tumor Segmentation, MRI scans, Deep Learning, Dual-Branch Attention Fusion Network, Transformer, RGAF



Day 2: Thursday, 22 October 2026

12:15 – 14:30 Online Technical Session II: Agentic AI, Security & Analytics

List of Papers

12:15 – 14:30 Online Technical Session II: Agentic AI, Security & Analytics

Zoom Meeting ID: 815 3886 0121; Meeting Passcode: aii-conf

Chair: **Dr Md Saef Ullah Miah**, American International University - Bangladesh, Bangladesh

Paper ID: 0005

Paper title: Agentic-DVC: Operationalizing Decision Efficiency for Autonomous Software Risk Mitigation via Multi-Agent Orchestration

Authors: Sadman Sakib, Aritri Roy Priota, Hossain Mohammad Sami, Abhijit Bhowmik

Presenter: *Sadman Sakib*

Paper ID: 0013

Paper title: Usage and Perceptions of Generative AI in Learning among University Students in Bangladesh

Authors: K. M. Tahsin Kabir, Koushik Biswas Arko, Arizit Chaki Artha, Md. Fahim Kabir Chowdhury, Md. Mortuza Ahmmed, Md. Ashraful Babu, M. Mostafizur Rahman

Presenter: *K. M. Tahsin Kabir*

Paper ID: 0030

Paper title: Disaster Classification and Progression Detection from Social Media Data Using Deep Learning

Authors: Md Saimul Haque Shanto, Suzad Mohammad, Ibna Masud Rana Parvej, Manzur Kabir Ayon, Sadia Sharmin

Presenter: *Md Saimul Haque Shanto*

Paper ID: 0033

Paper title: An Explainable Hybrid Machine Learning Framework for Smart Irrigation Prediction and Anomaly-Aware Decision Support

Authors: MD Ashfi Ar Raihan, Sabrina Islam Tesa, Antu Chakrabarty, Mhamud Hasan Kwoshick, Tawfiqul Hasan, Sultanul Arifeen Hamim, Md. Mazid-Ul-Haque, Abhijit Bhowmik, Md Manirul Islam

Presenter: *Md Ashfi Ar Raihan*

Paper ID: 0021

Paper title: Human Interpretive Presence in AI-Assisted Qualitative Research: A Reproducible Workflow for Social and Emotional Learning (SEL)

Authors: Anat Korem, Sigal Chen

Presenter: *Anat Korem*

Paper ID: 0036

Paper title: An explainable ensemble deep learning model for multiclass skin disease classification using dermoscopic images

Authors: Ekramul Hasib, Touhidul Islam Masfi, S M Abdullah Shafi, Abhijit Bhowmik, Md. Saef Ullah Miah, S. A. M. Manzur H. Khan

Presenter: *Ekramul Hasib*

Paper ID: 0039

Paper title: Improving Underwater Marine Species Classification through Imbalance-Aware Learning and Cross-Dataset Evaluation

Authors: Md Sazzad Hossain, Mosa. Farjana Eti, Md Saimul Haque Shanto, Suzad Mohammad

Presenter: *Mosa. Farjana Eti*

Paper ID: 0040

Paper title: Incongruity-Aware Sarcasm Detection

Authors: Obydullah Sayed, M. Showaib Rahman Tanveer, M. Samirul Islam, Saiful Azad, Sudip Ghoshal, Shankha Shubhra Sarkar, Tanpia Tasnim

Presenter: *Obydullah Sayed*

Paper ID: 0041

Paper title: Calcification-Informed BI-RADS Categorization of Mammograms: A Combined Detection and Classification Approach

Authors: Debapriya Chakraborty, Uddalak Mukhopadhyay, Sarbani Palit, Ujjwal Bhattacharya

Presenter: *Debapriya Chakraborty and Sarbani Palit*

Paper ID 0005

Agentic-DVC: Operationalizing Decision Efficiency for Autonomous Software Risk Mitigation via Multi-Agent Orchestration

Sadman Sakib, Aritri Roy Priota, Hossain Mohammad Sami, Abhijit Bhowmik

American International University-Bangladesh (AIUB), Dhaka, Bangladesh

Abstract

Software development in resource-constrained environments often encounters structural risks associated with unmet requirements and unfamiliar technologies, leading to project failures. These risks are conventionally countered by human-centric review boards, which create verification bottlenecks and significantly reduce Continuous Integration (CI) pipeline performance. This research paper presents an architectural multi-agent framework called Agentic-DVC which is characterized by a formal nature to help emulate and implement the key risk measures of the old Dynamic Verifier Core (DVC) and New Unproven Technology (NUT) through the use of Large Language Models (LLMs). The framework analyzes local telemetry to compute a normalized net decision efficiency score (EDi), mathematically balancing functional alignment and structural risk against API costs and labor overhead. Through a deterministic routing algorithm called the Deviation Gate, the system leverages EDi to autonomously merge pull requests, issue refactoring suggestions, or launch an Autonomous NUT agent to synthesize documentation for unfamiliar APIs. The theoretical feasibility of this routing logic is established using a localized fault-injection simulation matrix. A deterministic fail-safe protocol is implemented to halt any autonomous process and notify human reviewers in case of failure to meet the multi-agent consensus threshold.

Keywords: Software Risk Management, Multi-Agent Orchestration, Continuous Integration, Dynamic Verifier Core, Training team for NUT, Risk impact areas, IT Industry, Identify risk

Paper ID 0013

Usage and Perceptions of Generative AI in Learning among University Students in Bangladesh

K. M. Tahsin Kabir¹, Koushik Biswas Arko², Arizit Chaki Artha², Md. Fahim Kabir Chowdhury³, Md. Mortuza Ahmmed², Md. Ashraful Babu⁴, M. Mostafizur Rahman²

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³ Bangladesh Army International University of Science and Technology (BAIUST), Comilla, Bangladesh

⁴ Independent University, Bangladesh, Dhaka-1229, Bangladesh

Abstract

This study investigates the reported use and perceptions of Generative Artificial Intelligence (GenAI) among students enrolled at selected universities in Bangladesh. A cross-sectional quantitative survey was conducted during the Spring 2025–26 academic session using an online questionnaire administered through Google Forms. A total of 452 undergraduate and graduate students from different academic disciplines participated in the study. Participants responded to Likert-type questionnaire items concerning GenAI usage, perceived benefits, limitations, academic integration, and potential over-reliance. Descriptive statistics, Pearson correlation analysis, and exploratory stepwise multiple linear regression were used to examine associations among the questionnaire indicators. Participants generally reported positive perceptions of GenAI, particularly regarding time saving, perceived digital competence, accessibility, and personalized feedback, while also recognizing concerns related to inaccuracy, bias, and excessive reliance. Exploratory analyses showed that self-reported reliance was more strongly associated with several academic- and perception-related indicators than with the included demographic indicator. Given the cross-sectional, voluntary, and self-report nature of the study, the observed relationships are interpreted as associations rather than causal effects or objectively measured learning outcomes.

Keywords: Generative AI, higher education, student perception, learning support, Bangladesh

Paper ID 0030

Disaster Classification and Progression Detection from Social Media Data Using Deep Learning

Md Saimul Haque Shanto¹, Suzad Mohammad^{1,2}, Ibna Masud Rana Parvej¹, Manzur Kabir Ayon¹, Sadia Sharmin¹

¹ Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology, Bangladesh

² Department of Computer Science and Engineering, International University of Business Agriculture and Technology, Bangladesh

Abstract

In today's world, social media platforms such as Twitter, Facebook have become vital sources of real-time information during disasters, providing us useful data that can help save lives and reduce damage if properly analyzed. Our study examines how to utilize this data to categorize disaster types and monitor their progression stages. We have worked with a combined dataset (CrisisLex T6, CrisisLex T26, and CrisisNLP), which includes over 42,000 tweets covering 13 types of natural and human-made disasters which are split into three stages: early signs, peak impact, and recovery. We have prepared the data by cleaning the raw text data (tweets or posts) removing URLs, mentions, and hashtags, and then balanced the dataset using oversampling and undersampling to handle uneven class distributions. Our approach uses word embeddings as the foundation, feeding them into a Bidirectional Long Short-Term Memory (Bidirectional LSTM) model to capture the context of tweets from both directions. We dropped out some layers to avoid overfitting and finished with dense layers and also a softmax function for making the best predictions. We ran the experiments on Google Colab with 30 epochs, a learning rate of 0.001, a batch size of 64, and the ADAM optimizer. We achieved impressive results with 99% accuracy, 99% precision, 99% recall, and 99% F1-score for classifying disaster types, and 96% accuracy, 95% precision, 87% recall, and 91% F1-score for tracking progression stages. These outcomes beat the previous papers' results by increasing up to 5% in F1-score, showing that our method can significantly improve the detection of disasters.

Keywords: CrisisLex T6 CrisisLex T26, CrisisNLP, Oversampling, Undersampling, Bidirectional Long Short-Term Memory (Bidirectional LSTM), ADAM optimizer

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Paper ID 0033

An Explainable Hybrid Machine Learning Framework for Smart Irrigation Prediction and Anomaly-Aware Decision Support

MD Ashfi Ar Raihan, Sabrina Islam Tesa, Antu Chakrabarty, Mhamud Hasan Kwoshick, Tawfiqul Hasan, Sultanul Arifeen Hamim, Md. Mazid-UI-Haque, Abhijit Bhowmik, Md Manirul Islam

Department of Computer Science, American International University-Bangladesh (AIUB), 408/1, Kuratoli, Khilkhet, Dhaka-1229, Bangladesh

Abstract

Efficient irrigation management is important for sustainable agriculture because over-irrigation and under-irrigation can reduce water efficiency, soil quality, and crop productivity. Conventional irrigation practices often depend on fixed schedules, manual observation, or simple threshold rules, which are not sufficiently adaptive to changing soil and weather conditions. This study proposes an explainable hybrid machine learning framework for smart irrigation prediction and anomaly-aware decision support. A public smart farming sensor dataset was used, and selected soil, weather, crop, and irrigation-related features were considered. Since the dataset did not contain direct irrigation decision or failure labels, irrigation need and anomaly labels were constructed using soil moisture, temperature, humidity, and soil moisture change. SMOTE was applied to handle class imbalance, while CTGAN was used to evaluate the effect of synthetic tabular data augmentation through a CTGAN versus non-CTGAN comparison. Multiple machine learning classifiers were evaluated using accuracy, F1-score, ROC-AUC, and cross-validation. The CTGAN-enhanced Random Forest model achieved 0.9989 accuracy and 0.9898 F1-score for irrigation need prediction, while CatBoost achieved 0.9540 accuracy and 0.9541 F1-score for anomaly-aware warning. However, because the irrigation target was constructed from variables that were also available to the classifier, the near-perfect irrigation result primarily indicates successful recovery of the predefined pseudo-labeling rules rather than independently validated agronomic prediction. SHAP and LIME were used for explanation, and the final recommendation engine converted model outputs into practical irrigation actions.

Keywords: Smart irrigation, machine learning, anomaly detection, CTGAN, SMOTE, SHAP, LIME, decision support

Paper ID 0021

Human Interpretive Presence in AI-Assisted Qualitative Research: A Reproducible Workflow for Social and Emotional Learning (SEL)

*Anat Korem^{1,2}, Sigal Chen¹*¹ *Levinsky-Wingate Academic College, 15 Shoshana Persitz St., Tel Aviv 69387, Israel*² *The Hebrew University of Jerusalem*

Abstract

AI and computational informatics are reshaping qualitative research, giving scholars new tools for automated coding, theme extraction, and large-scale text analysis. However, applying these tools to a domain like social and emotional learning (SEL), where meaning is bound up with belonging, vulnerability, and relationship, carries a risk: Qualitative inquiry gets flattened into mechanical data classification. This paper introduces the principle of human interpretive presence (PHIP), a conceptual and operational framework for AI-assisted qualitative informatics. Drawing on educational epistemology and the psychology of socio-emotional experience, PHIP treats interpretation as an active, embodied, ethical encounter rather than as probabilistic pattern recognition. Case analyses involving subtext, irony, and conversational silence illustrate where standalone algorithmic text processing tends to fail when the material carries socio-emotional weight. In keeping with AII 2026's focus on reproducibility, we translate PHIP into operational guidance. Our human-in-the-loop model is built on three pillars: contextual resonance, affective reflexivity, and ethical hermeneutics. The model also incorporates a reflexive audit trail for logging the interactions, prompts, and corrections that pass between researcher and system. Thus, the result repositions AI as an assistive collaborator rather than an independent analyst, giving the field a transparent, reproducible workflow that retains the interpretive depth that human narratives require.

Keywords: Qualitative informatics, principle of human interpretive presence (PHIP), social and emotional learning (SEL), methodological reproducibility

Paper ID 0036

An explainable ensemble deep learning model for multiclass skin disease classification using dermoscopic images

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Abstract

Skin disease continues to cause serious concern worldwide, largely because melanoma can turn fatal quickly once diagnosis is delayed. Sorting a lesion correctly among several possible disease categories, and doing so early, has a direct bearing on how efficient treatment can be and on how well care can be tailored to the individual patient. Here we compare five convolutional networks – ResNet18, EfficientNet-B0, DenseNet121, MobileNetV2, and a custom-designed CNN – trained and tested on the HAM10000 dermoscopic image set. Of these, EfficientNet-B0 turned out to be the strongest performer on its own, posting an accuracy of 0.8739, precision of 0.8734, recall of 0.8739, an F1-score of 0.8723, and an AUC of 0.9321. Building on that, we bring EfficientNet-B0 together with MobileNetV2 and ResNet18 inside a weighted soft-voting ensemble, with the goal of cutting down variance and getting a more dependable prediction; doing so lifted performance to 0.8992 accuracy, 0.9089 precision, 0.8992 recall, an 0.8964 F1-score, and a 0.9483 AUC. We also bring in two explainability tools, Grad-CAM++ and LIME, so that the regions of each lesion actually driving the model's decision can be seen rather than assumed, which helps make the whole pipeline more transparent. It is worth being upfront that these numbers, while encouraging, come from a single public benchmark, so the framework here is best treated as an early research prototype for decision support rather than a diagnostic tool ready for clinical use – testing on independent patient populations that reflect real demographic diversity still has to happen before that claim could be made.

Keywords: Skin Cancer, Deep Learning, EfficientNet-B0, Ensemble Learning, Explainable Artificial Intelligence (XAI), dermoscopic Images

Paper ID 0039

Improving Underwater Marine Species Classification through Imbalance-Aware Learning and Cross-Dataset Evaluation

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Abstract

Automated recognition of marine species from underwater imagery is an important tool for biodiversity monitoring, but training datasets are rarely balanced, and this imbalance is compounded by degraded visibility and inter-class similarity typical of underwater scenes. A model can therefore post high overall accuracy while failing on the classes that matter most, and strong performance on an internal test set does not guarantee reliable generalisation to independently collected images. This study presents a comprehensive evaluation of imbalance-aware classification on the 20-class AQUA20 dataset (8,171 images), comparing YOLO26 and ConvNeXt-Small under class balancing, Gentle Class-Balanced Focal Loss, high-resolution fine-tuning, test-time augmentation, and probability ensembling. The best balanced single model, a high-resolution ConvNeXt-Small trained with class-balanced focal loss, achieved 92.12% Top-1 accuracy and 88.17% Macro F1. On 9,738 shared-class images from a separately sourced external dataset, the frozen model retained meaningful discriminative ability without any adaptation, reaching 76.50% Top-1 and 75.28% Macro F1 — a noticeable drop that highlights the gap between within-dataset gains and cross-dataset generalisation. Overall, imbalance-aware fine-tuning improves within-dataset recognition, while robust generalisation to externally sourced marine imagery remains an open challenge.

Keywords: marine image classification; underwater species recognition; class imbalance; class-balanced focal loss; high-resolution fine-tuning; cross-dataset generalisation; external evaluation; explainable artificial intelligence

Paper ID 0040

Incongruity-Aware Sarcasm Detection

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Abstract

Sarcasm detection is difficult because intended meaning often contradicts literal wording, which misleads sentiment analysis and other NLP systems. Although transformer encoders such as RoBERTa capture context well, they can miss subtle contrastive cues. This paper proposes an incongruity-aware framework, IDL-RoBERTa, that injects an interpretable sentiment-contrast signal into a RoBERTa-based classifier. Using VADER, we compute sentence-level polarity and token-level polarity, derive an incongruity feature from their disagreement, and align it with the token sequence as an additional feature channel. IDL-RoBERTa is trained with a multi-task objective that combines sarcasm classification with auxiliary regression of sentence-level incongruity to encourage attention to contrast rather than surface lexical patterns. Model parameters are optimized using gradient-based learning (mini-batch gradient descent) with an AdamW optimizer and a warmup schedule, as configured in the final notebooks. Experiments on the News Headlines Sarcasm Dataset v2 and a Twitter sarcasm dataset show consistent improvements over classical CNN/LSTM baselines and a strong RoBERTa baseline in our recorded runs: headline test F1 rises from 0.8019 to 0.8966, and Twitter test F1 from 0.6541 to 0.7342. We also report back-translation ablations on Twitter to examine augmentation effects. Overall, the approach improves performance while preserving interpretability through an explicit, inspectable proxy for incongruity.

Keywords: Sarcasm Detection, Incongruity Theory, IDL-RoBERTa, Back Translation, Sentiment Analysis

Calcification-Informed BI-RADS Categorization of Mammograms: A Combined Detection and Classification Approach

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Abstract

Mammogram images are classified according to the Breast Imaging Reporting and Data System (BI-RADS) scale depending on the severity of the lesions present. A higher BI-RADS class essentially indicates a greater risk of malignancy. Calcification is one of the most familiar and vital lesions found in mammograms. For the purpose of classification, it is crucial to detect the calcifications present on the mammogram. In this work, we present a novel calcification detection and classification pipeline for BI-RADS classification of the entire mammogram image while considering all the calcifications present. We propose a strategy for detection of calcification(s) in a mammogram image followed by the classification of the image itself into one of the BI-RADS category. Here, we propose an object detection strategy based on YOLOv8, since we observed that YOLOv8 is capable of highlighting the spread of calcifications in an efficient way. Further, each individual image is classified based on the BI-RADS categories depending only on the presence and spread of the calcifications spotted in the detection phase. We achieved MAP of 79.70% for the calcification detection task and classification accuracy of 81.50% and a F1 Score of 77.80% with the attention-based module aiding the residual based network (ResNet50) on a curated set of images from the combination of two publicly available datasets. The method presented here, thus tries to get closer to the analysis process of a radiologist in the real world.

Keywords: Mammogram, Calcification, BI-RADS, Attention