6th International Conference on Artificial Intelligence and Machine Learning

October 26-27, 2026 | Paris, France

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SCIENTIFIC PROGRAM

International Conference

DAY-1 (OCTOBER 26, 2026)

09:30-10:00 **Registrations & Opening Remarks**

Keynote/Plenary Session (10:00-11:00)

10:00-10:30

Title: T-CPDL: A Temporal Causal Probabilistic Description Logic for Developing Logic-RAG Agent Systems

Prof. Hongqing (Harry) Yu, University of Derby, United Kingdom



10:30-11:00

Title: Risk of Microvascular Complications in Newly Diagnosed Type-2 Diabetes Patients in Dubai, UAE, Using Automated Machine Learning Prediction Models

Prof. Amar Hassan Khamis, Mohammed Bin Rashid University , United-Arab-Emirates

11:00-11:20 Networking Break + Group Photo

Technical Session-I (11:20-13:00)

11:20-11:45

Title: AI for Atmospheric Rivers Study

Prof. Yang Zhao, Ocean University of China, China



SCIENTIFIC PROGRAM

International Conference

Day 01
October 26, 2026

11:45-12:10

Title: Computer Vision-Based Concrete Crack Identification Using MobileNetV2 Neural Network and Adaptive Thresholding
Dr. Ahmed Ibrahim, University of Idaho, USA

12:10-12:35

Title: Multiobjective Hyper-heuristics in Action: Trends and Perspectives
Prof. Hugo Terashima-Marin, Tecnologico de Monterrey, Mexico

12:35-13:00

Title: Research on Fault Diagnosis of UAV Rotor Motor Bearings Based on WPT-CEEMD-CNN-LSTM
Prof. Gao Zhilong, Beijing University , China



Lunch @ Restaurant (13:00- 14:00)

Technical Session-II (14:00-17:35)

14:00-14:25

Title: Score Function-Based Selection of Critical Infrastructure of turbine location using Intuitionistic Fuzzy Soft Hypergraphs
Dr.K. K. Myithili, Vellalar College forWomen, India

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International Conference

Day 01
October 26, 2026

14:25-14:50



Title: NornirNet: A Deep Learning Framework to Distinguish Benign from Malignant Type II Endoleaks After Endovascular Aortic Aneurysm Repair Using Preoperative Imaging
Dr. Giorgio Prouse, Ente Ospedaliero Cantonale, Lugano, Switzerland



14:50-15:15

Title: Artificial Intelligence in Cervical Cytology
Prof. Piotr Religa, Karolinska Institutet, Sweden

15:15-15:40

Title: Defense against AI control of humans with brain implants
Dr. Philip R Kennedy, Neural Speech Inc., USA

15:40- 16:05

Title: Leveraging Artificial Intelligence(AI)in Multi-Cancer Early Detection (MCED) through CpG Methylation Decoding from Cell-Free DNA Bloodstream Biomarkers
Nisa Tabeer & Usman Ayub, Tabeer Genai-training.com Ai Research Scelor program

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International Conference

Day 01
October 26, 2026

Refreshment Break @ foyer (16:05-16:20)

16:20- 16:45

Title: Trustworthy and Resilient Federated Learning from Robust Aggregation to Blockchain-Backed Accountability
Prof. Samir Ouchani, CESI Lineact, France

16:45-17:10

Title: Prediction of cell migration potential on human breast cancer cells treated with Albizia lebbeck ethanolic extract using extreme machine learning
Prof. Huzaifa Umar, Near East University, Turkey

17:10-17:35

Title: Bridging Safety Guarantees and Adaptive Learning: An AI-Driven Robust Control Framework for Autonomous Vehicles
Abdelmalek ZAHAF, University M'Hamed Bougara Boumerdes, Algeria

Day 01 Concludes

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International Conference

DAY-2 (OCTOBER 27, 2026)

Technical Session - I

10:00-10:25

Title: Multimodal Behavioral Intelligence for Personalized Healthcare: Detecting Within-Person Change through Human-Centered AI
Sinan Chen, Kobe University, Japan



10:25-10:50

Title: The Global Lens: Revolutionizing Healthcare Diagnostics through Vision Transformers and Strategic Education
Dr. Nesrine Atitallah, Arab Open University, Saudi Arabia

10:50-11:15

Title: Performance of CAD4TB artificial intelligence technology in TB screening programmes among the adult population in South Africa and Lesotho
Miss. Nonhlanhla Nzimande, University of KwaZulu-Natal, South-Africa





11:15-11:40

Title: Covariance-Controlled Superposition Learning: An Explainable Neural Ensemble Framework for Robust Escherichia coli (E. coli) Prediction
Mfanasibili Nkonyane, University of KwaZulu-Natal, South-Africa

11:40-12:05

Title: Basketball Action Recognition Using Deep Feature Extraction, Multiple Classifiers and Crash-Tolerant Processing Under Constrained Data
Mr. Paul Aliga, Ambrosi Alli University, Nigeria

SCIENTIFIC PROGRAM

International Conference

Day 02
October 27, 2026

12:05-12:30

Title: Comparative Evaluation of RL and ORCA-Enhanced Swarm Navigation in Dynamic Environments
Mr. Samuel Abiodun Oyedotun, Edo State University Iyamho, Edo State, Nigeria

12:30-12:55



Title: Exploring potential circRNA biomarkers for cancers based on double-lineheterogeneous graph representation learning
Dr. Naomi Abara, NHS,Nanning, UK

12:55-13:20



Title: Ontology-Guided Relation Extraction from Financial Documents Using Fine-Tuned Large Language Models
Dr. Nader Bakir, Beirut Arab University, lebanon

13:20-13:45

Title: Clustering Inference
Dr. Pau Figuera, University of Deusto, Spain

13:45-14:10

Title: One Scene Does Not Fit All: Generative AI for Disorder-Specific Visual Habituation in Vestibular Rehabilitation
Şeyma Tuğba Öztürk, Istanbul Medipol University

14:10-14:35

Title: FAIDN: A Congestion-Aware Framework for Assured Intent-Driven Networking
Mr. Utpal Barman, Manager, IT, Charter Communications, Missouri, USA

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Day 02
October 27, 2026

Poster-1

Title: Cybersecurity AI Framework for the Proactive Prevention of Deepfake Generation from Social Media Profile Pictures and Health effects
Dr. Anum Ali, Lahore Leads University, Pakistan

Poster-2

Title: Edge-Device Vision for Pangasius Fingerling Length Measurement and Injection-Site Estimation
Mr. Phuc-Truong Nguyen, Can Tho University, Vietnam

Day-02 Concludes

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Hongqing Yu

University of Derby, Derby, United Kingdom

T-CPDL: A Temporal Causal Probabilistic Description Logic for Developing Logic-RAG Agent Systems

Large language models (LLMs) exhibit strong fluency in text generation but remain limited in structured reasoning tasks involving temporal constraints, causal dependencies, and probabilistic uncertainty, which are critical for reliable agentic systems. In this work, we propose Temporal Causal Probabilistic Description Logic (T-CPDL), a unified reasoning framework that extends classical Description Logic with temporal interval operators, explicit causal relations, and probabilistic annotations. We introduce two complementary variants: one leveraging Allen's interval algebra for qualitative temporal reasoning, and another incorporating timestamped causal assertions for fine-grained temporal–causal inference. Both variants share a consistent logical backbone, enabling integrated reasoning across temporal ordering, causal chains, and uncertainty-aware inference. We evaluate T-CPDL using a dual-track framework against general LLM-based extraction pipelines on real-world accident investigation reports. Results show that T-CPDL consistently outperforms unconstrained LLM baselines in structured reasoning quality, achieving higher assertion F1 (70.1% vs. 57.5%) and causal edge F1 (47.6% vs. 40.3%), while ensuring complete schema validity (100% vs. 0%) and near-perfect temporal ordering accuracy (99.7% vs. 90.3%). Importantly, while both approaches capture similar high-level causal structures, T-CPDL provides significantly richer concept coverage, more complete causal hypothesis extraction, and calibrated probabilistic reasoning grounded in explicit rules, rather than heuristic confidence expressions. These results demonstrate that T-CPDL does not merely improve accuracy but fundamentally enhances the depth, structure, and interpretability of reasoning compared to current agent-style LLM systems. This work establishes a principled logic-driven foundation for next-generation Logic-RAG frameworks, enabling more robust, explainable, and controllable reasoning in knowledge-intensive and safety-critical domains.

Keywords: Temporal Causal Reasoning, Probabilistic Description Logic, Larg Language Models (LLMs), Explainable AI (XAI) and Logic-Retrieval-Augmented Generation (Logic-RAG)

Biography

Associate Professor Hongqing Yu is an academic and researcher at the School of Computing, University of Derby, United Kingdom, where he serves as Programme Leader for three MSc programmes. His teaching expertise includes Data Science and Machine Learning, and he is an active researcher within the university's Data Science Research Centre.

Before joining the University of Derby, he worked as a Senior Lecturer in Data Science and Course Leader for the MSc Sensor and Smart Cities programme. He has participated in more than ten research projects supported primarily by Innovate UK, European research framework programmes, and regional SME development initiatives.

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Dr. Samir Ouchani, HDR
Research Director • CESI LINEACT, Aix-en-Provence, France •

Trustworthy and Resilient Federated Learning From Robust Aggregation to Blockchain-Backed Accountability

Machine learning increasingly depends on data that cannot leave its owner: patient records in hospitals, sensor streams in factories, and logs on edge devices. Federated Learning (FL) makes collaborative training possible without centralizing such data. Its openness, however, expands the attack surface to malicious participants, poisoned model updates, inference attacks, and compromised aggregation. Achieving trustworthiness and resilience in this setting requires engineering the entire learning pipeline, not merely tuning the learning algorithm.

This talk presents an engineering-centric perspective on trustworthy machine learning, in which federation is treated as a controlled component embedded within explicit threat models, architectural boundaries, and runtime supervision mechanisms. Three interdependent pillars structure the talk:

- Robustness. Byzantine-resilient and poisoning-aware aggregation that bounds the influence of malicious clients; hybrid multi-level similarity that separates honest heterogeneity from adversarial deviation; and optimized detection placement in Hierarchical FL that contains attacks as early as possible in the hierarchy.
- Privacy & Confidentiality. Differential privacy and secure aggregation that limit what any party, including the server, can learn from model updates; combined with anomaly-driven client selection that keeps privacy protections from blinding the federation to attackers and neutralizes free-rider behavior without sacrificing model utility.
- Explainability & Accountability. Runtime monitors and XAI-grounded supervision that explain why updates are accepted or rejected as training unfolds; and TH-CHAIN, a trust-aware hybrid consensus protocol for blockchain-enabled industrial cyber-physical systems, which records federation decisions as tamper-evident evidence that can be audited after the fact.

Case studies in smart healthcare and industrial cyber-physical systems show how these pillars cooperate at design time and at runtime, allowing FL deployments to tolerate faults, adversarial participants, and distribution shifts without loss of trust. The talk concludes with a vision of Trustworthy Federated AI Engineering, in which resilience, privacy, and accountability are systematically verified properties of AI systems rather than afterthoughts.

Keywords: federated learning; Byzantine robustness; differential privacy; secure aggregation; explainable AI; blockchain; industrial; cyber-physical systems

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Biography

Samir Ouchani is a Research Director at CESI LINEACT, Aix-en-Provence, France, where he leads research in applied security and resilient and safe systems. He received the Ph.D. degree in computer science from Concordia University, Montreal, QC, Canada, in 2013, and the Habilitation à Diriger des Recherches (HDR) from the Conservatoire National des Arts et Métiers (CNAM), Paris, France, in 2022. Since 2023, he has held the French national qualification for Full Professor positions (CNU Section 27).

His research develops methods for building AI-driven and cyber-physical systems that remain correct, robust, private, and verifiable under adversarial conditions. His contributions span resilient federated learning architectures; robust aggregation and client-selection mechanisms against poisoning and free-riding; runtime supervision and explainability for distributed AI; trust-aware blockchain consensus for industrial cyber-physical systems; formal verification with Event-B refinement and ProVerif; and AI-assisted engineering for autonomous system remediation.

He has authored or coauthored more than 200 peer-reviewed publications, supervised six defended Ph.D. theses, and coordinated more than 20 research and industrial projects. He regularly serves as Program or Track Chair for international conferences and as an expert evaluator for major funding agencies, and maintains an active collaboration network spanning more than 13 countries, including EPFL, SnT (University of Luxembourg), and Concordia University. His research interests include cybersecurity, trustworthy AI, and federated and collaborative learning.

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Yang Zhao

Ocean University of China,Qingdao, China

AI for Atmospheric Rivers Study

Accurate forecasting of atmospheric rivers (ARs) holds significance in preventing losses from extreme precipitation. However, traditional numerical weather prediction (NWP) models are computationally expensive and can be limited in accuracy due to inaccurate physical parameter settings. To overcome these limitations, we propose a deep learning (DL) model, called GAN-UNet, to forecast the AR occurrence, position, and intensity in East Asia. GAN-UNet can capture the complex nonlinear relationship between the inputs at thepast moment, including the integrated water vapor transport (IVT), zonal wind at 850 hPa (U850), andmeridional wind at 850 hPa (V850), and the forecast output (IVT, U850, or V850), whose results are comparable to NWP models. In addition, the average model by integrating the results generated by GAN-UNet and European Centre for Medium-Range Weather Forecasts(ECMWF) outperforms all the NWP models selected, demonstrating its potential to improve the performance of NWP through the DL method. With the thorough analysis, GAN-UNet is shown as an effective model to forecast ARs.

Keywords: Atmospheric Rivers, Deep Learning, Forecast, GAN-UNet

Biography

Yang Zhao is a Professor at the Ocean University of China. Selected as a First-Tier Talent of the ‘Youth Talent Program’ and a Young Expert of the Shandong ‘Taishan Scholars’ Program. Research Primarily focuses on extreme weather events and deep learning in meteorology. Over 30 SCI-indexed papers have been published as first or corresponding author in leading international journals, among which 8 papers have been selected as ESI Highly Cited Papers, 2 as Wiley Highly Cited Papers, 1 as an annual highlight article of Environmental Research LettersHe is the Editorial Board Member of the international journal Machine Learning: Earth.

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Ahmed Ibrahim

University of Idaho,Moscow, ID. USA

Computer Vision-Based Concrete Crack Identification Using MobileNetV2 Neural Network and Adaptive Thresholding

Concrete is widely used in different types of buildings and bridges; however, one of the major issues for concrete structures is crack formation and propagation during its service life. These cracks can potentially introduce harmful agents into concrete, resulting in a reduction in the overall lifespan of concrete structures. Traditional methods for crack detection primarily hinge on manual visual inspection, which relies on the experience and expertise of inspectors using tools such as magnifying glasses and microscopes. To address this issue, computer vision is one of the most innovative solutions for concrete cracking evaluation, and its application has been an area of research interest in the past few years. This study focuses on the utilization of the lightweight MobileNetV2 neural network for concrete crack detection. A dataset including 40,000 images was adopted and preprocessed using various thresholding techniques, of which adaptive thresholding was selected for developing the crack evaluation algorithm. While both the convolutional neural network (CNN) and MobileNetV2 indicated comparable accuracy levels in crack detection, the MobileNetV2 model's significantly smaller size makes it a more efficient selection for crack detection using mobile devices. In addition, an advanced algorithm was developed to detect cracks and evaluate crack widths in high-resolution images. The effectiveness and reliability of both the selected method and the developed algorithm were subsequently assessed through experimental validation.

Keywords: structural inspection; concrete crack evaluation; computer vision, adaptive thresholding

Biography

Ahmed Ibrahim, is a professor in the Department of Civil & Environmental Engineering at the University of Idaho. His research interests involve the behavior and design, large-scale experimental testing, field evaluation, and numerical analysis of bridge elements, and the performance and strengthening of reinforced and prestressed concrete bridges. His research interests involve 3D printing of concrete and timber, blast-resistant design, large-scale experimental testing and numerical analysis of bridge elements, and the performance and strengthening of reinforced and prestressed concrete and steel bridges. Ahmed is a fellow at the Center for Advanced Energy Studies (CAES), working on projects in collaboration with Idaho National Laboratory, and he is a fellow of the ASCE Structural Engineering Institute. His research has been funded by state DOTs such as ITD, MODOT, IDOT, and Caltrans and the National Science Foundation (NSF) in the USA. He authored and coauthored more than 120 articles published in journals and conference proceedings. Ibrahim is registered as a professional engineer in the states of Idaho and Washington, and his experience includes more than 24 years in industry and academia. He is the chair of the ACI-343-A Bridge Design committee and a committee member of the National TRB AFF-30 Concrete Bridges committee

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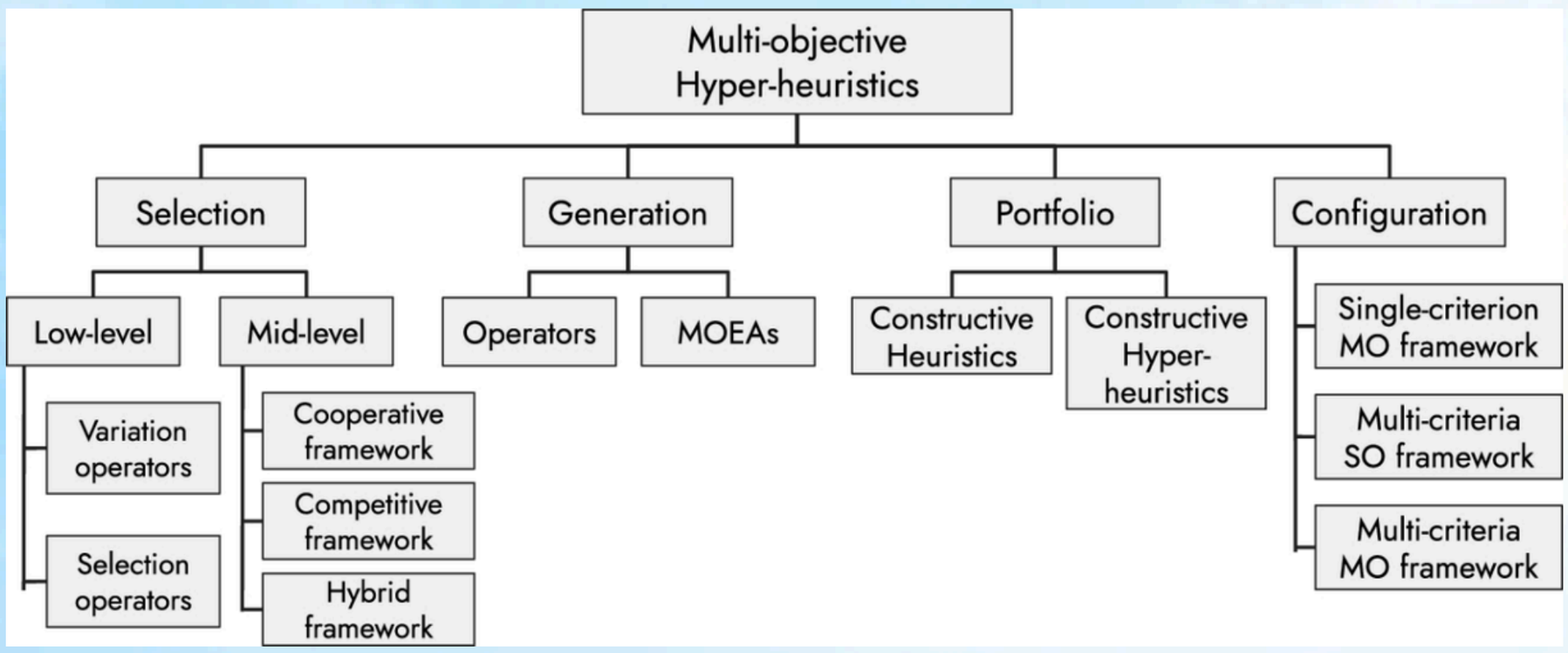
Dr. Hugo Terashima Marín

Tecnologico de Monterrey, School of Engineering and Sciences Campus Monterrey

Multiobjective Hyper-heuristics in Action: Trends and Perspectives

In recent years, research on the integration of evolutionary multiobjective optimization and hyper-heuristics (MOHHs) has significantly grown. In this talk, I will focus on the description of the two fields and their characteristics first, and then, I will explain the details on the combination, categorizing existing approaches into four main classes: selection, generation, portfolio, and configuration MOHHs. Each category is analyzed in terms of methodology, key contributions, and open challenges. The analysis reveals an imbalance in research focus, with selection and portfolio MOHHs receiving the most attention, followed by configuration MOHHs, while generation MOHHs remain largely unaddressed. Selection MOHHs are further divided by the hierarchy of components they control: low-level approaches (which typically manage evolutionary operators) require further study on move acceptance methods, whereas mid-level approaches need deeper exploration of selection strategies. Generation MOHHs, primarily based on genetic programming and grammatical evolution, lack investigation into alternative methodologies. Portfolio MOHHs, which produce a set of non-dominated constructive hyper-heuristics based on performance trade-offs, have been predominantly applied to combinatorial problems and exhibit limited diversity in the use of MOEAs as underlying optimizers. Configuration MOHHs, which focus on configuring algorithmic components for multiobjective optimizers, have largely relied on a single performance indicator, leaving room for multi-criteria performance approaches. At the end, I will talk about potential avenues of research and future perspectives.



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Xianyi Shang, Wei Li, Fang Yuan, Haifeng Zhi, **Zhilong Gao***, Min Guo, Bo Xin

Beijing University of Chemical Technology, China Academy of Aerospace Aerodynamics, Beijing, China

Research on Fault Diagnosis of UAV Rotor Motor Bearings Based on WPT-CEEMD-CNN-LSTM

To address the challenge of extracting adaptive fault features for UAV rotor motor bearings and meet the high accuracy requirements of bearing fault diagnosis, this paper proposes a neural network-based bearing fault diagnosis method using WPT-CEEMD-CNN-LSTM. Initially, the method applies multiple noise reduction processes to the original vibration signals and enhances their time-frequency resolution through Wavelet Packet Transform (WPT) and Complete Ensemble Empirical Mode Decomposition (CEEMD). This effectively removes noise and generates a high-quality dataset. Subsequently, a Convolutional Neural Network (CNN) is employed to automatically extract deep features, while a Long Short-Term Memory (LSTM) network is used for time-series modeling, thereby constructing an accurate rotor motor bearing fault diagnosis model. The experimental results demonstrate that the fault diagnosis accuracy of this method reaches 95.33%, which is significantly higher than that of traditional CNN (85%), LSTM (51.33%), and the CEEMD-CNN-LSTM model with single-signal noise reduction (77.33%). This method also exhibits stronger fault identification and generalization capabilities. This study confirms the effectiveness of combining WPT-CEEMD with CNN-LSTM deep learning techniques for UAV bearing fault diagnosis, providing a high-precision and stable diagnostic solution for UAV health monitoring.

Keywords: WPT-CEEMD-CNN-LSTM model; Bearing; Fault Diagnosis; UAV; Rotor Motor

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Francesco Andreoli 1,†, Fabio Mattiussi 2,†, Elias Wasseh 3, Andrea Leoncini 2, Ludovica Ettorre 1, Jacopo Galafassi 1, Maria Antonella Ruffino 2, Luca Giovannacci 1, Alessandro Robaldo 1,† **Giorgio Prouse 1,*†**

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NornirNet: A Deep Learning Framework to Distinguish Benign from Malignant Type II Endoleaks After Endovascular Aortic Aneurysm Repair Using Preoperative Imaging

Research Question
Can deep learning applied directly to preoperative computed tomography angiography (CTA) accurately predict the occurrence and severity of type II endoleak (T2EL) prior to endovascular abdominal aortic aneurysm repair (EVAR)?

Background
Type II endoleak is the most common complication following EVAR. Despite its prevalence, identifying patients at risk of developing clinically significant T2EL before treatment remains an unresolved challenge. In this study, T2EL was classified as malignant when associated with aneurysm sac enlargement of ⩾5 mm and benign when no significant enlargement occurred.

Purpose
This study evaluated whether deep learning applied directly to preoperative CTA can predict both the occurrence and severity of T2EL, supporting individualized treatment planning.

Methods
We developed NornirNet, an end-to-end three-dimensional convolutional neural network (3D CNN) that analyzes volumetric CTA images without manual segmentation or handcrafted radiomic features. A retrospective cohort of 277 patients who underwent standard EVAR between 2010 and 2023 was used for model development and evaluation. Performance was assessed using accuracy, precision, recall, F1-score, and the area under the receiver operating characteristic curve (AUC).

Results
NornirNet achieved an overall accuracy of 76.7%, a macro-averaged F1-score of 0.77, and a macro-AUC of 0.93. Class-specific AUCs were 0.93, 0.91, and 0.96 for patients without T2EL, benign T2EL, and malignant T2EL, respectively.

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Conclusion

These findings demonstrate the potential of end-to-end, AI-based computer vision to extract predictive imaging biomarkers directly from routine CTA, supporting personalized risk stratification and decision-making before EVAR. We are now conducting the next phase: a multicenter study across approximately 20 vascular centers, aiming to refine NornirNet on a larger, more heterogeneous dataset and perform rigorous external validation to establish its robustness, generalizability, and readiness for clinical deployment as an AI-driven decision-support tool.

Keywords: Deep Learning; Aortic Aneurysm; EVAR; Type II Endoleak; Healthcare AI; risk prediction

Biography

Dr. Giorgio Prouse is a Senior Staff Vascular Surgeon at the Division of Vascular Surgery and Angiology, Ente Ospedaliero Cantonale (EOC), Switzerland, and Head of the Vascular Surgery Unit at Ospedale Regionale di Bellinzona. He is a Faculty Member of the European Society for Vascular Surgery and Vascular International and founded the Vascular Research Unit at EOC in 2024. His research focuses on healthcare applied artificial intelligence, complex aortic procedures, computational haemodynamic studies, with particular interest in developing deep learning models and computational tools to support personalized clinical decision-making.

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Piotr Religa
Karolinska Institutet, Stockholm, Sweden

Artificial Intelligence in Cervical Cytology

Cervical cancer remains the fourth most frequently diagnosed cancer in women, causing approximately 600,000 new cases and over 300,000 deaths annually, with the heaviest burden in low- and middle-income countries. The question this work addresses is whether artificial intelligence can close the widening gap between screening demand and a shrinking cytology workforce. Manual cytology is labour-intensive, subject to intra- and inter-observer variability, and limited in sensitivity, while HPV testing has become the preferred primary screening test, repositioning cytology as a triage tool. We conducted a narrative review of PubMed, Scopus and Web of Science covering automated and assisted slide screening, liquid-based cytology, ASC-US triage, triage of HPV-positive women, and colposcopy support, and we relate those findings to deployment experience with the ScanAI Digital Pathology Platform (Scanome Ltd., Warsaw, Poland). Reported accuracy for distinguishing normal from abnormal preparations ranges from 80% to 100%; AI-assisted reading detected 92.6% of CIN2 and 96.1% of CIN3+ lesions with sensitivity equivalent to skilled cytologists and higher specificity; deep-learning triage of ASC-US outperformed hrHPV testing in both sensitivity (92.9% versus 89.3%) and specificity (49.7% versus 34.3%); dual-stain models reached 88.1% sensitivity for CIN3+ while cutting colposcopy referrals from 60.1% to 41.9%; and one system reviewed slides up to 380 times faster than a human reader. ScanAI operationalises exactly this evidence, ranking detected dysplastic cells by probability in its viewer, prioritising high-risk cases, maintaining audit trails, and integrating with existing LIS and scanner workflows. Evidence remains heterogeneous and prospectively under-validated; AI should therefore augment, not replace, human expertise.

Keywords: writing, template, sixth,edition, self-discipline, good

Biography

Prof. Piotr Religa, MD, PhD, is a physician, pathologist, and researcher affiliated with the Medical University of Warsaw and Karolinska Institutet in Stockholm. His work focuses on molecular pathology, cancer diagnostics, and the application of artificial intelligence in cytology. He is a co-founder of Scanome, a company developing ScanAI, an AI-powered system for automated cytological diagnostics. Prof. Religa has authored more than 80 scientific publications, cited over 5,000 times, and serves as principal investigator in several international research projects. An accomplished academic lecturer, he has received numerous scientific awards in Poland and Sweden and has been an ERC expert and member of the International Academy of Cytology.

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Dr. Yasmeen Usman1, Dr. Mian Khurram Hanif2, **Nisa Irshad3,** Tabeer Ali4, Laiba Ahmed5, Dr. Usman Ayub6, Mohammad Irshad7, Mahnoor8, Javaria Ishfaq9, Muhammad Aayan10

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6Anesthesia and pain management/Researcher - AI Research Scholar Program, USA
7Researcher - AI Research Scholar Program, USA
8Researcher - AI Research Scholar Program, USA
9Researcher - AI Research Scholar Program, USA
10Researcher - AI Research Scholar Program, USA

Leveraging Artificial Intelligence(AI) in Multi-Cancer Early Detection (MCED) through CpG Methylation Decoding from Cell-Free DNA Bloodstream Biomarkers

Multi-cancer early detection (MCED) using circulating cell-free DNA (cfDNA) represents one of the most challenging and consequential frontiers in oncology. Tumor-derived cfDNA (cfDNA) constitutes as little as 0.01–0.1% of total cfDNA in early-stage malignancies, demanding ultra-high signal discrimination capabilities.This research paper examines how Artificial Intelligence (AI) transformer-based foundation models originally developed for natural language processing (NLP), are being re-purposed to decode CpG methylation signatures, fragmentomics patterns, and mutational data from bloodstream cfDNA for pan-cancer early detection.We present a structured literature synthesis, a proposed multi-modal AI research model, and directional hypotheses linking LLM architecture choices to MCED performance outcomes. Foundation genomic models (DNABERT, HyenaDNA, Nucleotide Transformer) achieve AUC-ROC values of 0.93–0.96 on cfDNA cancer classification; clinical platforms (Grail Galleri, Guardant Shield) demonstrate >99% specificity across 50+ cancer types, though various stages. sensitivity remains 20–40%. Transformed Based foundation models' self-attention mechanisms are uniquely suited to capturing long-range CpG dependency structures that Machine Learning (ML) cannot. Multi-modal fusion with Bayesian calibration is the most promising pathway toward clinically deployable MCED screening.

Keywords: MCED, cfDNA, ctDNA, CpG methylation, LLM, DNABERT, HyenaDNA, Transformer, Liquid Biopsy, Multi-Cancer Detection, AI oncology, Fragmentomics, Tissue of Origin(TO).

Biography

Nisa Irshad is a researcher affiliated with the AI Research Scholar Program at genai-training.com and Half Hollow Hills School District, New York, USA. Her research interests include artificial intelligence and emerging AI technologies. Through her academic and research activities, she is engaged in exploring innovative applications of AI and contributing to the advancement of knowledge in this rapidly evolving field.

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Keywords: MCED, cfDNA, ctDNA, CpG methylation, LLM, DNABERT, HyenaDNA, Transformer, Liquid Biopsy, Multi-Cancer Detection, AI oncology, Fragmentomics, Tissue of Origin(TO).

Biography

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UAE-Dubai

Appraisal of Clinical Explanatory Variables in Subtyping of Type 2 Diabetes Using Machine Learning Models

Background
Clustering type 2 diabetes (T2D) remains a challenge due to its clinical heterogeneity and multifactorial nature. We aimed to evaluate the validity and robustness of the clinical variables in defining T2D subtypes using a discovery-to-prediction design.

Methods
Five explanatory clinical aetiology variables (fasting serum insulin, fasting blood glucose, body mass index, age at diagnosis, and HbA1c) were assessed for clustering T2D subtypes using two independent patient datasets. Clustering was performed using the IBM-Modeler Auto-Cluster. The resulting cluster validity was tested by multinomial logistic regression. The validity of the variables for direct unsupervised clustering was compared with machine learning (ML) predictive models.

Results
Five distinct subtypes were consistently identified: severe insulin-resistant diabetes (SIRD), severe insulin-deficient diabetes (SIDD), mild obesity-related diabetes (MOD), mild age-related diabetes (MARD), and mild early-onset diabetes (MEOD). Using all five variables yielded the highest concordance between clustering methods. Concordance was strongest for SIRD and SIDD, reflecting their distinct clinical signatures in contrast to that in MARD, MOD and MEOD.

Conclusions
These findings support the robustness of clinically defined T2D subtypes and demonstrate the value of probabilistic clustering combined with ML for advancing precision diabetes care.

Keywords: artificial intelligence; type 2 diabetes; subtyping; aetiology; logistic regression

Biography
Prof. Amar Hassan Khamis is a distinguished academic and Professor of Biostatistics at Mohammed Bin Rashid University of Medicine and Health Sciences in Dubai, United Arab Emirates. With expertise in biostatistics, he contributes to the advancement of medical and health sciences through statistical methodologies, research collaboration, and academic engagement.

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Sinan Chen

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Multimodal Behavioral Intelligence for Personalized Healthcare: Detecting Within-Person Change through Human-Centered AI

Population-level artificial intelligence models have shown considerable potential for healthcare assessment, but they often overlook an important source of clinically meaningful information: how an individual changes over time. This talk presents a human-centered research perspective on multimodal behavioral intelligence for personalized healthcare, with particular emphasis on detecting subtle within-person changes from everyday motor and behavioral signals. The approach integrates computer vision, multimodal sensing, machine learning, and longitudinal modeling to characterize functional behaviors such as gait, sit-to-stand movement, hand and finger motion, facial dynamics, and activities observed in home and healthcare environments. Rather than relying only on population-based classification, the framework emphasizes personalized baselines, temporal variation, multimodal complementarity, and uncertainty-aware interpretation. Representative studies demonstrate how vision-based and ambient sensing can quantify behavioral characteristics while reducing the burden of conventional manual assessment. These observations also highlight practical challenges including individual variability, sensor reliability, privacy, missing modalities, and the translation of computational measures into interpretable digital biomarkers. The talk will discuss how multimodal behavioral sensing can evolve from one-time recognition toward continuous assessment of individual change, and how such technologies may support personalized functional assessment, early identification of meaningful behavioral changes, and future closed-loop healthcare support.

Keywords: Multimodal sensing; Behavioral intelligence; Digital biomarkers; Human-centered AI

Biography

Sinan Chen received the M.S. degree in System Informatics and the Ph.D. degree in Computational Science from Kobe University, Japan, in 2019 and 2021, respectively. He was a JSPS Postdoctoral Research Fellow at Kobe University in 2022 and is currently an Assistant Professor at the Center for Mathematical and Data Sciences, Kobe University. His research focuses on multimodal intelligent sensing, computer vision, machine learning, digital health, edge AI, and human-centered cyber-physical systems, with particular interests in reliable behavioral sensing, personalized functional assessment, and digital biomarkers for real-world healthcare applications.

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Nesrine Atitallah

Faculty of Computer Studies, Arab Open University, Madinah, Saudi Arabia

The Global Lens: Revolutionizing Healthcare Diagnostics through Vision Transformers and Strategic Education

As Artificial Intelligence enters a new era of clinical integration, the transition from local feature extraction to global contextual understanding is redefining medical diagnostics. While Convolutional Neural Networks (CNNs) have long been the gold standard, the emergence of Vision Transformers (ViTs) and Self-Attention mechanisms has unlocked a "Global Lens" capable of identifying long-range spatial dependencies that traditional architectures often overlook.

In this keynote, Dr. Nesrine Atitallah explores the transformative impact of ViTs across high-stakes healthcare sectors, specifically focusing on breakthroughs in Diabetic Retinopathy and complex medical imaging. By moving beyond pixel-level analysis to sequence-based patch processing, ViTs allow for a holistic interpretation of medical data, mirroring the comprehensive approach of a senior clinician.

However, the "Next Era of AI" demands more than technical precision; it requires Responsibility. Dr. Atitallah addresses the critical "Black Box" challenge by demonstrating how ViT attention maps provide built-in explainability for doctors. Furthermore, she argues that real-world impact is only sustainable through Educational Governance. Drawing from her expertise in Quality Assurance (QAA), she presents a framework for integrating AI auditing into medical and engineering curricula. The session concludes with a vision for a future where high-performance architectures and rigorous academic standards work in symmetry to ensure patient safety and technological trust.

Keywords: Vision Transformers (ViTs), Self-Attention, Healthcare Informatics, Diabetic Retinopathy, Explainable AI (XAI), Academic Quality Assurance, Medical Education

Biography

Dr. Nesrine Atitallah is a distinguished academic and researcher currently serving as the head of the department at the Faculty of Computer Studies at the Arab Open University (AOU), Saudi Arabia, based at the Madinah campus. Her expertise lies at the intersection of Communication Engineering, Artificial Intelligence, and the Internet of Things (IoT).

Dr. Atitallah is an active researcher currently spearheading projects in deep learning and computer vision in Medical and Agricultural AI. She is also a seasoned peer reviewer for several international academic journals and conferences, contributing to the rigorous standards of the global scientific community.

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Performance of CAD4TB artificial intelligence technology in TB screening programmes among the adult population in South Africa and Lesotho

There is growing evidence of the performance accuracy and potential impact of Computer-Aided Diagnosis (CAD) products in TB-burdened settings. It remains unclear, however, which factors of populations and settings can affect CAD performance. We aimed to investigate the parameters affecting the performance accuracy of the two latest versions of CAD4TB in TB screening programmes in South Africa and Lesotho. We included participants recruited for the Lesotho National Prevalence Survey and the TB TRIAGE + ACCURACY studies, who underwent digital chest radiography and microbiological reference testing for TB. In total, 6,524 chest images were included in the analysis: 288 cases and 6,236 controls. CAD4TB versions 6 and 7 interpreted the X-ray images, and the performance of both versions was investigated. Threshold analyses were performed, as well as subgroup analyses, including age, X-ray hardware and HIV status. CAD4TB v7 showed overall improved performance accuracy compared to v6 ($p < 0.01$). The area under the ROC curve was 0.833 (95% CI 0.808–0.859) for v6 and 0.865 (95% CI 0.842–0.889) for v7. At 90% sensitivity, v7 showed a higher specificity of 65% compared to the 54% achieved by v6. Both versions showed lower performance in the older age group (⩾60 years) and individuals with a previous history of TB. The threshold required to achieve the same sensitivity or specificity varies notably across the two versions. CAD4TB performed well as a TB screening tool; however, factors such as software version, age, TB history and X-ray hardware should be considered in threshold determination and performance evaluation.

Keywords: CAD4TB, Artificial intelligence, TB screening, chest X-ray, Algorithm

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Biography

Nonhlanhla Nzimande is an independent public health researcher and healthcare professional. She holds a Master of Public Health (MPH) with a major in epidemiology. She has over 15 years of combined experience in clinical radiography, public health, and community-based research.

Her work focuses on leveraging advances in radiographic technology to improve access to care and health outcomes in resource-constrained settings. Her recent publication examined how technology, particularly artificial intelligence, can support remote TB screening programmes in high-burden, resource-limited countries like South Africa.
Outside of her professional work, she is passionate about empowering youth and women, especially through academic development.

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Mfanasibili Nkonyane, Professor Tom Walingo

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Covariance-Controlled Superposition Learning: An Explainable Neural Ensemble Framework for Robust Escherichia coli (E. coli) Prediction

Microbial contamination of surface water remains a major public health concern, requiring rapid and reliable prediction techniques to support operational decision-making. Although machine learning has demonstrated considerable potential for predicting Escherichia coli (E. coli) concentrations using routinely monitored physicochemical variables, conventional neural networks often suffer from high prediction variance, sensitivity to parameter initialization, and reduced robustness under changing conditions. This paper proposes a Covariance-Controlled Superposition Learning Feed-Forward Neural Network (CCSL-FFNN), a novel neural ensemble framework that explicitly incorporates residual covariance into Superposition Learning to reduce correlated prediction errors while preserving ensemble diversity. The proposed approach was evaluated using operational water quality datasets collected from the Midmar Water Works Raw Water System and Midmar Dam Integrated monitoring programmes. Four predictive models were investigated, namely the benchmark Extra Trees Regressor, a conventional Feed-Forward Neural Network (FFNN), the original Superposition Learning Feed-Forward Neural Network (SL-FFNN), and the proposed CCSL-FFNN. The benchmark Extra Trees Regressor achieved the highest predictive performance, obtaining an RMSE of 1.0812 and MAE of 0.8662 during chronological validation. Among the neural-network architectures, the proposed CCSL-FFNN consistently achieved the strongest performance, reducing RMSE and MAE by 19.2% and 15.6%, respectively, compared with the conventional FFNN during within-domain testing. Under RAW-to-Integrated transfer learning, CCSL-FFNN reduced RMSE and MAE by 67.7% and 71.5%, respectively, while providing consistent improvements over the original Superposition Learning model. The study demonstrates that covariance-aware neural aggregation provides a statistically grounded improvement over conventional Superposition Learning and establishes a foundation for uncertainty-aware, explainable, and transferable environmental artificial intelligence. The proposed framework has significant potential for future integration with IoT-enabled water-quality monitoring, cloud SCADA systems, Digital Twins, and intelligent Water 4.0 decision-support platforms.

Keywords: E. coli, Superposition Learning, Covariance-Controlled Ensemble, Extra Trees Regressor, Water 4.0.

Biography

Mfanasibili Stanley Nkonyane received the Bachelor of Technology and Master of Engineering degrees in Electrical Engineering from the Durban University of Technology and is currently pursuing the Ph.D. degree at the University of KwaZulu-Natal. He is the Executive: Assets and Operations at Dube TradePort Corporation. He serves on IEEE Standards Committees, the SABS Power Electronics Committee, and is a Senior Member of the South African Institute of Electrical Engineers (SAIEE). He co-authored Data-Driven Machine Learning Models for E. coli Concentration Prediction and Designing a New Artificial Neural Network for Harmful Algal Blooms Prediction: A Case Study of Midmar Dam. His research interests include artificial intelligence, machine learning, Industrial IoT, digital twins, and intelligent water systems.

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Basketball Action Recognition Using Deep Feature Extraction, Multiple Classifiers and Crash-Tolerant Processing Under Constrained Data

Many automated basketball action recognition systems that integrate deep learning and classical machine learning approaches primarily emphasize recognition accuracy and are often evaluated using large-scale video datasets. Besides, practical basketball analysts are required to study opponents' tactics, identify rare actions or analyze performance patterns when only limited video samples are available to them. In real-world scenarios, basketball datasets can contain few samples per action category, rare events and significant class imbalance. These situations inevitably create challenges for reliable model training and evaluation. Furthermore, many video recognition frameworks remain computationally intensive and vulnerable to processing interruptions and these eventually lead to inefficient repeated feature extraction after unexpected failures. This study uses deep feature extraction, multiple classification strategies and crash-tolerant processing mechanisms to explore limited-data and imbalanced-class conditions in basketball action recognition. The framework was developed in Python and evaluated using 38 basketball videos covering 3×3, 4×4 and 5-on-5 game scenarios involving male and female players. Seven basketball action categories were investigated including pick-and-roll, dunk, transition, isolation, dribble, pass and shooting. A three-dimensional Convolutional Neural Network (3D CNN) based on the R3D-18 architecture was employed for spatiotemporal feature extraction and 512-dimensional deep video representations. The extracted features were evaluated using six deep learning classifiers including Recurrent Neural Network (RNN), Bidirectional Long Short-Term Memory (BiLSTM), Bidirectional Gated Recurrent Unit (BiGRU), Transformer-RNN, Capsule Network and Softmax classifiers. Additionally, three classical Machine Learning approaches namely Logistic Regression, Quadratic Discriminant Analysis (QDA) and Gaussian Naïve Bayes (GNB) were investigated using a hybrid adaptive evaluation strategy. The framework incorporates crash-tolerant processing mechanisms based on feature caching, exception handling and resilient data management to reduce redundant computation and improve recovery during large-scale basketball video processing. Performance evaluation was conducted using accuracy, balanced accuracy, macro and weighted F1-score, Cohen's kappa coefficient, Matthews correlation coefficient, ROC-AUC and confusion matrix analysis. Experiments were conducted on a highly constrained dataset initially containing 38 basketball videos with 37 valid samples retained after preprocessing and feature extraction across the above seven action classes while one sample was automatically excluded due to unsuccessful processing or validation. Results showed that the BiLSTM classifier achieved the strongest overall performance among the evaluated deep learning models with an accuracy of 32.43%, balanced accuracy of 18.25%, macro F1-score of 12.52%, Cohen's kappa of 0.0976 and Matthews correlation coefficient of 0.1249 and ROC-AUC value of 0.7164. Other deep learning models achieved lower performance with accuracy values ranging from 24.32% to 27.03% to demonstrate their difficulty in recognizing basketball actions under the explored conditions. Classical classifiers produced lower recognition performance particularly for rare classes and few-shot scenarios. Logistic Regression achieved the highest classical-model accuracy of 18.92% and macro F1-score of 9.37%. Thus, the crash-tolerant framework provides a practical foundation for evaluating basketball action recognition systems when large annotated datasets are unavailable and highlights the importance of computational reliability.

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The research highlights the importance of computational reliability alongside recognition accuracy for real-world sports basketball video analytics applications. Thus, the crash-tolerant framework essentially provides a practical foundation for analyzing the strengths, limitations and performance variability of classical and deep learning classifiers for basketball action recognition under constrained data, rare-class imbalance and few-shot learning scenarios. Essentially, the above experiments demonstrate and highlight the practical value of building reliable basketball video analysis systems when data and computational resources are limited.

Keywords: Basketball Action Recognition, Deep Feature Extraction, R3D-18, Capsule Network, BiLSTM, Machine Learning, Crash-Tolerant Processing, Limited Data Learning, Sports Analytics

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Comparative Evaluation of RL and ORCA-Enhanced Swarm Navigation in Dynamic Environments

Multi-agent swarm navigation remains a challenging problem in autonomous systems because of the complex interactions among multiple agents, dynamic environmental conditions, obstacle uncertainty, congestion and collision risks. Independent navigation strategies may generate inefficient trajectories, unsafe interactions and unstable behaviours when agents operate simultaneously within constrained cooperative robotic environments. This study presents a comparative evaluation framework for analysing behavioural trends and navigation performance in multi-agent swarm systems by investigating the impact of cooperative intelligence mechanisms on autonomous agent coordination. A two-dimensional swarm simulation environment was developed to evaluate autonomous agents performing goal-directed navigation under dynamic obstacle conditions. The framework was implemented in Python to compare two control strategies: a baseline independent reinforcement-learning-inspired navigation approach (RL), in which agents rely on goal attraction and obstacle avoidance, and an enhanced cooperative strategy (RL with Swarm) that integrates inter-agent interaction modelling with an ORCA-inspired velocity-based collision avoidance mechanism. The simulation consists of four autonomous agents navigating towards individual goals while interacting with fifteen randomly generated dynamic obstacles under multiple stochastic environments. Repeated experiments with different random seeds introduced variations in obstacle placement, agent noise and environmental uncertainty to support statistical robustness analysis. Navigation performance was evaluated using cumulative reward, path length, collision frequency, velocity stability, repulsion response, obstacle proximity and collision risk. Behavioural trends were further analysed using exponential moving average smoothing and segmented evaluations across early, middle and late simulation stages. Statistical comparisons using Welch's t-test and the Mann-Whitney U test indicate that the cooperative strategy did not consistently outperform independent navigation across all evaluation metrics. No statistically significant differences were observed for cumulative reward ($p = 0.249$), repulsion response ($p = 0.151$) or obstacle proximity using Welch's test ($p = 0.066$) although the Mann-Whitney test detected a significant difference in obstacle proximity ($p = 0.0186$). Significant differences were observed for path length and velocity ($p < 0.001$) with the cooperative strategy producing slightly longer trajectories and higher average velocity values. Collision frequency and collision risk also differed significantly according to Welch's test ($p = 0.019$ and $p = 0.013$ respectively) with the RL with Swarm strategy exhibiting higher mean collision frequency (0.5200 versus 0.3472) and collision risk (0.1288 versus 0.0874) than the baseline RL approach under the evaluated conditions. These findings suggest that incorporating swarm cooperation and ORCA-inspired coordination influence collective navigation behaviour although its benefits depend on the specific performance metrics, the complexity of the environment and operating conditions considered. This framework also provides a statistically grounded methodology for evaluating cooperative multi-agent navigation strategies and demonstrates the importance of comprehensive behavioural analysis beyond average performance metrics when assessing intelligent swarm coordination in dynamic environments.

Keywords: Multi-agent systems, swarm robotics, autonomous navigation, Optimal Reciprocal Collision Avoidance (ORCA), collision avoidance, reinforcement learning, dynamic obstacles, behavioural trend analysis, robotic simulation

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Biography

Oyedotun Samuel Abiodun is a PhD student s in Edo State University, Iyamho, Nigeria. My area of specialisation is Computer Science (Robotic Option). His research focuses on Multi-agent Swarm Robotics. He obtained MSc.(Computer Science), BSc.(Computer Science), PGd Mechanical Engineering, HND(Mechanical Engineering). He is a professional member of council of regulation of Engineering in Nigeria(COREN) and Council of Computer Professional in Nigera(CPN). He had published papers in different reputable journals, both local and international.

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Comparative Effectiveness of Artificial Intelligence Versus Conventional Methods for Detecting Peritoneal Metastasis in Colorectal Cancer: A Systematic Review

Peritoneal metastasis (PM) in colorectal cancer (CRC) is associated with poor prognosis and remains challenging to detect early due to the limited sensitivity of conventional imaging modalities. This systematic review evaluates whether artificial intelligence (AI) improves diagnostic accuracy compared to traditional methods. A comprehensive search of PubMed, Web of Science, Scopus, Cochrane, and Embase databases was conducted for studies published between 2015 and 2025, following PRISMA guidelines. Twenty-two studies involving over 40,000 patients were included. AI-based approaches consistently outperformed conventional techniques across multiple modalities. While traditional models demonstrated moderate performance (C-indices 0.73–0.85) and computed tomography frequently missed small lesions, AI systems showed superior diagnostic accuracy. Cytology-based AI models achieved over 95% accuracy and up to 99% specificity, while radiomics models reached AUC values as high as 0.94. Integration of circulating tumor DNA significantly enhanced risk prediction, with up to an 8.5-fold increase in identifying high-risk patients. Additionally, computer-assisted staging laparoscopy improved diagnostic accuracy from 52% to 79% when combined with clinician assessment. Despite these promising findings, most studies lacked external validation and faced implementation challenges. AI demonstrates strong potential to enhance early detection and clinical decision-making in CRC-related PM; however, further large-scale prospective studies and real-world validation are required before widespread clinical adoption.

Keywords: Artificial intelligence, colorectal cancer, peritoneal metastasis, radiomics, machine learning, systematic review

Biography

Naomi Abara is a surgical trainee at the Royal Cornwall Hospital, UK with a keen interest in general surgery and clinical research. She has contributed to multiple collaborative research projects, including systematic reviews exploring the role of artificial intelligence in improving diagnostic accuracy and patient outcomes. Her academic interests include surgical oncology, evidence-based practice, and innovation in healthcare technology. Naomi is actively involved in research, audit, and quality improvement initiatives, aiming to enhance clinical decision-making and patient care through data-driven approaches.

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Ontology-Guided Relation Extraction from Financial Documents Using Fine-Tuned Large Language Models

Natural language processing struggles with the extraction of structured financial information from a broad range of complex documents. Some of the difficulties include a domain-specific language, multilingual documents, and inflexible schema requirements of financial systems. We suggest a system of relation extraction that is automated and that is built around a pipeline employing different ontologies to address a broader range of financial documents in both English and Arabic. The extraction schema is based on financial domain ontologies. These ontologies provide a domain-specific vocabulary to assist with entities and relations, and also with the computational efficiency in the fine-tuning of the large language models (LLMs) through Low-Rank Adaptation (LoRA) and 4-bit quantization. Three models were analyzed that were successively larger (Qwen2.5-1.5B, Llama 3.2 3B Instruct, Mistral-7B-Instruct) and their performance was compared to ChatGPT, which was used as a no-task benchmark. Mistral-7B was the most effective of the models and achieved a 96% success rate for the most relevant extraction fields, which included a valid JSON, document type, company name, and monetary amount for over one hundred financial documents. We argue that the outcome of financial document extraction can be achieved with limited resources and low ontologies. We provide an analysis of the models' failure modes and argue that the format and schema consistency are essential for the extraction datasets.

Keywords: Financial document processing, ontology, LLM fine-tuning, NLP

Biography

Nader Bakir received the master's degree in applied mathematics from the Faculty of Science, Lebanese University, Beirut, Lebanon, in 2003, and the Ph.D. degree in signal and image processing from the National Institute of Applied Sciences of Rennes, France, in 2020. He is currently an assistant professor in the Faculty of Science at Beirut Arab University, Lebanon. His research focuses on Deep Learning and image processing fields. ERP Odoo Certified Functional Consultant. Data analyst expert in SPSS, Power BI and Python. Team leader with 5+ years of experience in the Software Development Industry.

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One Scene Does Not Fit All: Generative AI for Disorder-Specific Visual Habituation in Vestibular Rehabilitation

Visual habituation is a cornerstone of vestibular rehabilitation, yet most programmes still deliver the same generic optokinetic or virtual-reality stimuli regardless of diagnosis. Vestibular disorders, however, differ in what provokes symptoms: persistent postural-perceptual dizziness is aggravated by busy, complex visual environments; otolith dysfunction by linear and vertical motion; unilateral vestibular hypofunction by retinal slip during head movement; and vestibular migraine by fast, high-contrast visual motion. This talk asks whether generative artificial intelligence can close this gap by producing disorder-specific habituation stimuli on demand. We propose a framework in which each disorder's symptom-provocation profile is translated into controllable scene parameters: plane and direction of motion, central versus peripheral field, speed, scene density, contrast and realism. Generative AI tools are then prompted to build graded scene libraries that clinicians can deliver on ordinary screens or virtual-reality headsets. Our previous work confirms that these parameters matter: peripheral but not central visual motion altered cVEMP latencies in a direction-dependent manner, and purpose-designed horizontal and vertical motion scenes improved both symptoms and otolith-reflex responses in patients with otolith dysfunction. The same logic can be extended to every vestibular disorder and, beyond diagnosis, to every individual patient. Scenes can first be selected for the disorder and then personally modified, adjusting motion direction, speed, visual complexity and exposure time to each patient's symptom profile, test findings and day-to-day tolerance. Generative AI therefore makes disorder-specific, individually tailored visual rehabilitation not only possible but low-cost and scalable, turning visual habituation from a fixed, one-size-fits-all protocol into a personal prescription.

Keywords: Generative artificial intelligence, vestibular rehabilitation, visual habituation, vestibular disorders, virtual reality, personalised medicine

Biography

Şeyma Tuğba Öztürk, PhD, is a lecturer in the Department of Audiology at Istanbul Medipol University, where she has worked since 2017, first as a research assistant and as a lecturer since 2020. She completed her PhD in Audiology at Istanbul Medipol University in 2026 with a thesis on the impact and rehabilitation of otolith dysfunction in vestibular disorders. Her research focuses on VEMP methodology, otolith function, visual–vestibular interaction and AI-supported, virtual-reality-based vestibular rehabilitation. She teaches across several health sciences programmes, supervises graduation projects and chairs her department's Quality Commission.

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FAIDN: A Congestion-Aware Framework for Assured Intent-Driven Networking

Intent-Driven Networking (IDN) aims to simplify network management by enabling operators to specify what the network should achieve rather than how it should be configured. However, practical deployments of IDN often fail to satisfy user intent under dynamic network conditions such as congestion, failures, and heterogeneous traffic. In this paper, we redefine Assured Intent-Driven Networking in terms of four operational properties: correctness guarantees, continuous verification, convergence, and graceful degradation — rather than as an idealized error-free system.

FAIDN (Framework for Assured Intent-Driven Networking) is a congestion-aware intent execution framework built on Software-Defined Networking (SDN) which integrates intent translation, real-time network state awareness, verification, and automated remediation into a closed control loop. Using decision-tree–based diagnostics, FAIDN detects congestion, identifies root causes across control, data, link, and host planes, and applies corrective actions such as rerouting, queue resizing, traffic prioritization, and rate limiting.

FAIDN is implemented using the Ryu SDN controller and the Mininet emulator and evaluated under a heterogeneous background traffic environment comprising video streaming, VoIP, and bursty variable bit rate flows. Performance is assessed for a video conferencing intent as the primary evaluation target. Experimental results demonstrate that FAIDN achieves a 56× throughput improvement over baseline SDN-based execution at peak congestion, maintains video conferencing intent satisfaction above 80% at 90% load, and converges within 2–4 remediation steps. Evaluation across additional intent types remains as future work.

Keywords: Intent-Driven Networking, Software-Defined Networking, Ryu SDN Controller, Mininet Emulator, Congestion Control, Intent Satisfaction, Network Remediation, Closed-loop Control.

Biography

Mr. Utpal Barman serves as Manager of Information Technology at Charter Communications in Missouri, USA. He has co-authored research on polyglot persistence, exploring the integration of multiple database technologies and addressing challenges in scalability, data consistency, and system performance.

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Edge-Device Vision for Pangasius Fingerling Length Measurement and Injection-Site Estimation

Background
Manual vaccination of Pangasius fingerlings requires skilled operators to identify injection sites visually. A vision-based system for non-contact fish measurement and injection-site estimation could improve consistency and support vaccination automation.

Purpose
This study developed an edge-device vision system to measure Pangasius fingerling length and estimate candidate injection sites using a Raspberry Pi 4B.

Methodology
YOLO26n-seg was fine-tuned on 316 images and deployed on the Raspberry Pi 4B using NCNN. OpenCV extracted fish masks for length measurement. A calibration function was developed using 120 fingerlings, and injection sites were estimated using a mean length ratio of 0.29. Performance was evaluated against manual measurements on an independent dataset of 60 fingerlings.

Results
Calibration reduced length measurement MAE from 2.94 mm to 1.37 mm and increased mean accuracy from 97.98% to 99.07%. On the independent dataset, the system achieved an MAE of 1.69 mm, mean accuracy of 98.85%, and RMSE of 2.20 mm. Injection-site estimation achieved an MAE of 1.40 mm, with errors ranging from 0.07 to 4.44 mm. At a conveyor speed of 0.25 m/s, the reported throughput was 3,600 fish per hour, with a mean processing time of 0.764 s.

Conclusion
The proposed system enables non-contact fish-length measurement and injection-site estimation on low-cost edge hardware. The results support further development toward automated Pangasius vaccination, although integration with a mechanical injection mechanism and practical validation remain necessary.

Keywords: Computer vision, edge computing, instance segmentation, Pangasius, vaccination

Biography
Nguyen Phuc Truong received his M.S. degree in Electronic Engineering from Ho Chi Minh City University of Technology and Education, Vietnam in 2013. He is currently pursuing his Ph.D. in Control Engineering and Automation at Can Tho University. Since 2015, he has been a faculty member and lecturer in the Faculty of Electrical and Electronics at Vinh Long University of Technology and Engineering. His primary research interests focus on the applications of automation in agriculture and aquaculture.

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