

# ICMLAI2024

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## International Conference on **MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE**

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### **CONFERENCE DATES & VENUE**

October 21-22, 2024  
Edinburgh, UK

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## FOREWORD

We are delighted to invite scientists, academicians, technology professionals, young researchers, business delegates, and students from around the globe to attend the **International Conference on Machine Learning and Artificial Intelligence (ICMLAI-2024)**, taking place at the Tynecastle Park Hotel, **Edinburgh, UK**, from **October 21-22, 2024**.

ICMLAI-2024 offers a platform to explore the latest advancements and innovative breakthroughs in the field of machine learning and artificial intelligence, fostering an engaging environment with a vibrant community of researchers, practitioners, and industry leaders. The conference aims to unite a multidisciplinary group of experts and enthusiasts worldwide to share cutting-edge research, practical applications, and transformative ideas in ML and AI. It seeks to promote high-quality research, foster global collaborations, and encourage discussions on outstanding achievements and emerging trends that are shaping the future of AI.

We eagerly anticipate an enriching meeting with participants from diverse backgrounds and look forward to exchanging innovative insights and inspiring new developments in the field of machine learning and artificial intelligence.



## COMMITTEE

### Organizing Committee Members

<b>Yudong Zhang</b>	University of Leicester, UK
<b>Frederic Alexandre</b>	Inria Research Director, France
<b>Amir Hajjam EL Hassani</b>	University of Technology of Belfort-Montbeliard, France
<b>Hari Mohan Srivastava</b>	University of Victoria, Canada
<b>Pascal Lorenz</b>	University of Haute Alsace, France
<b>Shuang-Hua Yang</b>	University of Reading UK
<b>Patrick Siarry</b>	University of Paris, France



# Novel Higher Order Signal Processing for Vibro-Acoustical Condition Monitoring

**Prof. L. Gelman**

*The University of Huddersfield, UK*

## Abstract:

The classical higher order signal processing, that are employed for condition monitoring, will be discussed. Important future directions of higher order signal processing for condition monitoring will be presented for application in transient conditions:

- New type of non-stationary adaptive spectral transforms
- New type of non-stationary non-adaptive spectral transforms
- New type of non-adaptive and adaptive frequency response functions

Validation of these novel techniques by simulation and experiments in laboratory and field conditions will also be presented.

It is shown, that the proposed transforms deliver an essential improvement in effectiveness of vibro-acoustical condition monitoring, comparing to the traditional transforms.

## Biography:

Len Gelman, PhD, Dr. of Sciences (Habilitation) joined University of Huddersfield as a Professor, Chair in Signal Processing/Condition Monitoring and Director of Centre for Efficiency and Performance Engineering, in 2017 from Cranfield University, where he worked as Professor and Chair in Vibro-Acoustical Monitoring since 2002. Len developed novel condition/health monitoring technologies for aircraft engines, gearboxes, bearings, turbines, compressors and composite/concrete materials and structures.



Len published more than 250 publications, 17 patents and is Co-Editor of 14 Springer books. He is Fellow of: British Institute of NDT, International Association of Engineers and Institution of Diagnostic Engineers, the Executive Director, the International Society for Condition Monitoring, the Editor-in-Chief, the International Journal of Engineering Sciences (SCMR), Editor-in-Chief, IAENG International Journal of Computer Science, the General Chair, annual International Condition Monitoring Conferences, Honorary Co-Chair, annual World Congresses of Engineering, Co-Chair, the International Congress COMADEM 2019 and Chair, International Scientific Committee of Third World Congress, Condition Monitoring.

Len the Editor-in-Chief of the book series Condition Monitoring, Cooxmoor, Oxford, UK, Editor, Journal of Asian Scientific Research, the Associate Editor, International Journal Sensors, Associate Editor, International Journal Signal, Image and Video Processing, Springer, and Associate Editor, International Journal of Complex Engineering Systems.



# AI Techniques in Early Detection of Oesophageal Cancers

**Xiaohong Wang Gao**

*Middlesex University, UK*

## Abstract:

AI techniques in early detection of oesophageal cancers Prof. Xiaohong (Sharon) W. Gao, Middlesex University, London, NW4 4BT, UK. [x.gao@mdx.ac.uk](mailto:x.gao@mdx.ac.uk) Oesophagus cancer (EC) remains the 9th most common cancer and the 6th leading cause of cancer-related death in the world. In 2018, the estimated number of new cases was 572,000, of which approximately 509,000 persons (89%) died from oesophageal cancer. Histologically, there are two major types that constitute the majority of all oesophageal cancers, adenocarcinoma and squamous cell carcinoma cancer (SCC) (87%). While the overall five-year survival rate of oesophagus cancer is less than 20%, this figure can be improved significantly to up to 90% if an oesophageal cancer is detected in its early (i.e. intramucosal) stage when lymph node metastasis is unlikely, and endoscopic resection or surgery is possible. Unfortunately, routine upper gastrointestinal endoscopy carries a significant miss rate (1 in 4) for detecting oesophageal cancer and pre-cancerous lesions due to their inconspicuous changes in the surface appearance in the early intra-mucosal stage. Hence artificial intelligence techniques are developed to assist clinicians to determine pre-cancerous regions. In this talk, challenges facing development of AI-powered systems are addressed, including data shortage, colour variations between data sources and real time process. Specifically, fusion of colour contrasted images to an AI system is exploited, leading to improved performance. As a result, the sensitivity and specificity for detecting early stage of oesophagus cancer, i.e. low-grade dysplasia (LGD) increased from 75% and 88% to 83% and 97%, respectively while the video processing/play back speed is 33.46 frames per second.



### Biography:

Prof Gao is currently a full professor in Computer Vision and Imaging Science at Middlesex University, London, UK. She received her PhD in Loughborough University, UK in 1994. Since then, she has worked as a post-doc researcher at the St. Mary's Hospital at Imperial College, London and the Wolfson Brain Imaging Centre at the University of Cambridge in the UK for 4 years before becoming an academic at the Department of Computer Science in Middlesex University, London in 1999. She was firstly as a lecturer, then reader and later full professor in 2013. She has received a number of funding awards from EPSRC, the Royal Society, JISC, British Council and European Commission as a principle investigator or coordinator. Prof. Gao has edited 3 books and published several book chapters on medical image analysis and medical informatics. In 2017, her team has won top 1 (out of 23 teams) in accuracy in classification of Tuberculosis Competition organized by Image CLEF, through the design of novel deep learning networks. For the competition on early detection of oesophageal (food pipe) cancer (EAD2020), her team achieved #3 on Task 2-cancer detection. She has been invited to give keynote talks at several conferences including recent NextComp2022 and ICCBR2022. At present, she is working on the projects on Expandable AI in Medicine funded by the British Council, Asthma+ Lung UK and CRUK, respectively.



# The Potts & Ising Hardware Models

**Luke Theogarajan**

*University of California Santa Barbara, USA*

## Abstract:

In this talk I will outline our efforts on implementing Potts and Ising Models in hardware. More importantly compact optoelectronic hardware capable of implementing both the Potts and the Ising models, which are lattice models sampling from the underlying distributions determined by the coupling strengths. Both these models are extremely useful in two areas of AI and computing. The first is in optimization problems, these models can find approximate solutions to many NP-complete problems, such as graph coloring. Second is in generative models, Ising Machines are Boltzmann Machines sampling from an underlying distribution. Thus, they can sample states not in the training set but belonging to the underlying distribution. I will also touch upon the usefulness of lattice models in cancer modeling.

## Biography:

Luke Theogarajan is currently a Professor of Electrical and Computer Engineering at the University of California, Santa Barbara. Professor Theogarajan received his Ph. D. in 2007 from the Massachusetts Institute of Technology (M.I.T.) in Electrical Engineering and Computer Science. Prior to joining M.I.T. he worked for Intel corporation from 1996-2001, where he was part of the Pentium 4 design team. Prof. Theogarajan research lies at the intersection of biology and engineering. He is especially interested in replicating principles of learning & inference found in biological systems in synthetic AI/ML systems. Prof. Theogarajan was the recipient of the National Institutes of Health New Innovator Award in 2010, the National Science Foundation Career Award in 2011, the Northrup Grumman Excellence in teaching award in 2011 and the outstanding faculty member in EE for the years 2009, 2010, 2011, 2012, 2013, and 2017.





## AI at the Edge in IIoT Scenarios

**Valerio Frascolla**

*Director Research and Innovation at Intel, Germany*

### **Abstract:**

This talk focuses on the latest enhancements on the broad AI at the Edge topics, touching on some key advancements happened in the last couple of years and providing a Roadmap for the main innovations to come in the next couple of years moving forward. Even if the vertical domain selected for such analysis is Industrial Internet of Things (IIoT), the analysis has implications that can be generally applied to other domains as well. Results obtained from a set of running EU-funded collaborative research projects, together with themes taken from a personal research and a survey of recent literature, are taken as basis for the discussion.

### **Biography:**

Dr. Valerio Frascolla (MSc and PhD in Electronic Engineering) works as Director of Research and Innovation at Intel, as consultant for applications at the convergence of data and AI, as expert evaluator for the European Commission and three EU member state funding agencies, and open call reviewers in several EU-funded projects. He had been working at Ancona University, Comneon, Infineon, also attending standardization workgroups (3GPP, ETSI, IEEE) for 10 years. He serves as advisory board member of 8 EU- and national-funded research projects and covered various roles in other 20, currently being Standardization Manager in VERGE, Innovation Manager in PREDICT-6G, work package lead in ISOLDE, and contributing to 6G-XR. He has expertise in wireless system architecture, standardization and business aspects, program management, coaching and mentoring; his main research domains are wireless systems design with focus on 6G, spectrum management and edge, AI, and green technologies. Valerio represents Intel in the European R&D ecosystem, being elected in November 2023 for a second mandate as Vice-President of BDVA, covering driving roles in AIOTI and



6G-IA, and participating to the Digital Europe R&I workgroup. He is author of 90+ peer-reviewed publications (Google Scholar  $h=23$ ), TPC member of 120+ conferences, reviewer for 70+ journals, serving as Associated Editor of IET Quantum Communications, Guest Editor of MDPI Sensors, of IEEE Transaction on Vehicular Technology and IEEE Networks Magazine, and of Frontiers in Robotics and AI.



# AI-Aided Drive System Design, Control, and Maintenance for More-Electric Aircraft Applications

**Yuan Gao**

*University of Leicester, UK*

## Abstract:

The concept of more-electric aircraft (MEA) has been developed for several decades. Currently, we are studying the application of artificial intelligence (AI) technology in MEA. This has the potential to improve aircraft performance, energy efficiency, and reliability. However, the application of AI techniques onboard MEA are still under exploration. This talk will give several AI cases for the design, control, and maintenance of MEA drive systems.

## Biography:

Dr. Yuan Gao (Member, IEEE) received his PhD degree in Electrical and Electronic Engineering (EEE) from the University of Nottingham, Nottingham, UK, in 2021. He studied his masters in Aeronautical Engineering at the Beihang University, Beijing, China, 2014-2017. He finished his Bachelor of Engineering degree in 2013 at the Dalian Maritime University, Dalian, China. In Feb 2023, He joined the School of Engineering at the University of Leicester, Leicester, UK, as a lecturer in EEE. Prior to that, he was a postdoc research associate in hybrid autonomous system engineering, Department of Aerospace Engineering, at the University of Bristol, Bristol, UK. His research interests include motor drive, model predictive control, multi-agent modelling and simulation, autonomous system engineering, machine learning-based design, control, and maintenance.



Dr. Gao is a Reviewer for the IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS and IEEE TRANSACTIONS ON POWER ELECTRONICS. He also serves as the Session Co-Chair of the AIAA/IEEE Electric Aircraft Technologies Symposium (EATS) 2020. He is a recipient of a highly prestigious Chinese National Award for Outstanding Students Abroad in 2021.



# Vector Decision and Quantum Robot Routing for Smart Agent with Big Model & Federated Q-learning

**Wanyang Dai**

*Nanjing University, China*

## Abstract:

Vector decision-making appears in real-world systems ranging from smart agents (e.g., multi-task man-shaped robots) with big model to wireless networks such as semantic communication and generative metaverse over quantum 6G/IoT. The computing of such a dynamic decision-making policy can be implemented via developing a quantum robot routing algorithm through blockchain federated learning and Q-learning, which is the core technology in the generative AI area. More precisely, two vector policy computing algorithms are developed. One is concerned with a stochastic optimization based dynamic decision-making vector policy. Another one is concerned with a game-theoretic decision-making based dynamic vector policy via diffusion approximation. The effectiveness of our derived federated Q-learning policies is supported by simulation examples and numerical comparisons.

## Biography:

Wanyang Dai is a Distinguished Professor in Nanjing University, Chief Scientist in Su Xia Control Technology. He is the current President & CEO of U.S. based (Blockchain & Quantum-Computing) SIR Forum, President of Jiangsu Probability & Statistical Society, Chairman of Jiangsu Big Data-Blockchain and Smart Information Special Committee. He received his Ph.D. in mathematics and systems & industrial engineering from Georgia Institute of Technology in USA. He was an MTS and principal investigator in U.S. based AT&T Bell Labs (currently Nokia Bell Labs) with some project won Technology Transfer now called cloud system. He was the Chief Scientist in Depths Data Digital Economic Research Institute. He published numerous influential papers in big name journals including Quantum Information Processing,



Operations Research, Operational Research, Queueing Systems, Computers & Mathematics with Applications, Communications in Mathematical Sciences, and Journal of Computational and Applied Mathematics. He received various academic awards and has presented over 50 keynote/plenary speeches in IEEE/ACM, big data and cloud computing, quantum computing and communication technology, computational and applied mathematics, biomedical engineering, mathematics & statistics, and other international conferences. He has been serving as IEEE/ACM conference chairs, editors-in-chief and editorial board members for various international journals ranging from artificial intelligence, machine learning, data science, wireless communication, pure mathematics & statistics to their applications.



# Wineinformatics: Building Neural Networks and Computational Models on Wine Reviews Merged from Different Sources to Comprehend Characteristics of Classic (95+ scores) Wines

**Bernard Chen**

*University of Central Arkansas, USA*

## Abstract:

This research explores the classification of wine scores using reviews from Wine Spectator and Robert Parker. Two datasets are analyzed: elite Bordeaux wines (600 wines) and a larger dataset (10,000 wines). Reviews are merged and processed using the Computational Wine Wheel 3.0 to extract attributes for classification. Naive Bayes, SVM, and neural networks are compared. Results show Naive Bayes and SVM benefit from merged reviews for average wine ratings, while Neural Networks perform similarly with Wine Spectator's reviews alone and combined. However, Neural Networks perform poorly with merged reviews for individual wine ratings, indicating incompatibility between Wine Spectator and Robert Parker reviews. This study lays the groundwork for AI to comprehend and classify wine reviews from diverse sources. Future research involves expanding the dataset with reviews from other professional reviewers and integrating advanced Natural Language Processing techniques with the Computational Wine Wheel for deeper comprehension of review sentiments.

**Keywords:** Wineinformatics, Merge Wine Reviews, Naïve Bayes, SVM, Neural Networks

## Biography:

Prof. Bernard Chen is a research scholar and educator in the field of Data Science, currently serving as a Full Professor in the Department of Computer Science and Engineering at the



University of Central Arkansas (UCA). He holds a Ph.D. in Computer Science from Georgia State University, where he laid the foundation for his illustrious career in academia. With a diverse array of research interests, Dr. Chen has made significant contributions to the fields of Data Science, Data Mining, Bioinformatics, Wineinformatics, and Fuzzy logic and granule computing. Dr. Chen is the author of the seminal book “Wineinformatics: A New Data Science Application,” which has become a cornerstone text in the field. His expertise in Wineinformatics, coupled with his extensive research background, has led to numerous insights into the complexities of wine analysis and appreciation. As a prolific researcher, Dr. Chen has authored over 80 publications, which have amassed over 800 citations, demonstrating the impact and relevance of his work in academia. Additionally, he serves as a revered reviewer for multiple prestigious journals, conferences, and funding agencies, contributing his expertise to ensure the quality and rigor of scientific research.





# Assessing Zero-Shot and Zero-Shot Chain-of-Thought Reasoning Abilities in JAMB Mathematics and Physics Exams: Do LLMs ‘Know’ JAMB?

**Oluwole Olaoluwa Fagbohun**

*GenAI Lab, Readrly Limited, UK*

## **Abstract:**

This study investigates the zero-shot and zero-shot chain-of-thought reasoning capabilities of advanced language models—GPT-4, 01-preview, Claude, and Mistral—on the Joint Admissions and Matriculation Board (JAMB) Mathematics and Physics exams. By evaluating these models without prior fine-tuning, we aim to understand their inherent ability to solve standardised test problems that require logical reasoning and domain-specific knowledge.

We systematically presented past JAMB exam questions for each model in both zero-shot and zero-shot chain-of-thought settings. Metrics such as accuracy, reasoning quality, response time, and computational efficiency were analysed to compare performance across models and evaluation methods. Our findings highlight the strengths and limitations of each model in handling complex problem-solving tasks, with particular attention paid to the impact of chain-of-thought prompting on their reasoning processes.

The results offer valuable insights into the potential application of large language models in educational contexts, especially in automated tutoring and assessment tools. By identifying areas in which these models excel or fall short, we provide guidance for future developments in AI systems aimed at supporting learning in Mathematics and Physics within the Nigerian educational framework.



**Keywords:** Zero-shot learning, Chain-of-thought reasoning, GPT-4, Language models, JAMB exams, Mathematics education, Physics education, AI in education, Comparative study, Computational efficiency

### **Biography:**

Oluwole Fagbohun is the founder of Readrly, an AI-powered literacy platform that enhances the learning experience for young readers. He is also the author of The TensorFlow Developer Certificate Guide with Packt Publishers and is currently working on his next book, AI in Action, with Manning Publishers. As a keynote speaker at leading academic conferences in the UK and beyond, Oluwole has presented on AI's role in education and innovation. A Google Certified TensorFlow developer and ML researcher with peer reviewed publications, Oluwole brings over 7 years of experience in AI development and EdTech, with expertise in building end-to-end AI solutions that improve learning outcomes. As a thought leader, he is passionate about using cutting-edge AI to tackle literacy challenges and empower educators and parents to provide personalised, engaging learning experiences for children.



# Ethical & Societal Implications of AI-Advances in the Assessment and Certification of AI Ethics

**Ali G. Hessami**

*Vega Systems, UK*

## Abstract:

This Workshop will cover the advances on technology ethics and two IEEE initiatives namely IEEE 7000 suite of standards and the Ethics Certification Programme for Autonomous and Intelligent Systems (ECPAIS). The ECPAIS suites of SMART technology ethics criteria comprise Accountability, Transparency, Algorithmic Bias, Privacy, Fairness and Responsible Governance. These provide a basis for raising awareness and offer a comprehensive systematic framework for the innovators, researchers and technologists as well as small and large, public and private enterprises involved in AI and autonomous technology innovation, development and deployment. The main focus is on Autonomous Decision Making and Algorithmic Learning Systems, the emerging regulatory landscape and two complementary approaches to the risk reduction in societal harms and ethical assurance of these technologies.

## Biography:

Ali is currently the Director of R&D and Innovation at Vega Systems with extensive track record in systems assurance and safety, security, sustainability, knowledge assessment/management methodologies and has a background in design and development of advanced control systems for business and safety critical industrial applications.

Ali is a UK expert on CENELEC & IEC safety/security systems, hardware & software standards committees. He was appointed by CENELEC as convener of a number of Working Groups for review of Safety Critical Software Standards. Ali also a member of Cyber Security Standardization at CENELEC WG26 Group and IEC PT63452. A past Section chair



in the UK and Ireland section of IEEE and chaired the Humanitarian Technologies (SIGHT) group, SMC and Systems Council Chapters in the section.

During 2017 Ali joined the IEEE Standards Association (IEEE-SA) initially as a committee member for the new landmark IEEE 7000 standard focused on “Addressing Ethical Concerns in System Design”. He was subsequently appointed as the Technical Editor and later the Chair of IEEE 7000 standard to its publication in 2021. In November 2018, he was appointed as the Vice Chair and Process Architect of the IEEE ‘s global Ethics Certification Programme for Autonomous & Intelligent Systems (ECPAIS). This is now a global programme under IEEE CertifAIED brand for criteria development, evaluation, conformity assessment and certification of products, systems and services hinged around AI technologies.

Ali is a Visiting Professor at London City University’s Centre for Systems and Control in the School of Engineering & Mathematics and at Beijing Jiaotong University School of Electronics & Information Engineering. He is also a Fellow of Royal Society of Arts (FRSA), Fellow of the UK Institution of Engineering & Technology (IET) and a Life Senior Member of IEEE.



# Explainable Anomaly Detection with Generative Adversarial Networks for Time Series

**Cher Simon**

*Principal Architect at Amazon Web Services, USA*

## Abstract:

Generative Adversarial Networks (GANs) have emerged as a promising approach for time series anomaly detection, a crucial task in mission-critical applications. However, the lack of explainability in deep learning models like GANs poses a significant challenge in gaining trust and confidence. This presentation covers a comprehensive assessment of post-hoc local explainability in GAN-based time series anomaly detection by systematically evaluating state-of-the-art GAN frameworks, identifying their advantages and limitations, and quantifying the extent of explainability for GAN-detected anomalies. The results demonstrate that GANs effectively capture complex time series temporal distributions and are applicable for anomaly detection. Notably, post-hoc explanations can quantify and interpret GAN predictions, offering valuable insights for businesses considering adopting generative deep learning models.

## Biography:

Dr. Cher Simon is a technology specialist focusing on artificial intelligence, machine learning, and data analytics. She has over twenty years of experience developing large-scale data-driven and AI-based solutions across various industries. Dr. Simon holds the position of Principal Deep Learning Architect at Amazon Web Services (AWS). She earned her Doctorate in Technology from Purdue University, where her research focused on generative AI for time series anomaly detection. Dr. Simon's academic background complements her practical knowledge. Beyond her professional endeavors, she is also the author of "Deep Learning and XAI Techniques for Anomaly Detection."



# Evaluating the Effectiveness of a Collaborative Framework on Student Learning

**Omar Zammit**

*Middlesex University, UK*

## **Abstract:**

Students rely on search engines to increase their knowledge about a topic or to complete a given assignment. Online information retrieval consists of web sessions where students submit keyphrases as queries to search engines. In addition, search engines will surface Search Engine Result Pages (SERP) containing suggestions pertinent to the queried domain. Some studies show that to build effective queries, one should have some knowledge about the topic being searched, this might pose a challenge for newly enrolled students who are not familiar with the domain. This research aims to measure the effect on learning of a framework designed to lessen such challenges. The proposed framework includes four key tabs to enhance student search experience by providing relevant keyphrases. The Last Searched Keyphrases tab helps students navigate through their research history, offering easy access to previously searched terms. The Auto-Generated Keyphrases tab dynamically creates new keyphrases using a keyphrase extraction function based on HTML content and Part of Speech (POS) tagging. The Similar Keyphrases tab promotes collaboration by displaying keyphrases searched by peers, utilising algorithms like Euclidean distance, Cosine similarity, and Jaccard similarity to identify the most relevant matches. Lastly, the Similar Study Group Keyphrases tab presents pre-defined terminologies identified by lecturers to aid students in expanding their domain-specific vocabulary. An evaluation methodology involving students and techniques to aggregate results are discussed to determine if such a framework increases the student's knowledge of a particular subject. The results obtained show that students using the proposed framework, performed better, their overall marks improved and the framework assisted students in solving theoretical and problem solving questions. In addition, the evaluation methodology can be adopted by



other researchers to assess the effectiveness of their proposed frameworks or interventions in enhancing student learning outcomes in various domains.

**Keywords:** Online Information Retrieval, Keyphrase Extraction Framework and Measuring Learning Impact

### **Biography:**

Omar Zammit works as a Data Engineer at River Tech in Malta. He successfully achieved a computer science degree in internet application development and a Masters degree in business information system management from Middlesex University. He is working towards a Ph. D in computer science at Middlesex University. He also holds a lecturing position within the faculty of computer science at the University of Wolverhampton and he assists students in learning different subjects related to Data Science and Software Engineering. He was engaged in different software engineering roles during his career in multiple organisations and was engaged in various projects. In 2021 he won the best technical paper during the SGAI International Conference on Artificial Intelligence in Cambridge. His current research interests include Software Engineering, Natural Language Processing, Machine Learning in Education, and Recommender Systems.



# Shadows in the Classroom: The Unseen Consequences of Large Language Models in Educational Settings

**Akinyemi Sadeeq Akintola**

*NOVA University Lisbon, Portugal*

## **Abstract:**

The use of Large Language Models (LLMs) in educational environments has transformed how information is accessed and has enabled more tailored learning experiences. However, this study examined the consequences of their widespread adoption in academic settings. We explored how dependency on LLMs can erode critical thinking skills, leading students to rely heavily on technology for answers, rather than engaging in deep analysis. Additionally, we examine inherent biases within AI algorithms that may perpetuate misinformation and adversely impact both teaching and learning processes. Academic integrity has emerged as a significant concern, with plagiarism and originality issues becoming increasingly complex in the age of AI.

This paper discusses how LLMs can inadvertently facilitate academic dishonesty, affect student learning outcomes, and challenge educators to uphold ethical standards. We also assessed the impact on traditional teaching methods, highlighting changes in teacher roles and the necessity for evolving pedagogical approaches to effectively integrate technology without diminishing educational quality.

Furthermore, the digital divide was scrutinised to understand how unequal access to technology exacerbates educational inequalities. Students who lack resources may find themselves at a disadvantage, widening the gap in educational outcomes. To mitigate these risks, we propose strategies for educators and institutions to emphasise ethical considerations and best practices. We conclude the paper by presenting our findings and suggesting future directions for research and practical applications to ensure equitable and effective use of LLMs in education.





**Keywords:** Large Language Models, Education Technology, Critical Thinking, AI Bias, Academic Integrity, Teaching Methods, Digital Divide, Educational Inequality, Ethical Considerations

### **Biography:**

Sadeeq is a Graduate Researcher who recently completed a Master's Degree in Data Science and Advanced Analytics at University NOVA de Lisbon, Portugal. With nearly two decades of industry experience, he has developed software and data infrastructure for sectors including Retail, Manufacturing, Finance, and Government, working at companies like FMDQ Exchange, KPMG, and Microsoft. Now a Smart Analytics Customer Engineer at Google, he helps customers tackle complex data challenges on Google Cloud. A recognized leader in Data Engineering, AI, and Generative AI, Sadeeq mentors startups across the UK and Africa through leading accelerators. His PhD research interests focus on core AI/ML and its applications in retail, business analytics, and AIoT.



# The Role of Artificial Intelligence in Revolutionising Green Financing: Enhancing Sustainability Through Technology

**Omotoso Oluwayomi Joseph**

*Talents Corp Limited, UK*

## **Abstract:**

The integration of artificial intelligence (AI) into green financing presents a transformative opportunity to advance global sustainability objectives. This study explores how AI technologies revolutionise green finance by enhancing decision-making processes, improving operational efficiency, mitigating risks, and enabling scalability in sustainable investments. We examine the current applications of AI, such as machine learning algorithms, natural language processing, and big data analytics, in areas such as risk assessment, investment strategy optimisation, and supply chain financing.

Our research employs a comprehensive literature review and case study analysis to identify both the benefits and challenges associated with AI integration in green finance. Key findings reveal that AI can significantly improve the accuracy of evaluating sustainable investment opportunities and provide real-time analysis of environmental impacts. However, obstacles such as data quality issues, ethical considerations, regulatory uncertainties, and technical limitations pose significant challenges.

This study discusses the implications of these findings for policymakers, financial institutions, and technology developers. We recommend the development of standardised ESG reporting frameworks, investment in AI infrastructure and expertise, and fostering interdisciplinary collaboration to address the skill gaps. Stakeholders can expedite their progress towards sustainability goals by strategically applying AI, ensuring that technological advancements support environmental imperatives.



**Keywords:** Artificial Intelligence (AI), Green Financing, Sustainable Finance, Machine Learning, Risk Assessment and Sustainable Investment

### **Biography:**

Yomi Omotoso is a Senior Software Engineer and Technical Leader with 6+ years of experience in scalable applications using PHP, JavaScript, and block chain. He specializes in fintech, e-commerce, and logistics solutions. As Convener of UK Tech Career Summit and an ADPList Mentor, Yomi is passionate about guiding others in tech. With an MBA in E-commerce and MBCS membership, he focuses on developing technologies for the next billion users, particularly in payments. Yomi combines technical expertise with strong leadership, prioritizing both customer satisfaction and business goals.



# Assessing Zero-Shot and Zero-Shot Chain-of-Thought Reasoning Abilities in JAMB Mathematics and Physics Exams: Do LLMs ‘Know’ JAMB?

**Ogheneruona Maria Esegbona-Isikeh**

*Birmingham City University, England*

## Abstract:

This study investigates the zero-shot and zero-shot chain-of-thought reasoning capabilities of advanced language models—GPT-4, 01-preview, Claude, and Mistral—on the Joint Admissions and Matriculation Board (JAMB) Mathematics and Physics exams. By evaluating these models without prior fine-tuning, we aim to understand their inherent ability to solve standardised test problems that require logical reasoning and domain-specific knowledge.

We systematically presented past JAMB exam questions for each model in both zero-shot and zero-shot chain-of-thought settings. Metrics such as accuracy, reasoning quality, response time, and computational efficiency were analysed to compare performance across models and evaluation methods. Our findings highlight the strengths and limitations of each model in handling complex problem-solving tasks, with particular attention paid to the impact of chain-of-thought prompting on their reasoning processes.

The results offer valuable insights into the potential application of large language models in educational contexts, especially in automated tutoring and assessment tools. By identifying areas in which these models excel or fall short, we provide guidance for future developments in AI systems aimed at supporting learning in Mathematics and Physics within the Nigerian educational framework.



**Keywords:** Zero-shot learning, Chain-of-thought reasoning, GPT-4, Language models, JAMB exams, Mathematics education, Physics education, AI in education, Comparative study, Computational efficiency

### **Biography:**

Ogheneruona Maria Esegbona-Isikeh is a Data Journalist with years of experience in uncovering compelling stories through data analysis and visualization. She specializes in using Python, R, and SQL to mine large datasets and distill complex information into clear, engaging narratives. Ogheneruona's work often explores social justice, economic trends, and public policy, with a particular focus on making data accessible to a broad audience.

She is a passionate researcher who enjoys publishing her works in top-tier peer-reviewed journals in order to make it available for the public to read and aid the work of other researchers.

She is currently a reviewer with reputable journal publishing companies, a role she was invited to do because of her scholarly experience in AI, data journalism, e-healthcare and digital technology-based research.



# Machine learning in Detection and Stratigraphic Age Prediction of Lunar Craters

**Wei Zuo**

*National Astronomical Observatories, Chinese Academy of Sciences, China*

## **Abstract:**

Craters are the most widely distributed geomorphic features on the lunar surface. In comparison to erosion and weathering processes on Earth, the Moon lacks the influence of atmosphere and water, allowing lunar craters to effectively preserve geological characteristics related to the evolution of the lunar crust, thereby providing crucial information about lunar surface geological history and impact events. Accurately identifying and quantifying craters, as well as predicting the stratigraphic ages of these craters, can unveil a time sequence of lunar surface evolution, leading to a better understanding of planetary evolutionary history, surface morphology formation processes, and interactions among planets. The rapid development of artificial intelligence technology offers new methods and approaches for the processing, exploration, and knowledge discovery of lunar exploration data. We present relevant applications, including precise identification of small lunar craters using deep learning based on high-resolution image data and practical experiences in predicting different stratigraphic ages of lunar craters through machine learning using multi-source lunar exploration data. Experimental results demonstrate that machine learning provides effective solutions and technical support for lunar crater identification and stratigraphic age prediction, significantly enhancing the utilization and application value of lunar scientific data, and promoting knowledge innovation and discovery.

**Keywords:** Machine Learning, Deep Learning, Lunar Crater Detection, Stratigraphic Age Prediction, Moon



### Biography:

Wei Zuo received the Ph.D. degree in University of Chinese Academy of Sciences, in 2004. Since 2013, She has been a Professor with the National Astronomical Observatories, Chinese Academy of Sciences (CAS), Beijing, China. She is deputy director of China's National Space Science Data Center. Her research interests include the management, analysis and application of scientific data for lunar and planetary exploration, and she currently focuses on using machine learning and artificial intelligence techniques to effectively mine and utilize this valuable data.



# Teaching Software Development and Programming in the Face of AI – Challenges, Opportunities and Strategies

**Dr. Mathias Fonkam**

*Penn State University, USA*

## Abstract:

With the explosion of freely and easily accessible content on the Internet the academic world has been wrestling with new ways to leverage technology and online resources to improve student learning while mitigating dangers such as students simply finding solutions online. The introduction of AI models like ChatGPT and related LLM models compounds these dangers. Most will agree that in today's teaching and learning environment the objectives of the pedagogists (instructor and support team) do not always align with those of the learners. While the pedagogists emphasize the learning outcomes typically expressed as demonstrable knowledge, life skills and even changes in behavior, most learners are focused on getting as good a passing grade as the means at their disposal allow. Ideally a student's grade from a course should reflect the level of achievement of the learning outcomes. The traditional approach to pedagogy, especially the component of grading and evaluation of student learning are seriously challenged by the ease with which learners can simply discover solutions online or create them using AI assistants. In this presentation, we investigate the challenges, opportunities and strategies to teaching programming and software development in the face of AI assistants such as Github Copilot and ChatGPT. In particular, we argue that with the growing complexity of software and the multi-paradigm nature of mainstream programming languages (Python, Java, JavaScript, etc) there is need to repurpose (and maybe even refactor) the learning outcomes and by extension the means to pedagogy. We present a new set of learning outcomes and strategies to implementation. As AI technologies become part and parcel of the Internet infrastructure the onus falls on us in the teaching profession to embrace them in a way that enhances rather than





compromises student learning. This demands a fundamental shift in the way we do business, engage with the learners and ultimately evaluate their learning. This presentation is a small step in that direction.

### **Biography:**

Dr. Mathias Fonkam is currently an Associate Teaching Professor in the College of IST at Penn State University (PSU). Before joining PSU he served as Dean and Associate Professor of the School of IT & Computing (SITC) at the American University of Nigeria (AUN) for over 10 years. He has over 20 years of teaching experience at a number of Universities in the USA, Brazil and Nigeria. He also worked for 4 years in the software industry in the Silicon Valley in California between 1998 and 2002. He holds a PhD in Computer Science with specialization in distributed databases, an MSc in Systems Engineering with specialization in software engineering and a BSc in Computer Engineering, all obtained from Cardiff University (University of Wales in the UK) between 1984 and 1992. He has taught a wide spectrum of courses in computer science, software engineering, systems engineering and information systems. He brings to his academic teaching and research extensive hands-on experience in web and mobile application development with open-source technologies and the growing fields of data science, machine learning and crypto-economics. As Dean of the School of IT & Computing he helped transform the school to a model for reference in Nigeria aimed at building capacity through teaching and research within the major computing disciplines (Computer Science, Software Engineering, Information Systems and Data Science).



# Ten (Easy) Ways to Use Generative AI to Destroy a Business

**Lin Chase**

*Minnesota State University, USA*

## **Abstract:**

The latest advances in generative AI and deep learning systems are astounding, powerful, and full of promise. As we're seeing their initial applications roll out in the business world, we're also starting to learn how their use can sometimes go awry. In this talk we'll look at the first year in the life of these systems through the eyes of business owners, their customers, and their suppliers. Many examples will be shared, with a particular emphasis on the impact that large scale AI is having on the supply chain of goods globally.

## **Biography:**

Lin Chase is an experienced executive with an extensive track record in the successful application of artificial intelligence technologies in complex business environments. She has spent thirty years developing emerging software and telecommunications technologies in the commercial world. Lin earned a B.S. in Physics and an M.S. and Ph.D. in Robotics at Carnegie Mellon University. She was then awarded the NATO/NSF postdoctoral fellowship which she took to CNRS in Paris. Afterwards she served in a series of international leadership roles with speech technology companies including SpeechWorks International (Director of European Operations), Rhetorical Systems (VP Marketing and Partnerships, and NeoSpeech (CEO). She then joined Accenture as a Senior Executive (Partner), where she founded both the firm's R&D organization in India and a joint venture with Cisco in the data center space. Since 2010, Lin has been running the Silicon Valley based technology consulting firm Big Tech Strategy and Woo Factor Music, a production music studio. In 2021 Lin joined Minnesota State University, Mankato as director of their new entirely project-based undergraduate program in computer science, which is the only program of its type in North America.



# Enhancing Mathematical Creativity Through Ai-Augmented Argumentative Discourse-Centered Classroom: A Paradigm Shift In Mathematics Education

**Mae Antonette Ticar**

*Middlesex University, UK*

## **Abstract:**

This study addresses the persistent challenge of improving mathematics education by examining the impact of an innovative teaching strategy—the Argumentative Discourse-centered Classroom model—on students’ mathematical creativity. Despite curriculum reforms, the Philippines continues to struggle with low math achievement, as highlighted by the 2018 PISA results. This research explores how incorporating argumentative discourse into classroom instruction can enhance students’ ability to think creatively in mathematics. A quasi-experimental pretest-posttest design was used to compare the outcomes of students taught using the Argumentative Discourse-centered Classroom model with those following the traditional DepEd 4A’s framework. Mathematical creativity was assessed through an 8-item open-ended problem-solving test, evaluating fluency, flexibility, and originality. Statistical analysis revealed comparable scores between the groups, but the findings suggest that the discourse-centered model offers a promising alternative for mathematics instruction in the Philippines. This approach not only improves mathematical reasoning but also fosters critical thinking, creativity, and communication skills—essential for success in today’s world. The study advocates for the broader adoption of argumentative discourse-centered strategies across disciplines, aiming to invigorate teaching practices and promote a culture of active learning and intellectual engagement. Building on this foundation, my ongoing research explores the integration of AI, specifically ChatGPT, into this model, where students engage in debates comparing their solutions with those generated by AI, further enhancing their mathematical creativity and critical thinking skills.



**Keywords:** argumentative discourse-centered classroom, 4A's, mathematical creativity, quasi-experimental, ChatGPT integration



# Predicting Physician Empathy from Facial Mimicry Analyzed in Real-World Clinical Video Data of Dermatology Outpatient Clinics

**Annisa Ristya Rahmanti**

*Middlesex University, UK*

## Abstract:

**Introduction:** Understanding the dynamics of facial mimicry—the mirroring of facial expressions—and its implications for predicting empathy in physician-patient interactions is essential for enhancing patient-centered care and satisfaction. This study investigates how spontaneous facial mimicry, captured through real-world clinical video data, can serve as an indicator of physician empathy in patient interactions.

**Methods:** We analyzed 150 clinical video recordings from dermatology outpatient clinics at Taipei Medical University Hospital and Taipei Municipal Wanfang Hospital. A Facial Emotion Recognition (FER) system utilizing MobileNetV2 architecture was employed to identify seven basic emotions: anger, disgust, fear, happiness, neutrality, sadness, and surprise. These emotions were analyzed to assess the emotional congruence between physicians and patients. We applied several machine learning algorithms, including Logistic Regression, Light Gradient Boosting Machine, Random Forest Classifier, Naive Bayes, Extreme Gradient Boosting, K Neighbors Classifier, and Multilayer Perceptron. The Jefferson Scale of Empathy (JSE) was used to quantify empathy levels, and a 10-fold cross-validation method was utilized to validate the models.

**Findings:** Neutrality was the predominant emotion observed and mimicked in the study, with neutral mimicry occurring in 25,424 instances and lasting an average of 90 seconds. In contrast, mimicry of sadness and happiness was less frequent and shorter, occurring only 356 and 635 times respectively, with durations of approximately 1 and 2 seconds. Machine learning



algorithms demonstrated promising results in predicting physician empathy levels, indicating the potential of leveraging facial mimicry and emotional matching to enhance empathetic communication in healthcare settings. Specifically, the Logistic Regression model exhibited the best performance, with AUC values observed to be 0.82, 0.46, and 0.84 for class 0 (low empathy), class 1 (medium empathy), and class 2 (high empathy), respectively. This indicates a high degree of discriminative ability for predicting low and high empathy, while the model's performance was less accurate in classifying medium empathy.

**Conclusion:** This study highlights the potential of using facial mimicry analyzed from real-world clinical video data to predict physician empathy in dermatology outpatient settings. The findings suggest that such predictive analysis can be a valuable tool for enhancing empathetic communication in healthcare, potentially leading to improved patient outcomes. Further research could expand these methodologies to other medical settings and explore additional non-verbal cues to enrich the predictive accuracy.



# Machine Learning Chemometric Analysis of Infrared (IR) Spectroscopic Data for Investigating Cultural Heritage Objects

**Guan-Lin Liu**

*Middlesex University, UK*

## **Abstract:**

Scientific investigation and analytical methods have been utilised for decades to examine cultural heritage objects and items in museum collections, such as oil paintings, manuscripts, photographs, textiles, pottery, and metal artifacts. These methods aim to understand the original manufacturing techniques and materials, as well as to address issues related to heritage conservation and preservation. Recently, machine learning chemometric methods, such as Principal Component Analysis (PCA) and k-means clustering, have been employed in conjunction with scientific equipment to investigate cultural heritage objects.

In this study, Hyperspectral Imaging (HSI) and Fourier Transform Infrared (FTIR) spectroscopic imaging were carried out as non-invasive and non-destructive analyses of two cultural heritage objects: oil paintings and antique photographs. HSI scanning of the painting *The Rice Portrait* revealed the presence of a crack and two-point losses. These mechanical damages, which exhibited similar spectra, could be effectively discriminated by HSI. In the other painting, *The Portrait of Jane Halswell*, HSI imaging revealed the distribution of titanium white retouches.

FTIR imaging, combined with PCA, was used for the first time to differentiate antique photographs into distinct groups. K-means clustering, another chemometric tool used in this study, was applied to analyse FTIR spectroscopic data obtained from cross-sectional samples, enabling the characterisation of different layers within each antique photograph.



The results of this study are intended to aid the development of novel and effective machine learning models for predicting degradation and identifying materials in cultural heritage objects. These models will provide scientifically validated and data-driven strategies for conservation.





# Implementation of Counter Propagation Artificial Neural Network Models to Determine the Pharmacological and Toxicological Properties of Fullerene Carbon Structures

**Natalja Fjodorovaa**

*National Institute of Chemistry, Slovenia*

## **Abstract:**

Fullerenes belong to the group of nanoscale molecules. They are used in various fields such as materials science, the biomedical and pharmaceutical industries, etc. [1]. In the pharmacological and biomedical field, they are mainly used to inhibit proteins that are responsible for diseases. In these research areas, it is also important to evaluate the toxicological properties of this class of chemicals. In materials science, it is important to know the degree of toxicity of the materials used, both in the production cycle and in the final product. The data set of 169 FDs with different functional groups was in the focus of our investigation. The binding affinity of these fullerenes to 1117 proteins were determined by inverse molecular docking. In addition, quantum chemistry and machine learning methods were used in the study. With the help of counter propagation artificial neural network (CPANN) models we were able to gain important information about the inhibitory effect of fullerene derivatives (pharmacological properties) as well as about the potential toxicity of the chemicals investigated [2-4]. We have shown which structural features of FDs nanostructures have the greatest impact on toxicity. In this context, we will be able to reduce the need for animal testing by establishing a prioritized list of the most toxic FDs, which will support the decision on the selection the right FDs in advance of manufacturing.



### Biography:

Dr. Natalja Fjodorova is a researcher who, in addition to her scientific-research work in the fields of chemical informatics, also conducts research in fields that touch only marginally on the scientific way of thinking. She graduated from the University of Saint Petersburg, from the Faculty of Technology and Design. She later obtained a PhD in chemistry from the same university. Since 2006, she has been employed at the National Institute of Chemistry as a chemical informatics researcher. She became more interested in art, or in the connection between science and art, in 2015 at the “CroArtScia” conference. As a guiding thought in her presentation for this conference, Natalja highlighted the thought of John M. Templeton: “Human life is ultimately a search for meaning, a path to enlightenment - to discovery”.



# Building Neural Networks Models for Biological Activity Evaluation of Chemical Substances

**Katja Venko**

*National Institute of Chemistry, Slovenia*

## Abstract:

Risk assessment of chemical substances with in silico safety profiles through artificial intelligence models can be performed to reduce experimental toxicity/biological activity assessments, which are usually complex, time-consuming and costly assays. Various endpoints can be predicted analysing available experimental data using quantitative structure–activity relationships (QSAR) approach. Therefore, computational QSAR models for the prediction of selected endpoints are an alternative to animal testing for industrial and regulatory stakeholders. We have developed several models for the assessment of various biological activities based on their chemical structure. The classification and regression models were built by combining a genetic algorithm, counter-propagation artificial neural network and cross-validation. All models were built according to OECD principles. When using QSAR models for regulatory purposes, it is recommended to use as many available QSAR models as possible for the endpoint of interest, as agreement between predictions generated by multiple independent QSAR models increases confidence in the predictions. The neural network models presented can be used for the preliminary generation of chemical safety profiles for virtually any other substance of interest.



# Machine Learning Models for Dynamic Pricing

**Amir Atiya**

*Cairo University, Egypt*

## Abstract:

The abundance of data in many applications and the opportunity to optimize operations based on the data has opened many opportunities. One such application is revenue management. This is achieved through the concept of dynamic pricing, which seeks to adjust the price of a product dynamically with time in an attempt to maximize revenue. By tracking the fluctuations of demand one can optimally benefit from more variable and responsive pricing. It has gained significant worldwide adoption in many industries in the last two decades. In this talk I will briefly review the topic of dynamic pricing. I will also connect it with the topic of time series forecasting, as forecasting demand is the engine upon which dynamic pricing is built, and to machine learning, which has been increasingly applied to this field.

## Biography:

Amir Atiya received his degrees from Cairo University, Egypt, and his Ph.D. from Caltech (California Institute of Technology). He is currently a Professor at the Department of Computer Engineering, Cairo University, where he has been a faculty member since 1993. He received several awards such as the Egyptian State Appreciation Award, the Kuwait Prize for 2005, and the Young Investigator Award from the International Neural Network Society.

Amir Atiya was among the first generation of scientists to work on machine learning, since his Ph.D. years in 1986. He has had several research contributions in the areas of in machine learning and neural networks. Recently, he has performed some research in the time series forecasting and the dynamic pricing fields. He has been one of the handling editors of International Journal of Forecasting.



# Advancements in AI-driven Predictive Analytics for Cybersecurity

**Praveen Tripathi**

*HCL Tech, USA*

## Abstract:

Artificial Intelligence (AI) and Machine Learning (ML) have dramatically influenced the development of predictive analytics in cybersecurity, enabling early detection of potential threats and anomalies in network traffic. This abstract presents the development of an AI-driven predictive analytics framework designed to enhance threat detection and incident response across multi-cloud infrastructures. The framework employs advanced machine learning algorithms, such as deep neural networks (DNNs), support vector machines (SVMs), and reinforcement learning, to analyze vast datasets and predict security vulnerabilities in real-time.

The core innovation is the application of AI to the automation of threat detection, allowing organizations to reduce response times, lower operational risks, and enhance cybersecurity protocols. This research demonstrates the effectiveness of the framework through case studies on large-scale data breaches and simulated attacks, where a predictive accuracy of over 95% was achieved.

The integration of these technologies within existing security infrastructures poses several challenges, including data privacy, computational overhead, and model interpretability. This paper discusses potential solutions to these challenges, particularly focusing on the implementation of secure AI models that comply with global cybersecurity regulations (e.g., GDPR, CCPA). The practical application of this framework has the potential to revolutionize enterprise security, providing a scalable and adaptive solution for mitigating future cyber threats.



**Keywords:** Artificial Intelligence, Machine Learning, Predictive Analytics, Cybersecurity, Neural Networks, Threat Detection

### **Biography:**

Praveen Tripathi is a globally recognized technology leader specializing in AI, Cloud Services, and Digital Transformation. He has been honored with several prestigious awards, including the CIO Today Award for being one of the “World’s 10 Most Dynamic Tech Leaders to Follow, 2024,” and the “Most Prominent Industry Expert of the Year - 2024, in Technology & Digital Transformation” by Business Mint. He is also a Gold Stevie® Award Winner (Executive of the Year - Cloud Services) and serves as a judge for the Globee® Awards and QS Reimagine Education.

At HCLTech, Praveen leads strategic technology initiatives that drive innovation and operational efficiency across global enterprises. His expertise spans developing and delivering complex AI-driven solutions, cloud migrations, and PCI-compliant payment gateways. Praveen is committed to advancing the fields of machine learning and AI through his thought leadership, research, and mentorship, making him a prominent figure in the global IT industry.



# Incorporating the Latest Human Feedback Techniques in Training Large Language Models

**Manas Talukdar**

*Data Infrastructure and Enterprise AI, USA*

## **Abstract:**

This talk will cover the recent advances in human feedback techniques for training large language models. We will discuss the motivation, challenges and start-of-the-art techniques behind incorporating human feedback that is enabling the development of powerful multi-modal LLMs for generative AI. This will include a discussing of research such as EvalGen, reward modeling, multilingual preference optimizations, etc. We will also discuss the implications of these techniques on the future of AI.

## **Biography:**

Manas Talukdar is a senior industry leader in Data Infrastructure and Enterprise AI. He has significant experience designing and developing products in artificial intelligence and large-scale data infrastructure, used in mission critical sectors across the world. He is a senior member of IEEE, AI Senior Fellow and Advisory Board/Council member. Manas has made key contributions to the preeminent industrial data historian in the world, specially ubiquitous throughout the process industry. As Director of Platform Engineering at C3 AI, the leading Enterprise AI company, he founded and led an organization of multiple teams developing cutting edge capabilities at the intersection of artificial intelligence and large-scale systems. He is currently Director of Engineering at Labelbox, a startup building a data-centric AI platform, where he runs platform, product and machine learning engineering organizations. Manas has been invited to speak at multiple technical and leadership conferences. His contributions have been recognized through multiple awards, appointments to judge several prestigious national and international industry awards and invitations to join prestigious AI organizations. Manas also advises startups in the AI and Data space and has filed multiple patents in data processing and machine learning for AI.



# Robust Deep Learning-Based Barcode Detection

**Xiaoyan Dai**

*Kyocera Coporation, Japan*

## Abstract:

Barcode processing of seized images is quite a big challenge, as different shooting conditions can result in different barcode appearances. In this paper, we design a robust barcode “scanning” system by applying deep learning. In order to improve barcode detection performance of deep learning model, we propose synthetic-to-real data augmentation to generate various data closed to real scene. Comparisons with previous works and evaluations with our original data set show that the proposed approach achieves state-of-the-art performance both in normal images and difficult images in the real-world scenario. In addition, the system is designed to use low-resolution image for barcode detection and high-resolution partial image for barcode recognition, which is and is applicable to real-time applications.

## Biography:

Xiaoyan Dai received her Ph.D in image processing from Muroran Institute of Technology in Japan in 2004 where she specialized in computer vision and machine learning. Since then, she has focused on image processing and document processing in Canon Inc. From 2019, she joined Research Center of Kyocera Corporation as an Expert. Her current interests include deep learning and computer vision for objects detection, fraud detection, object recognition and object tracing.





# Efficacy in Lift and Shift of ML Models in SaaS Applications

**Venkat Duvvuri**

*Director of Data Science at Oracle Corporation, USA*

## **Abstract:**

In traditional Software as a Service (SaaS) enterprise applications, there is a need for easy-to-do machine learning (ML) frameworks. Additionally, SaaS applications are closely related when they form an application suite, which brings forth the need for a ML framework that can facilitate the “lift and shift” of ML model code in similar needs in multiple enterprise applications in a suite. To add to this, some SaaS applications are still using legacy infrastructure (on-premise) mandating the need for a ML framework that is backward compatible with coexisting platforms, both cloud and legacy on-premise infrastructure. This study first demonstrates that in SaaS applications, microservices are an essential ingredient to deploying machine learning (ML) models successfully. In general, microservices can result in efficiencies in software service design, development, and delivery. As they become ubiquitous in the redesign of monolithic software, with the addition of machine learning, the traditional SaaS applications are also becoming increasingly intelligent. Next the dissertation recommends a portable ML microservice framework Minerva (also known as contAIIn—second generation), a Micro-services based container framework for Applied Machine learning as an efficient way to modularize and deploy intelligent microservices in both traditional “legacy” SaaS application suite and cloud, especially in the enterprise domain. The study also identifies and discusses the needs, challenges, and architecture to incorporate ML microservices in such applications. Secondly, the study further identifies that there is an impetus to innovate quickly with respect to machine learning features in enterprise SaaS applications. Minerva’s design for optimal integration with legacy and cloud applications using microservices architecture leveraging lightweight infrastructure accelerates deploying ML models in such applications. The study showcases several realistic use cases that have adopted Minerva resulting in twice the speed



of innovation with the same human resources. In addition, the study evaluates the reusability of ML model code across applications in a suite using static configuration or dynamic, generative AI-based mappers, resulting in a 1.15 to 2X faster adoption relative to earlier mechanism in a cutting-edge marketing application suite. Furthermore, Minerva (contAIIn™) provides top-tier security, scalability, and near-real-time prediction capabilities, which are requirements specifically demanded by SaaS applications in marketing domains. Lastly, it helps accelerate ML innovation through the use of ready-to-use, best-in-class, off-the-shelf open-source libraries, which is coined as a new polyglot library capability, not offered by other recent cloud ML frameworks. It's been discovered that a layered design can help with acceleration of innovation by adopting and porting existing models from similar applications into a related business suite or application. Generative AI methods are an encouraging phenomenon in this porting but significant gains do not currently materialize with smaller models when measured with lines of code.

### **Biography:**

Venkata Duvvuri is the Founder of Siriusmindshare labs, a AI research company and recently a Director of data science at Oracle corporation. He is results oriented data science, business, web & marketing analytics leader with over 12 years experience in Data science, Business Analytics, Digital Media Analytics and Web Marketing optimization with leading internationally recognized corporations, additional 10 years software engineering experience and a top business school MBA. He has experience in management of onshore and offshore teams as well as leadership experience ranging from Director to Manager at Fortune 100 companies including marketing agencies. He is a cross functional leader and subject matter expert in machine learning.



# Agentic Framework for Data Engineering, Data Virtualization, and Database Task Automation

**Anandaganesh Balakrishnan**

*AI & Data Engineering, USA*

## Abstract:

The Agentic Framework for Data Engineering, Data Virtualization, and Database Task Automation presents a novel, integrated approach to optimizing the complexities of modern data infrastructure. As organizations handle increasing volumes of data, there is a growing need for scalable, efficient systems to manage data ingestion, transformation, and querying processes. This framework leverages agent-based architecture to streamline data engineering workflows, automate database tasks, and enable seamless data virtualization. The framework reduces manual intervention and enhances system scalability by employing autonomous agents that handle specific data engineering and database development tasks. Automating routine database tasks such as data cataloging, query optimizations, and ETL (Extract, Transform, Load) operations fosters improved performance and resource utilization. Data virtualization is achieved by creating a unified access layer, allowing real-time access to diverse data sources without requiring extensive data replication. This approach enables more efficient decision-making and reporting while reducing latency and operational complexity. The framework optimizes data engineering processes and ensures adaptability and responsiveness to evolving business needs, making it a crucial asset for enterprises needing flexible, automated data systems.

## Biography:

Anandaganesh Balakrishnan is a data engineering and data analytics leader who has held senior leadership roles across the fintech, biotech, and utility domains. His expertise is architecting scalable, reliable, and performant Data Platforms for Advanced Data Analytics, Quantitative Research, and Machine Learning.



He presently holds the position of Principal Software Engineer at a leading Utility firm. He leads the development and optimization of data virtualization infrastructure and data engineering strategies. He collaborates with the enterprise architecture team to optimize and redesign the Organization's data architecture to benchmark and accommodate the next generation of tools. He advises application developers, data products team, database developers, data scientists, and other key stakeholders on data initiatives. His current research is AI on unstructured data, Large Language Models (LLMs), Generative AI (Gen AI), Self-service data analytics, and Data catalogs.



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