UNITAR INTERNATIONAL UNIVERSITY | LIVERPOOL JOHN MOORES UNIVERSITY | MINISTRY OF ECONOMY DEPARTMENT OF STATISTICS MALAYSIA | UNITAR UNIVERSITY COLLEGE KUALA LUMPUR

THE 4TH INTERNATIONAL CONFERENCE ON DATA SCIENCE AND EMERGING TECHNOLOGIES

ΔαSΣT

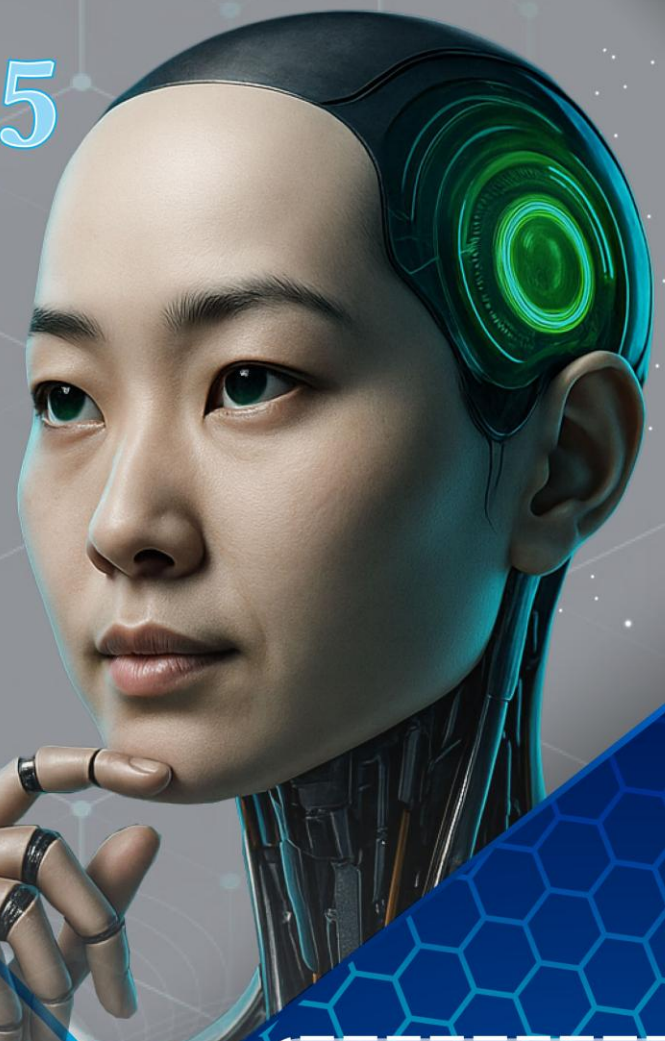
DaSET 2025

"The Rise of Autonomous Intelligence in the Era of Data Science"

OFFICIATED BY:

YBhg. Dato' Sri Dr. Mohd Uzir Mahidin

Chief Statistician,
Department of Statistics Malaysia



PROGRAMME AND ABSTRACTS

9–10 DEC 2025

VENUE: UNITAR INTERNATIONAL UNIVERSITY, PETALING JAYA, SELANGOR, MALAYSIA | HYBRID CONFERENCE

UKM MUC UK Malaysia University Consortium | MELBOURNE INSTITUTE OF TECHNOLOGY | THE UNIVERSITY OF NOTRE DAME AUSTRALIA | UNIVERSITI TEKNOLOGI MARA | UTM UNIVERSITI TEKNOLOGI MALAYSIA | Chulalongkorn University จุฬาลงกรณ์มหาวิทยาลัย | ITS | UPNM | Data Analytic and Collaborative Computing Group

PROGRAMME & ABSTRACTS BOOK

International Conference on Data Science and Emerging Technologies (DaSET 2025)

The Rise of Autonomous Intelligence in the Era of Data Science

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About UNITAR International University

UNITAR International University (UNITAR) was established in 1997 as the first virtual university in Southeast Asia and among the earliest private universities in the country. It is the first institution in Asia to be awarded a QS 5-Star Rating for the Online Learning category. In alignment with the United Nation's Sustainable Development Goals, UNITAR's holistic and innovative learning ecosystem provides a comprehensive programme offering for all socio-economic levels whilst developing highly employable and entrepreneurial global citizens.

It aims to go beyond just providing the learning journey for students in acquiring relevant skill sets, but through their C.A.R.E. — Collaborative, Adaptive, Reflective, and Entrepreneurial education methodology, UNITAR nurtures its students in developing self-awareness of their talents and abilities, as well inculcating in them the need for social responsibility whilst moulding them to be better citizens of the nation.

UNITAR's programmes are offered in 24 locations, including its main campus in urban Kelana Jaya. It has a total enrolment of over 7,000 students spread within 40 homegrown programmes ranging from the Foundation, Diploma and Bachelor's levels to the postgraduate Master's and Doctorate's. To meet the current needs of the industries, UNITAR also provides over 50 professional certification programmes. With APEL, working professionals can continue their education journey with the option to reduce their programme duration.

UNITAR takes pride in having committed academics housed in various faculties and schools. The academic verticals comprise of the Faculty of Business, Faculty of Education & Humanities, the School of Information Technology (SIT) and the School of Media, Arts & Design (SMArD). Since its inception, UNITAR has embarked on an innovative learning methodology where technology is featured significantly, but never aimed to replace human relationships. Its pursuit to offer competitive quality education in both conventional and online teaching modes continues till today, meeting the needs of 21st Century education.

Business

Certificate
- Business Studies

Foundation
- Management

Diploma
- Business Administration
- Logistics Management

Bachelor's Degree
- Business Administration
- Fintech

Master's Degree
- Business Administration

Doctorate
- Business Administration
- Philosophy (PhD) in Business Administration
- Philosophy (PhD) in Management

Accounting

Diploma
- Accounting

Bachelor's Degree
- Accounting

Information Technology

Foundation
- Information Technology

Diploma
- Information Technology

Bachelor's Degree
- Information Technology

Master's Degree
- Information Technology

Doctorate
- Philosophy (PhD) in information Technology

Education & Humanities

Diploma
- Early Childhood Education
- Psychology

Bachelor's Degree
- Education
- Education (UPSI-UNITAR Dual-Degree)
- Early Childhood Education
- Psychology

Post-Graduate Diploma
- Education

Master's Degree
- Early Childhood Education
- Educational Leadership & Management
- Education (Teaching English as a Second Language)
- Instructional Technology

Doctorate
- Philosophy (PhD) in Education

Art & Design

Certificate
- Art and Design

Foundation
- Arts

Diploma
- Animation Design
- Fashion Design
- Interior Design

Bachelor's Degree
- Animation Design with Game Art
- Fashion Design with Marketing

Online mode available
Offered in Bahasa Melayu

Message from the Vice-Chancellor

It is with great pleasure that I welcome our distinguished guests, esteemed keynote speakers, researchers, and all participants to the fourth International Conference on Data Science and Emerging Technologies 2025 (DaSET 2025).

We are profoundly honoured to have YBhg. Dato' Sri Dr. Mohd Uzir Mahidin, Chief Statistician of Malaysia, with us to officiate the opening of DaSET 2025. His presence underscores the critical intersection of robust data governance and our pioneering theme.

My sincere thanks to Professor Dhiya Al-Jumeily, General and Founding Chair of DaSET and our Visiting Professor, for his visionary leadership in fostering the international collaborations that make such a dialogue possible. This conference stands as a testament to that commitment.

On behalf of UNITAR, I extend our deepest gratitude to our renowned keynote and international speakers. Your expertise is invaluable as we navigate this conference's vital theme: The Rise of Autonomous Intelligence in the era of Data Science. You are guiding us in exploring how data science is evolving from predictive analytics to powering self-directed, intelligent systems that will redefine our future.

International conferences like DaSET are the crucibles where theory meets transformation. They are essential for sharing knowledge that bridges academia and industry, fostering the strategic partnerships needed to responsibly steward this new era of autonomous systems. Universities have a dual mandate: to cultivate the creative, ethical thinkers who will solve pressing global challenges, and to ensure our curricula evolve alongside these very technologies, closing the talent gap with industry-informed excellence.

Now, more than ever, it is essential for researchers across all disciplines to develop their capabilities at this confluence of data science, AI, and emerging technologies. The rise of autonomous intelligence presents a paradigm shift, demanding multidisciplinary collaboration to ensure its development is both impactful and aligned with human values.

I am optimistic that these two days will spark meaningful dialogue and forge collaborations that accelerate groundbreaking research. May this conference be a catalyst, empowering you to move forward with strategic partnerships that harness autonomous intelligence for the greater good.

I wish you all a stimulating, rewarding, and profoundly insightful experience at DaSET 2025. May the discussions here today seed the innovative ideas and impactful research that will benefit our global community tomorrow.

Professor Emeritus Tan Sri Dato' Sri Ir. Dr. Sahol Hamid Bin Abu Bakar *FASc*
Vice-Chancellor
UNITAR International University

Message from the Conference Chairs



On behalf of UNITAR International University, Liverpool John Moores University, and the Department of Statistics Malaysia, we extend a warm welcome to our honorable guests, esteemed keynote speakers, and all participants of the fourth International Conference on Data Science and Emerging Technologies 2025 (DaSET 2025). This year's conference, themed "*The Rise of Autonomous Intelligence in the Era of Data Science,*" promises to be a significant gathering for sharing knowledge and fostering innovation.

DaSET 2025 aims to provide a platform for academics and industry practitioners to share the latest trends in data science and emerging technologies, and to establish collaborations that drive impactful research for community development, business success, and economic prosperity.

We are deeply grateful for the support of our university partners: the UK Malaysia University Consortium, Universiti Teknologi MARA, Universiti Teknologi Malaysia, Institut Teknologi Sepuluh Nopember, Indonesia, President University, Indonesia, Chulalongkorn University, Thailand, Melbourne Institute of Technology, Australia, The University of Notre Dame Australia, Institut Teknologi Bandung, Indonesia, National Defence University of Malaysia, CerDaS (Centre for Data Science), UTP Malaysia, and the Data Analytics and Collaborative Computing Group, University of Macau, China. We also sincerely appreciate the strong support from our industry partners: Microsoft Malaysia, Malaysia Digital Economy Corporation (MDEC), The ACCESS group, Statworks Sdn Bhd, and Cybersecurity Malaysia.

We are honored to have Dato' Sri Dr. Mohd Uzir Mahidin, Chief Statistician of Malaysia, to officiate the opening of DaSET 2025. We are also proud to present our distinguished lineup of keynote speakers:

Prof. Dr. Mohd Shafry Mohd Rahim, Vice-Chancellor, Universiti Teknologi Malaysia (UTM); Mr. Lim Chee Gay, Managing Director-GOC APAC, The Access Group & Adjunct Professor of UNITAR International University, Malaysia; Prof. Ts. Dr.-Ing. Lau Sian Lun, Department of Smart Computing and Cyber Resilience, Sunway University, Malaysia; Ts. Kumar Krishnasamy, Microsoft Engineering Lead - FLW/Copilot/Agent, Asia Growth Market & Central Eastern Europe and Middle East Africa; Prof. Li Minn Ang, School of Science, Technology and Engineering, University of the Sunshine Coast, Australia; Prof. Dr. Borys Wrobel, Nectome Inc., USA & European Institute for Brain Research, The Netherlands; Assoc. Prof. Dr. Ivan Serina, Department of Information Engineering, University of Brescia, Italy; Mr. Raja Segaran, Director, State Digital Economy Office, MDEC & Adjunct Professor of UNITAR International University

We extend our sincere thanks to Professor Emeritus Tan Sri Dato' Sri Ir Dr. Sahol Hamid Bin Abu Bakar, Vice Chancellor of UNITAR International University, for his outstanding leadership and support in

fostering international academic collaborations. Our gratitude also goes to Dato' Puvan Balachandran, CEO of UNITAR, and the corporate staff for their continual assistance.

This year, we received 101 paper submissions. Following a rigorous review process, 38 papers were selected for oral presentation, with authors representing 18 different countries. We thank Professor Dr. Michael W. Berry of the University of Tennessee for serving as editor of the DaSET 2025 proceedings, which will be published by Springer in the Lecture Notes in Data Engineering and Communication Technologies series. We are also grateful to the technical reviewers for their time and expertise, and to Springer and Mr. Aninda Bose, Senior Publishing Editor, for their invaluable collaboration.

Our heartfelt thanks go to the dedicated DaSET 2025 committees for their tireless work in organizing this conference, and to everyone who has contributed to its success.

Finally, we wish all participants fruitful discussions and productive sharing throughout DaSET 2025. May this conference inspire new ideas, forge lasting friendships, and cultivate meaningful collaborations.

Professor Dr Yap Bee Wah, Professor Dr Dhiya Al-Jumeily, OBE, and Assoc. Prof. Dr. Farhad Nadi
General and Founding Conference Chairs

Introduction to DaSET 2025

DaSET 2025 aims to bring together leading industry practitioners, academic scientists, researchers, and scholars to exchange and share their experiences and research results. This year, under the theme 'The Rise of Autonomous Intelligence in the Era of Data Science,' the conference provides a premier interdisciplinary platform to present and discuss the most recent innovations, trends, and practical solutions in these fields.

The emergence of autonomous intelligence presents both a profound opportunity and a critical challenge within Industry 4.0. Developing the necessary knowledge and skills to harness these technologies is essential across all domains, from business and manufacturing to healthcare and education. DaSET 2025 provides the vital platform for industry and academia to converge, share insights, and form the collaborations needed to accelerate talent development and solution-building for this new technological era.

The conference is honored to feature renowned international and local keynote speakers who will share their expertise. DaSET 2025 is organized by UNITAR International University, Liverpool John Moores University (UK), and the Department of Statistics Malaysia (DOSM). It is supported by the UK Malaysia University Consortium, Universiti Teknologi MARA, Universiti Teknologi Malaysia, Institut Teknologi Sepuluh Nopember, Indonesia, President University, Indonesia, Chulalongkorn University, Thailand, Melbourne Institute of Technology, Australia, The University of Notre Dame Australia, Institut Teknologi Bandung, Indonesia, National Defence University of Malaysia, CerDaS (Centre for Data Science), UTP Malaysia, and the Data Analytics and Collaborative Computing Group, University of Macau, China. We also sincerely appreciate the strong support from our industry partners: Microsoft Malaysia, Malaysia Digital Economy Corporation (MDEC), The ACCESS group, Statworks Sdn Bhd, and Cybersecurity Malaysia.

Ultimately, DaSET 2025 seeks to create rigorous international and local university-university and university-industry collaborations to drive knowledge transfer and talent development in the era of autonomous intelligence and data science.

All accepted and registered papers of DaSET2025 will be published in the renowned series of "**Lecture Notes on Data Engineering and Communications**" https://www.springer.com/series/15362 by Springer Verlag.

Keynote Speaker 1: Professor Dr. Mohd Shafry Bin Mohd Rahim

Vice-Chancellor, Universiti Teknologi Malaysia

Potential of Quantum Computing for Image Processing Applications

Abstract

The exponential growth in the volume and complexity of digital image data, particularly in fields such as medical diagnostics, satellite remote sensing, and artificial intelligence, presents significant challenges for classical computation. Traditional image processing techniques are increasingly constrained by the computational limits of classical hardware. Quantum Computing (QC) emerges as a transformative paradigm, offering a fundamentally new approach to computation by leveraging the principles of quantum mechanics, including superposition and entanglement.

This keynote explores the potential of quantum computing to revolutionize image processing applications. We review the foundational concepts of Quantum Image Processing. This keynote will enlighten the development of novel quantum algorithms that promise exponential speedups in critical tasks such as edge detection, image segmentation, filtering, and feature extraction. Particular attention is given to the potential impact on medical imaging, where quantum algorithms could drastically reduce image reconstruction times for MRI and CT scans, enhance diagnostic accuracy through superior pattern recognition, and reduce patient exposure to radiation. While the field is still in its early stages, quantum image processing holds significant potential to solve computationally intractable problems, enabling real-time analysis of high-dimensional image data and unlocking new capabilities in computer vision and data science.

Biography

Mohd Shafry Mohd Rahim is a Professor of Image Processing at the Faculty of Computing, University Teknologi Malaysia (UTM), Malaysia. He also serves as Research Fellow of Media and Game Innovation of Excellence (MaGICX), Institute of Human-Centred Engineering (iHuMeN), University Teknologi Malaysia and leading Image Processing and Application Research Initiatives. His passion is to explore new invention on processing various type images in the emerging application based on the revolution of technology for prospering lives. His research interests include image enhancement, feature extraction, segmentation, recognition, detection and classification, deep learning, computer graphics, computer vision and digital media. He currently holds the position of Vice-Chancellor of UTM.

Keynote Speaker 2: Mr. Lim Chee Gay

Managing Director-GOC APAC,
The Access Group, Malaysia & Adjunct Professor of UNITAR International University

AI-First Mindset Transformation: Leading Toward Autonomous Intelligence

Abstract

In an era where artificial intelligence is reshaping the future of work, organizations face a critical question: How do we transform from AI spectators to AI architects? This keynote explores the strategic journey of building an AI-first culture across a global organization.

Drawing from real-world experience leading Global Operations Centre, this presentation examines the practical challenges and breakthrough moments in driving AI transformation across an organization. From deploying agentic AI tools for software engineering to embedding AI fluency across every department, we'll explore how to move beyond pilot projects to enterprise-wide adoption.

Key insights include strategies for scaling AI literacy across diverse teams, overcoming organizational resistance to change, and fostering a culture where innovation becomes everyone's responsibility—not just the domain of technical specialists. The session will share lessons learned from hackathon initiative, demonstrating how to activate entire organizations as participants in the AI evolution rather than passive observers.

Attendees will gain actionable frameworks for leading AI transformation, practical approaches to talent development in the age of autonomous intelligence, and

insights into building organizational cultures that thrive on continuous innovation. This is a story of how one team's commitment to "One Team, One Goal is reshaping the future of global operations through strategic AI adoption..

Biography

Mr. Lim Chee Gay is the Managing Director of The Access Group's Global Operations Centre (GOC) in Kuala Lumpur, Malaysia, where he leads AI-first transformation initiatives. Under his leadership, the GOC has evolved into a strategic hub for innovation, with a growing team scaling and ambitious plans focused on Gen AI and product innovation.

Chee Gay's leadership philosophy centers on the principle that AI transformation requires cultural change, not just technological adoption. He champions the organization's mission of "One Team, One Goal" while fostering an inclusive workplace culture guided by "Love Work, Love Life, Be You." His strategic initiatives have included developing agentic AI tools, implementing comprehensive AI fluency programs, and creating enterprise-wide innovation challenges that engage every employee in the AI evolution.

Beyond his professional achievements, Chee Gay brings a disciplined approach to leadership shaped by his experience as an active Ironman triathlete, Aquathlon, Open Water swimmer and marathon runner. His commitment to continuous improvement, resilience, and goal achievement in endurance sports mirrors his approach to organizational transformation—embracing challenges, maintaining long-term vision, and celebrating incremental progress toward ambitious goals.

Chee Gay's unique combination of strategic vision, operational excellence, and people-first leadership has positioned The Access Group's Global Operations Centre as a model for AI-driven transformation.

Keynote Speaker 3: Prof. Ts. Dr.-Ing. Lau Sian Lun

Department of Smart Computing and Cyber Resilience,
Faculty of Engineering and Technology,
SUNWAY University, Malaysia

The Autonomy Paradox: When AI Systems Make Decisions We Don't Understand

Abstract

As autonomous intelligence systems demonstrate remarkable capabilities in extracting contextual information from images and sensor data, a paradox emerges: the more sophisticated these systems become, the less humans trust their decisions. This keynote explores the critical tension between AI capability and the "black box nervousness" that hinders real-world adoption.

Modern context-aware systems excel at processing multi-modal data from smart cities, autonomous vehicles, and IoT networks. However, their inability to explain why decisions are made creates deployment barriers and undermines confidence. This opacity is particularly problematic where systems must interpret complex relationships between environmental conditions, temporal patterns, and visual information.

Explainable AI (XAI) offers a solution by transforming black box models into transparent systems. Through attention mechanisms, saliency maps, and feature importance visualization, XAI enables stakeholders to understand not just what an autonomous system decided, but why and how.

Drawing from sustainable AI and smart cities research, this talk presents practical applications of AI to solve problems. The presentation argues that true

autonomous intelligence must integrate explainability from the design phase. For the next generation of data scientists, demanding transparency in AI systems is both a technical skill and an ethical imperative.

Biography

Dr. Sian Lun Lau received his Dr.-Ing. and MSc in Electrical Communication Engineering from the University of Kassel, Germany. He also holds a BEng with Hons in Electronics and Telecommunications Engineering from Universiti Malaysia Sarawak (UNIMAS).

During his nine years (2004 – 2013) as a researcher at the Chair for Communication Technology (ComTec) at the University of Kassel, he has worked and managed various German National- and EU-funded research projects. Among them are EU IST-MobiLife, ITEA S4ALL, BMBF MATRIX and EU-SEAM4US.

He joined Sunway University, Malaysia, in February 2013 as a senior lecturer and Head of the Department of Computing and Information Systems until March 2021. He is currently a Professor at the Department of Smart Computing and Cyber Resilience at the Faculty of Engineering and Technology.

He is currently a senior member of the Institute of Electrical and Electronics Engineers (IEEE) and serves as the Vice Chair of the IEEE Computer Society Malaysia Chapter for the term 2023/2024 and 2025/2026. His research interests include ubiquitous computing, sustainable smart city, context-awareness, and applied machine learning. His recent research projects include ISPF BEST, EDUFI CyberBridge, ImpactXChange and SustHack, MOSTI TED2 RADIC and US DOD DeepSpray+..

Keynote Speaker 4: Ts. Kumar Krishnasamy

Engineering Director, FLW/Copilot/Agent – Asia Growth Market & Central Eastern Europe and Africa
NTU Alumni & Industry Fellow

The Symbiotic Future: From Classroom to Career - Mastering Generative AI for the Next Industrial Revolution

Abstract

The future of work and learning hinges on a single, transformative concept: Human-AI Symbiosis. This keynote session explores how Generative AI (Gen-AI) is not merely automating tasks but is actively pioneering the Fifth Industrial Revolution, driven by collaborative intelligence.

Targeted at shaping the next generation of academic and industrial leaders, this talk dissects the crucial bridge "From Classroom to Career." Will analyze the profound re-orientation of education, moving beyond rote knowledge acquisition toward cultivating critical synthesis, adaptive creativity, and indispensable human oversight - the definitive skills demanded by tomorrow's professional landscape.

Crucially, the session connects the digital transformation to the Social Sustainability Imperative. This symbiotic partnership in industry serves as the lever for establishing AI-driven equity, ensuring ethical governance, fostering transparent practices, and delivering measurable positive SDG (Sustainable Development Goals) as an outcome. This is a call to action for the academic community: to master, shape, and govern this powerful collaborative future being a responsible society.

Biography

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Kumar is a Product & Business Leader at Microsoft, driving transformative growth and large-scale impact across APAC and CEMA. As a strategic ambassador of modern collaborative workplace innovation, he spearheads the adoption of Microsoft 365, Copilot, AI Agents, and Frontline Worker (FLW), Security Compliance & Governance solutions - embedding AI-driven collaboration into the fabric of enterprise productivity.

He leads customer & partner engagements, shaping adaptive usage and transformation strategies establishing prioritization loop for product advancements. With over 2 decades of experience across consulting, product engineering, academia, and product/program management; Kumar blends deep technical fluency with human-centered leadership. He is passionate about building high-performing teams, championing customer/partner/community success, and cultivating thriving technology ecosystems through innovation and rapid experimentation.

Currently, Kumar is also pursuing advanced academic research in the field of Generative AI, with a focus on its implications for social sustainability in workplace collaboration. This adds a unique thought leadership dimension to his work - bridging practical product strategy with future-forward insights around AI ethics, DEI, and collaborative intelligence.

With multiple accolades in the Industry, Kumar is known for his strong ethos of learning, unlearning, and relearning. He is a recognized Microsoft ambassador and seasoned keynote speaker, often delivering sessions at executive briefings,

community events, public forums, and technical readiness programs to inspire technology adoption and responsible innovation.

Keynote Speaker 5: Prof. Li Minn Ang

School of Science, Technology and Engineering,
University of the Sunshine Coast,
Petrie, Australia

Electrical Network Frequency: A New Tool for Multimedia Forensics

Abstract

The accurate geolocation of multimedia evidence is of critical importance to law enforcement and national security. While outdoor localization is well-supported by technologies such as GPS, reliable indoor positioning remains a significant challenge due to the frequent absence of discernible visual landmarks. This presentation addresses this gap by exploring the forensic use of Electrical Network Frequency (ENF), an artifact embedded in audiovisual recordings through interactions with the power grid. Existing research has predominantly utilized ENF for inter-grid classification, distinguishing recordings made in different continental power systems. This work, however, investigates the underexplored potential of subtle intra-grid ENF variations as a cue for location estimation within a single grid. A novel method for intra-grid localization is presented, based on ENF signals extracted from smartphone videos. The extraction of a clean ENF signal from smartphone recordings is a non-trivial task, complicated by significant sensor noise and aliasing artifacts.

To overcome this, we introduce an improved super-pixel-based technique for the robust isolation of the ENF signature. The proposed approach is validated using a dataset of real-world smartphone recordings collected from diverse locations within the Australian Eastern power grid. The extracted ENF signatures are compared against ground-truth data from grid anchor points, provided by a power supplier, demonstrating reliable intra-grid location estimation. To our knowledge,

this work represents the first practical implementation achieving smartphone video localization in an intra-grid scenario.

Biography

Dr Li-minn Ang (Kenneth) received his BEng (Hons) and PhD degrees from Edith Cowan University in Australia. He is currently Professor of Electrical and Computer Engineering at the School of Science, Technology and Engineering at University of the Sunshine Coast. His research interests are in computer, electrical and systems engineering including intelligent systems and data analytics, machine learning, visual information processing, Internet of Things, embedded systems, wireless multimedia sensor systems, reconfigurable computing, and development of innovative technologies for real-world systems including smart cities, grids, engineering, agriculture, environment, health and defense. He is a Fellow of Engineers Australia.

Keynote Speaker 6: Prof. Dr. Borys Wróbel

Nectome Inc., Vancouver, Washington, United States.
European Institute for Brain Research, Amsterdam, The Netherlands

Human Mind is Data: Brain Preservation is a Bridge to Bring this Data to Make Possible Future Restoration to Life

Abstract

Human psychological features—such as personality, skills, and autobiographical memories—are stored long-term in the brain's structural elements. The continuous electrical activity of brain cells is almost certainly not required to maintain this information. The most widely supported neuroscientific hypothesis is that such storage depends mainly on the strength of the connections between brain cells. Other structures may also contribute, but whatever they are, they—and the strengths of these connections—can be preserved by creating chemical bridges (cross-links) between proteins in the brain. If, in addition, chemical substances that prevent water from freezing are introduced, the information in the brain can be stored for hundreds of years at low, though not necessarily extremely low, temperatures. This method of preservation and storage already exists. Reading out this information from an entire human brain is not currently possible. Even if it were, faithfully emulating the human brain and body would require enormous computational resources. However, progress in structural neuroscience (which will eventually enable readout) and computational neuroscience (which will enable emulation) has been exponential. This is why we argue that brain preservation should be made available, on the largest possible scale, to anyone who desires it as a bridge toward restoration to life by future technologies. We also argue that human brain preservation offers a path to prevent possibly disastrous consequences of creation or emergence of artificial super intelligence.

Keynote Speaker 7: Assoc. Prof. Dr. Ivan Serina

Department of Information Engineering,
University of Brescia, Italy

Artificial Intelligence for Sustainable Water Management: Advances, Challenges, and Future Directions

Abstract

Artificial intelligence (AI) is increasingly transforming the way water resources are monitored, predicted, and managed. From forecasting water availability and demand to optimizing distribution and treatment processes, AI-based systems are becoming essential tools for achieving resilient and sustainable water management.

This talk will provide an overview of the current state of the art in AI applications for water management, focusing on three key areas: (i) prediction of water availability, using data-driven and hybrid modelling approaches; (ii) forecasting and optimization of water demand, integrating environmental, social, and economic variables; and (iii) decision-support systems for real-time water allocation and infrastructure management.

The presentation will also discuss the main scientific and operational challenges, including data scarcity, model interpretability, and the integration of AI with physical and hydrological models. Recent research trends will be highlighted as promising directions toward more transparent, adaptive, and efficient water governance.

By combining technical insight with a systems-level perspective, the talk aims to stimulate discussion on how AI can effectively contribute to sustainable and equitable water management under increasing climatic and socio-economic pressures.

Keynote Speaker 8: Mr. Raja Segaran

Director, State Digital Economy Office,
Corporate Affairs, MDEC & Adjunct Professor of UNITAR International University

Developing AI ecosystems in Malaysia's digital economy

Abstract

Malaysia stands at a pivotal moment to shape a vibrant AI ecosystem that fuels our digital economy. By positioning the AI Growth Zone as a catalyst, we can accelerate innovation, drive enterprise adoption, nurture world-class talent, and unlock funding pathways that empower every state to participate in this transformation. Through strategic collaboration between state governments, agencies, and industry partners, Malaysia can build a robust AI value chain that strengthens competitiveness, supports SMEs, and creates future-ready opportunities for our people. This keynote explores how we turn ambition into action, state by state, sector by sector to realise Malaysia's AI Nation ambition.

Biography

Raja is currently the Director of the State Digital Economy Office in the Malaysia Digital Economy Corporation (MDEC), a government agency tasked with developing and leading the country's digital economy. In this role, he leads the execution of strategies to develop the states' digital ecosystems and participates in various national-level platforms, committees, and task forces to shape impactful policies. Beyond MDEC, Raja holds the position of Adjunct Professor in Digital Strategies at UNITAR International University, supporting the integration of industry perspectives into talent development and innovation, where he also serves as Advisor to the Centre for Innovation and Technology Adoption (CITA). He is also a Fellow with the Malaysian Institute of Management (FMIM). Internationally, Raja is the IEEE Global Chair for the Digital Economy & Financial Inclusion (DEFI) Sub-Committee under the IEEE's Digital Resilience Industry Connection Program. Before joining MDEC, Raja

was a Director with Ernst & Young (EY) Consulting in Kuala Lumpur, where he was one of the leaders in the Transformation domain, focusing on setting up and managing medium to large transformation offices for various multinational and local private sector clients.

Virtual Links

Main Room

Link	QR-Code
https://tinyurl.com/daset2025	

Room 1

Link	QR-Code
https://tinyurl.com/daset2025r1	

Conference Schedule

Day 1: Tuesday, 9th December 2025

Time (MYT)	Activities
8:00 -9:00	Online Registration
9:00 -9:05	National Anthem & Doa Recital Main Room: Click to join
9:05 - 9:10	**Welcoming Remarks** **Associate Professor Dr Farhad Nadi** Conference Chair UNITAR International University, Malaysia
9:10 -9:20	**Opening Speech by:** **YBhg Dato' Sri Dr. Mohd Uzir Mahidin** Chief Statistician Department of Statistics, Malaysia
9:20 - 9:25	Montage DaSET2025
9:25 -9:30	Online Photography Session
9:30- 10:00	Break
10:00 -10:30	**Keynote Speaker 1** **Professor Dr. Mohd Shafry Bin Mohd Rahim** Vice-Chancellor, Universiti Teknologi Malaysia *Keynote Title*: Potential of Quantum Computing for Image Processing Applications **Moderator: Dr. Mehdi Samieiyeganeh** UNITAR International University, Malaysia Main Room: Click to Join

10:30 -11:00	**Keynote Speaker 2** **Mr Lim Chee Gay** Managing Director The ACCESS Group, Malaysia & Adjunct Professor, UNITAR International University *Keynote Title:* AI-First Mindset Transformation: Leading Toward Autonomous Intelligence **Moderator: Assoc. Prof. Dr Farhad Nadi** UNITAR International University, Malaysia Main Room: Click to Join
11:00-11:15	Break
11:15 -11:45	**Keynote Speaker 3** **Ts Kumar Krishnasamy** Microsoft Engineering Lead *Keynote Title:* The Symbiotic Future: From Classroom to Career - Mastering Generative AI for the Next Industrial Revolution **Moderator: Assoc. Prof. Dr. Wan Fairos Wan Yaacob** Universiti Teknologi MARA, Malaysia Main Room: Click to Join
11:45 -12:15	**Keynote Speaker 4** **Professor Ts Dr. -Ing Lau Sian Lun** Sunway University, Malaysia *Keynote Title:* The Autonomy Paradox: When AI Systems Make Decisions We Don't Understand **Moderator: Assoc. Prof. Dr. Fakhrul Hazman Yusoff** UNITAR International University, Malaysia Main Room: Click to Join

12:15-12:45	**Keynote Speaker 5** **Mr Raja Segaran** Director, State Digital Economy Office, Corporate Affairs, MDEC & Adjunct Professor, UNITAR International University *Keynote Title:* Developing AI ecosystems in Malaysia's digital economy **Moderator: Assoc. Prof. Dr Syerina Azlin Md Nasir** Universiti Teknologi MARA, Malaysia Main Room: Click to join
12:45-14:00	Lunch Break
14:00 - 16:30	**Paper Presentations** Main Room: Click to join Track 1: Computer Vision, Remote Sensing, and Geospatial AI (7 papers) **Moderator: Muhammad Aiman Bin Md Zuki** UNITAR International University, Malaysia
	Paper Presentations Room 1: Click to join Track 2: Industrial, Environmental, and Emerging Technologies (5 papers) **Moderator: Mrs. Fazidah Wahit** UNITAR International University, Malaysia
16:30 - 16:40	Closing of Day 1 Main Room: Click to join

Day 2: Wednesday, 10th December 2025

Time (MYT)	Activities
09:15 - 09:25	Online Registration
09:25 - 09:30	Welcoming Remarks Main Room: Click to join
09:30 - 10:00	**Keynote Speaker 6** **Professor Li Minn Ang** University of the Sunshine Coast, Malaysia *Keynote Title*: Electrical Network Frequency: A New Tool for Multimedia Forensics **Moderator: Dr. Umar Farooq Khattak** UNITAR International University, Malaysia Main Room: Click to join
10:00-10:30	Break
10:30 – 11:00	**Keynote Speaker 7** **Professor Dr. Borys Wrobel** Nectome Inc., Vancouver, Washington, United States. European Institute for Brain Research, Amsterdam, The Netherlands *Keynote Title*: Human mind is data: Brain preservation is a bridge to bring this data to make possible future restoration to life **Moderator: Professor Jamila Mustafina** Kazan Federal University, Russia Main Room: Click to join
11:00 - 13:15	**Paper Presentations** Main Room: Click to join Track 3: Time Series Analysis and Forecasting (9 papers) **Moderator: Dr. Wan Zakiyatussariroh Wan Husin** Universiti Teknologi MARA, Malaysia

	Paper Presentations Room 1: Click to Join Track 4: Statistical Methods, Process Control, and Anomaly Detection (5 papers) **Moderator: Prof. Sapto Wahyu Indratno** Institut Teknologi Bandung (ITB), Indonesia
13:15 - 14:30	Lunch Break
14:30– 15:00	**Keynote Speaker 8** **Associate Professor Dr. Ivan Serina** Department of Information Engineering, University of Brescia, Italy *Keynote Title*: Artificial Intelligence for Sustainable Water Management: Advances, Challenges, and Future Directions **Moderator: Dr. Tahir Mehmood** UNITAR International University, Malaysia Main Room: Click to join
15:00-15:15	Break
15:15 - 17:00	**Paper Presentations** Main Room: Click to join Track 5: Advanced AI Architectures, Interpretability, and Large Models (7 papers) **Moderator: Dr. Achmad Choiruddin, Institut Teknologi Sepuluh Nopember, Indonesia**
	Paper Presentations Room 1: Click to Join Track 6: Applied Data Science for Health, Public Services, and Social Impact (5 papers) **Moderator: Dr. Mohammad Nasir Abdullah** Universiti Teknologi MARA, Malaysia

17:00- 17:30	Best Paper Awards Closing Ceremony

Paper Presentations Schedule

Track 1: Computer Vision, Remote Sensing, and Geospatial AI

Venue: Main Room: Click to join
Date: 9th December 2025 (Tuesday)
Session 1: 14:00 – 16:30
Session Chair: Muhammad Aiman Bin Md Zuki, UNITAR International University, Malaysia

NO	TIME	ID	TITLE	AUTHORS
1.	14:00 – 14:15	1571201929	XGBoost for Nonparametric Intensity Modeling of Spatial Point Processes with Application to Earthquake Risk Analysis	Muhammad Akmal Abbad, Achmad Choiruddin, and Naufal Luthfan Tasbihi
2.	14:15 – 14:30	1571206077	Monocular Depth Estimation: Model Adaptation Evaluation on Synthetic-to-Real Transfer	Minh Nguyen Duc, Binh Le-Dien, Huy Le-Dang, and Quoc-Trinh Vo
3.	14.30 – 14.45	1571212564	Segmentation-Driven Oriented Bounding Boxes for Accurate Chromosome Detection	Nguyen Duong Nguyen Nhat, Thanh Huyen Dang Thi, Quoc Cuong Nghiem, and Duc Lam Le, Viet Dung Nguyen
4.	14.45 – 15.00	1571213074	Robustness of Spatially Constrained Fernandez-Steel Skew Normal Mixture Model with Spatial Prior for Left Ventricular Wall Segmentation	Miftah Fahira, Nur Iriawan, and Kartika Fithriasari
5.	15.00 – 15.15	1571213760	Comparative Study of Image Recognition Models for Automated E-Waste Identification	Md Mosarrof Hossen, Aya Nabil Sayed, Tala Jano, Ridha Hamila, and Faycal Bensaali

6.	15:15 – 15:30	1571214007	Deep Temporal Convolution for Crop Type Identification from Spectral and Vegetation Index Time Series	Musa Jalili, Syed Hamad Shirazi, Tahir Mehmood, Mushtaq Ali, Mehran Ajmal
7.	15:30 – 15:45	1571223465	Classification of Elliptocytes, Microcytes, and Target Cells Using Pretrained Deep Models	Ahmed Bin Mazhar, Aitezaz Ahsan, Farhad Nadi Tanzeela Yaqoob and Muhammad Yaqoob

Track 2: Industrial, Environmental, and Emerging Technologies

Venue: Room 1: Click to Join
Date: 9th December 2025 (Tuesday)
Session 2: 14:00 – 16.30
Session Chair: Mrs. Fazidah Wahit, UNITAR International University, Malaysia

NO	TIME	ID	TITLE	AUTHORS
1.	14:00 – 14:15	1571201613	Anomaly Detection in Crude Palm Oil Production Using EWMA Control Chart Based on Temporal Convolutional Network Residuals	Adristy Rizki Fahriyah and Muhammad Ahsan
2.	14:15 – 14:30	1571201834	Robust Multivariate Statistical Process Control for Portland Composite Cement Manufacturing: A Simultaneous Max-Half-Mchart Approach Based on the Minimum Regularized Covariance Determinant	Sabina Aisha Fidela and Muhammad Ahsan
3.	14.30 – 14.45	1571202011	Forecasting Palm Oil Production Using a Hierarchical Time Series Approach Extreme Gradient Boosting and Neural Network Autoregressive	Nazia Mahmudah,' Muhammad Ahsan, and Novri Suhermi

4.	14.45 – 15.00	1571206046	Comparative Study of SARIMA and LSTM for Forecasting Seasonal Paddy Yield	Mohammad Nasir Abdullah, Roslah Arsad, and Ilya Zulaikha Zulkifli
5.	15.00 – 15.15	1571213779	From State of the Art to Practice in AI-Water Projects: Challenges and the AI4Water Approach	Salah ELSAYED, Slaheddine KHLIFI, Eva ONAINDIA DE LA RIVAHERRERA, Sana OUNAIES, Ivan SERINA, Salah Eddine TACHI, Fatma TRABELSI

Track 3: Time Series Analysis and Forecasting

Venue: Main Room: Click to join
Date: 10th December 2025 (Wednesday)
Session 3: 11:00 – 13.15
Session Chair: Dr. Wan Zakiyatussariroh Wan Husin, Universiti Teknologi MARA, Malaysia

NO	TIME	ID	TITLE	AUTHORS
1.	11:00 – 11:15	1571200596	Optimizing Commuter Line Capacity Planning Using LSTM and Genetic Algorithm	Muchammad Aqik Ardiansyah and Achmad Choiruddin
2.	11:15 – 11:30	1571204521	Air Quality Forecasting with Hybrid Statistical-Deep Learning Models	Novri Suhermi, Rahmatin Nur Amalia, Rahida Rihhadatul Aisy, Akhmad Imam Haromain, Rendi Andria Gita Putra, Elsa Meilisa, Septika Rizmadhani, Karina

				Wahyu Sri Utami, Muhammad Fairuz Zaqi, Rabithah Zahiratus Salwa, Muhammad Hasan Aqilah, Dimas Ajisaka Saputra and Narsischa Sekar Ningrum
3.	11:30-11:45	1571205269	Crude Oil Price Prediction Using Time Series Statistical Modelling Techniques	Sunny Raj Pradeep Kumar Gupta, Jamila Mustafina, Mehdi Samieiyeganeh, Nailya Sultanova
4.	11:45-12:00	1571205989	Bitcoin Volatility Forecasting Using a Hybrid Generalized Autoregressive Conditional Heteroscedasticity - Long Short-Term Memory (GARCH-LSTM) Model	Farah Syahfira and Irhamah
5.	12:00-12:15	1571205998	Forecasting Air Quality Index Using LSTM and CNN-LSTM Methods	Bagas M. Adyatma, Irhamah, Tintrim D.A.Widhianingsih, Adatul Mukarromah
6.	12:15 – 12:30	1571206060	Forecasting Natural Gas Power Generation Using Attention-Based Deep Learning Model	Muhamad Syukron, Muhammad Rifqy Rezvany Anwar, Putri Hanna Nareswari, Anisa Ardiani Putri, Joycelin Gracelda Resi Gaya
7.	12:30 – 12:45	1571213701	Regularized Self-Exciting Threshold Autoregressive Modeling: A Simulation Study with Application on Air Quality Case Modeling	D. A. Safira and H. Kuswanto, M. Ahsan

8.	12:45 – 13:00	1571213703	A Machine Learning Approach to NASDAQ Index Prediction: XGBoost Model with Moving Average and Lagged Price Features	Yoel Christopher Tjen and Hasanul Fahmi
9.	13:00 – 13:15	1571213815	Intra-Hour Global Horizontal Irradiance Forecasting Using CNN-Based Feature Extraction with Multi-Model Feature Selection and LSTM Prediction	Parisa Bahraminikoo, Sing Yee Chua, Boon Han Lim, Yong Kheng Goh , Yuen Chark See, Feng Zhang , Dachuan Xu , Yong Zhang

Track 4: Statistical Methods, Process Control, and Anomaly Detection

Venue: Room 1: Click to Join
Date: 10th December 2025 (Wednesday)
Session 4: 11:00 – 12:15
Session Chair: Prof. Sapto Wahyu Indratno, Institut Teknologi Bandung (ITB), Indonesia

NO	TIME	ID	TITLE	AUTHORS
1.	11:00– 11:15	1571206098	Volume-Ratio-Variance Based Outlier Factor for Anomaly Scoring	Pajaree Onsoy and Krung Sinapiromsaran
2.	11:15– 11:30	1571212519	Bivariate Generalized Weibull Regression Modeling and Identification of Factors Affecting Life Expectancy and Poverty	Elisabeth Vianey Mali, Purhadi and Setiawan
3.	11:30– 11:45	1571213648	Successive Difference Covariance Matrix for Monitoring High-Dimensional Spectral	Ayu Afrinah, Muhammad Mashuri and Muhammad Ahsan

			Data: A Functional Hotelling's T^2 Approach	
4.	11:45 – 12:00	1571213650	RKHS-Based Adaptive Penalized Spline-Kernel Regression Applied to Human Development Index	Muhammad Sopian Sauri, I Nyoman Budiantara and Vita Ratnasari
5.	12:00 – 12:15	1571213824	Improving Fast Double Bootstrap for h Chart Based Control Limits Using Robust Memoryless Property Estimator	M. Y. Matdoan, M. Mashuri and M. Ahsan

Track 5: Advanced AI Architectures, Interpretability, and Large Models

Venue: Main Room: Click to join
Date: 10th December 2025 (Wednesday)
Session 5: 15:15– 17:00
Session Chair: Assoc. Prof. Dr Achmad Choiruddin, Institut Teknologi Sepuluh Nopember, Indonesia

NO	TIME	ID	TITLE	AUTHORS
1.	15:15– 15:30	1571202017	Hybrid Deep Learning and Classical Machine Learning Approach for Deepfake Detection	Kelila Karenza Kumala, Nicole Livia Alexandra, Griven Nathanael and Andry Chowanda
2.	15:30- 15:45	1571205606	MLLM Interpreter: A Model-Agnostic Method to Explain Multimodal Large Language Models	Marcel Henkel, Anna Kaiser and Nadia Burkart

3.	15:45-16:00	1571206067	Modular Numeric Planning in Python: A Framework for Learning-Based Heuristics	Valerio Borelli, Alfonso Emilio Gerevini, Enrico Scala, Ivan Serina
4.	16:00-16:15	1571208572	Explainable AI and Gated Recurrent Units for Predicting Stock Movements in the IDX ESG Leaders Index	Noviyanti Santoso, Rezkihana Nur Fadhilah, Muhammad Rafli Nugrahasyach, Shuzlina Abdul Rahman and Siti Meriam Zahari
5.	16:15-16:30	1571213821	LiteRAB: A Lightweight Residual Attention Network for Real-Time Image Dehazing	Syeda Rabail Zahra, Farhan Hussain, Ali Hassan, Ali Khalid, Umar Farooq Khattak, Charles Lim and Muhammad Amir Khan
6.	16:30-17:45	1571217814	A Hybrid Framework for Feature Extraction: Integrating LDA-Based Topic Modeling with Clustering for Enhancing SVM Classification on Small Datasets	Fazidah Wahit and Nor Samsiah Sani
7.	16:45-17:00	1571221973	LabourLens AI: A Generative AI Assistant for Labour Market Intelligence	Liyana Safra Zaabar, Nur Hurriyatul Huda Abdullah Sani, Muhammad Amirul Asraf bin Awang Chik @ Alias, Mohd Radziq bin Alias, Muhammad and Khairul Syafiq bin Mustafa

Track 6: Applied Data Science for Health, Public Services, and Social Impact

Venue: Room 1: Click to Join
Date: 10th December 2025 (Wednesday)
Session 6: 15:30 – 17.00
Session Chair: Dr. Mohammad Nasir Abdullah, Universiti Teknologi MARA, Malaysia

NO	TIME	ID	TITLE	AUTHORS
1.	15:30 – 15:45	1571194215	Modeling Spatial Heterogeneity of Crime Cases Using a Geographically Weighted Artificial Neural Network (GWANN)	Muhammad Syawal, Hasbi Yasin, Deby Fakhriyana, and Budi Warsito
2.	15:45 – 16:00	1571201607	A BHHH-Optimized Geographically Weighted Poisson Generalized Inverse Gaussian Regression for Localized Maternal Mortality Risk Mapping	Yusrianti Hanike, Purhadi and Achmad Choiruddin
3.	16:00 – 16:15	1571201697	Classification of Stroke Based on Clinical and Demographic Risk Factors Using a Binary Response Multivariate Adaptive Regression Splines (MARS) Model	Sri Sulastri, Bambang Widjanarko Otok, and Achmad Choiruddin
4.	16:15 – 16:30	1571208786	Poverty Population Segmentation Using the CLARANS Clustering Method	Syarifah Diana Permai, Jeklin Harefa, Alexander Alexander, Kania Agatha
5.	16:30 – 16:45	1571219711	Survival Analysis Methods for Lung Cancer Data Using Imputation Techniques	Muniba M. Ahmed, Muna A. N. Rayashi and Faiz Elfaki1

Proceeding Abstracts

Track 1: Computer Vision, Remote Sensing, and Geospatial AI

NO	ID	TITLE	AUTHORS
1.	1571201929	XGBoost for Nonparametric Intensity Modeling of Spatial Point Processes with Application to Earthquake Risk Analysis	Muhammad Akmal Abbad, Achmad Choiruddin, and Naufal Luthfan Tasbihi
2.	1571206077	Monocular Depth Estimation: Model Adaptation Evaluation on Synthetic-to-Real Transfer	Minh Nguyen Duc, Binh Le-Dien, Huy Le-Dang, and Quoc-Trinh Vo
3.	1571212564	Segmentation-Driven Oriented Bounding Boxes for Accurate Chromosome Detection	Nguyen Duong Nguyen Nhat, Thanh Huyen Dang Thi, Quoc Cuong Nghiem, and Duc Lam Le, Viet Dung Nguyen
4.	1571213074	Robustness of Spatially Constrained Fernandez-Steel Skew Normal Mixture Model with Spatial Prior for Left Ventricular Wall Segmentation	Miftah Fahira, Nur Iriawan, and Kartika Fithriasari
5.	1571213760	Comparative Study of Image Recognition Models for Automated E-Waste Identification	Md Mosarrof Hossen, Aya Nabil Sayed, Tala Jano, Ridha Hamila, and Faycal Bensaali
6.	1571214007	Deep Temporal Convolution for Crop Type Identification from Spectral and Vegetation Index Time Series	Musa Jalili, Syed Hamad Shirazi, Tahir Mehmood, Mushtaq Ali, Mehran Ajmal

7.	1571223465	Classification of Elliptocytes, Microcytes, and Target Cells Using Pretrained Deep Models	Ahmed Bin Mazhar, Aitezaz Ahsan, Farhad Nadi Tanzeela Yaqoob and Muhammad Yaqoob

XGBoost for Nonparametric Intensity Modeling of Spatial Point Processes with Application to Earthquake Risk Analysis

Muhammad Akmal Abbad[1], Achmad Choiruddin[1], and Naufal Luthfan Tasbihi[1]

[1] Department of Statistics, Institut Teknologi Sepuluh Nopember (ITS), Surabaya 60111, Indonesia
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Abstract. Comprehensive seismic hazard modeling is essential to support disaster mitigation in regions with high tectonic activity such as Sumatra. Earthquake modeling based on spatial point processes has been frequently conducted, in-cluding the involvement of geological factors. Unfortunately, the modeling that has been done is limited to parametric and semi-parametric models that have limitations in parametric form, both in whole and in part. Although these limitations can be overcome with nonparametric models, the models that have been studied previously can only accommodate a limited number of covariates, whereas in the case of Sumatra earthquakes there are many covariates that can have an effect. In this study, intensity modeling based on a nonparametric model involving many covariates was performed by imple-menting XGBoostPP, which is an adaptation of the Extreme Gradient Boost-ing (XGBoost) algorithm in a point process framework to estimate the earth-quake intensity function in Sumatra. The results indicate that, despite the clustered distribution of Sumatra earthquake epicenters, the standard Poisson likelihood loss is more suitable than the dynamic weighted variant, empha-sizing that dynamic weighting schemes must be empirically validated for each application. Furthermore, the model obtained is also capable of identi-fying the covariates that most influence earthquake intensity, including depth, dip, and nearest distance from earthquake to the subduction zone.

Keywords: Earthquake Intensity Function Estimation, Machine Learning, Natural Disasters, Spatial Point Process, XGBoostPP.

Monocular Depth Estimation: Model Adaptation Evaluation on Synthetic-to-Real Transfer

Minh Nguyen Duc[1], Binh Le-Dien[1], Huy Le-Dang[1], and Quoc-Trinh Vo[1][0000−0001−8603−4209]

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Abstract. Monocular depth estimation (MDE) has lacked large-scale labeled datasets to adapt to real-world applications. Synthetic datasets offer a practical solution by providing unlimited, precisely annotated training samples. Unfortunately, MDE models often suffer from poor generalization due to domain shifts. This paper presents a comparative study on the adaptation of three state-of-the-art MDE models, including Depth Anything V2, MIM-Depth, and EcoDepth, which are trained on synthetic datasets (Virtual KITTI 2 and VirDepth) and evaluated on the real-world dataset (KITTI). The strengths and weaknesses of different adaptation strategies in the above mentioned models, including teacher-student distillation, masked image modeling, and diffusion-based approaches are evaluated and analyzed using standard depth estimation metrics. Experimental results show that Depth Anything V2 achieves the best synthetic-to-real transfer, followed closely by MIM while EcoDepth hardly generalizes accurate estimation beyond synthetic domains. The findings highlight the critical role of training paradigms and dataset alignment in enabling robust cross-domain transfer, offering insights for developing scalable depth estimation systems.

Keywords: Monocular depth estimation, Synthetic-to-real adaptation, Domain generalization, Depth Anything V2, MIM, EcoDepth

Segmentation-Driven Oriented Bounding Boxes for Accurate Chromosome Detection

Nguyen Duong Nguyen Nhat[1], Thanh Huyen Dang Thi[1], Quoc Cuong Nghiem[1], and Duc Lam Le[2], Viet Dung Nguyen[1,*]

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Abstract. Automated chromosome analysis is essential for genetic diagnostics and cytogenetic research. However, the irregular morphology of chromosomes—often elongated, bent, and non-axis-aligned—limits the performance of traditional detection methods based on axis-aligned bounding boxes (AABBs). In this paper, we present a segmentation-driven Mask-to-Oriented Bounding Box (Mask-to-OBB) approach that converts chromosome masks into oriented bounding boxes (OBBs), capturing both position and orientation. Our pipeline integrates SAM-based segmentation, CVAT refinement, and several geometric conversion algorithms such as minimum-area rectangles and PCA-based fitting. Experimental results on a public metaphase chromosome dataset show that the proposed Mask-to-OBB detectors achieve competitive mAP performance (mAP_{50}: 0.953, $mAP_{50:95}$: 0.846 for MinArea variant) to the YOLOv8-AABB baseline (mAP_{50}: 0.984, $mAP_{50:95}$: 0.838), while significantly improving orientation alignment and morphological consistency. These findings demonstrate that OBB representations provide a geometrically faithful alternative for accurate and interpretable chromosome detection.

Keywords: Chromosome detection, Mask-to-OBB, Oriented bounding box, self-supervised.

Robustness of Spatially Constrained Fernandez-Steel Skew Normal Mixture Model with Spatial Prior for Left Ventricular Wall Segmentation

Miftah Fahira, Nur Iriawan*, and Kartika Fithriasari

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Abstract. This paper develops a practical and accurate method for segmenting the left-ventricular wall in echocardiographic images. The approach is anat-omy aware and skew aware, uniting a Fernandez-Steel Skew Normal in-tensity model with a Markov Random Field and an explicit spatial prior so the model knows where the ventricle is likely to appear. We construct a probabilistic spatial map from aggregated ground truth contours and use it to bias the label field toward anatomically plausible regions while the skew-normal components capture the right-skewed intensity histo-gram typical of ultrasound. Experiments use the public HMC-QU da-taset in the apical four-chamber view consist of 109 videos and 2,349 ground truth that are aggregated to build the spatial prior, and a repre-sentative subset of frames is used for testing. The proposed model is compared with a spatially constrained Gaussian mixture and with the original skew-normal mixture without a spatial prior, and performance is assessed with Dice, IoU, and CCR under a cross-validated protocol. The proposed method achieves Dice 86.78, IoU 76.65, and CCR 98.77, and consistently produces anatomically plausible masks that remain fo-cused on the correct region even in low-contrast frames, with a modest increase in running time due to skewness estimation and use of the spa-tial prior. These findings indicate that combining intensity skewness modeling, local spatial coherence, and explicit anatomical guidance can meaningfully improve ultrasound segmentation in practice.

Keywords: FSSN, MRF, Spatial Prior, Image Segmentation, Bayesian.

Comparative Study of Image Recognition Models for Automated E-Waste Identification

Md Mosarrof Hossen[1,*], Aya Nabil Sayed[1], Tala Jano[1], Ridha Hamila[1], Faycal Bensaali[1]

[1]Department of Electrical Engineering, College of Engineering, Qatar University, Doha, Qatar; Email: md.hossen@qu.edu.qa (M.M.H.), as1516645@qu.edu.qa (A.N.S.), tj1610336@student.qu.edu.qa (T.J.), hamila@qu.edu.qa (R.H.), f.bensaali@qu.edu.qa (F.B.)
**Corresponding author: Md Mosarrof Hossen (md.hossen@qu.edu.qa)*

Abstract. The increasing amount of electronic waste (e-waste) presents a serious environmental and big operational challenge for recycling facilities, since manual sorting still remains slow and inconsistent. Automated visual detection offers a practical solution for identifying and classifying discarded electronics more efficiently. This study presents a comparative evaluation of state-of-the-art object detection frameworks, YOLO (v5, v8, and v11) and Detectron2 (Faster R-CNN and RetinaNet), for e-waste recognition. The models were evaluated on seven of the most common representative categories of e-waste, including batteries, keyboards, laptops, mobile phones, monitors, mouse and printed circuit boards (PCBs). All models were trained under identical settings and evaluated using precision, recall, and mean Average Precision (mAP). The results demonstrate that YOLOv8m has the best balance between speed and accuracy, with an mAP@50 of 94\% and real-time performance at 80 FPS. Detectron2 models had similar accuracy, but the time it took to make predictions was much longer. Qualitative results show even more that YOLOv8m makes consistent and well-localized predictions across many categories. In general, the results show that modern YOLO designs strike a good compromise between accuracy and speed, making them good choices for automated systems for sorting and recycling e-waste.

Keywords: E-waste Management, Recycling Automation, E-waste Detecton, Object Detection, YOLO, Detectron2

Deep Temporal Convolution for Crop Type Identification from Spectral and Vegetation Index Time Series

Musa Jalili[1], Syed Hamad Shirazi[1], Tahir Mehmood[2], Mushtaq Ali[1], Mehran Ajmal[1]

[1] Department of CS and IT, Hazara University, Mansehra, Pakistan

[2]School of Information Technology, UNITAR International University, Malaysia
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Abstract. Accurate crop mapping from satellite imagery is essential for agricultural monitoring, yield forecasting, and sustainable land-use planning. Yet the high spectral similarity among many crops makes this task challenging. This study evaluates a temporal deep learning approach for crop classification using multi-temporal Sentinel-2 imagery and ground-truth data collected by the Asian Development Bank. We generated monthly median composites from October 2022 to October 2023 and extracted nine spectral bands and vegetation indices (including NDVI, NDWI, and NBR) for each sample. A Temporal Convolutional Network (TCN) was trained to classify five major crops (wheat, maize, rice, sugarcane, and tobacco). The TCN achieved an overall accuracy of 90.4% and a macro F1-score of 0.902. Most misclassification occurred between wheat and maize, likely due to their overlapping phenological cycles. These results show that TCNs effectively capture crop phenology in Sentinel-2 time series and offer a robust, computationally efficient alternative to recurrent and hybrid deep learning models for satellite-based crop mapping.

Keywords: Temporal Convolutional Networks, Sentinel-2, Crop Classification, Remote Sensing.

Fine-grained Classification of Anaemic RBC Cells Using Pre-trained Deep Models

Ahmed Bin Mazhar[1], Aitezaz Ahsan[1], Farhad Nadi[3] Tanzeela Yaqoob[2] and Muhammad Yaqoob[1]

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[2]School of Health, Medicine and Life Sciences, University of Hertfordshire, UK
[3]School of Information Technology, UNITAR International University, Malaysia

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Abstract. Anaemia, defined as the deficiency or deformity of red blood cells, poses a significant threat to global healthcare systems due to its diverse aetiology and prevalence among vulnerable populations. Standard anaemia diagnosis relies on complete blood count (CBC) tests and manual microscopic examination of RBC morphology, which are labourintensive, time-consuming and prone to human error. This paper investigates the potential of deep learning models for classifying three types of abnormal red blood cells: (i) Elliptocytes, (ii) Microcytes, and (iii) Target cells from peripheral blood smear images. We systematically evaluate two convolutional neural network architectures: (i) MobileNetV2, and (ii) DenseNet-121, using a custom dataset, containing RBC cell images which are extracted from the AneRBC-1 dataset. The decision-making of each model is interpreted with Grad-CAM-based visualisations by highlighting the input regions that influenced the decisions made by the model. Despite DenseNet-121 achieving higher classification performance than MobileNetV2 across all metrics for Elliptocytes, Microcytes, and Target Cells, we observed that the performance of both models is affected by the similar morphology of microcytes and target cells. Whereas, properly elongated Elliptocytes were consistently classified correctly by both models. This work highlights the potential of optimised deep learning models to accelerate and automate anaemia diagnosis in a real-time healthcare setting. The code and dataset are made available in a Git repository for future research [1].

Keywords: Anaemia Classification · RBC · Blood Smear Image · Elliptocytes · Microcytes · Target Cells · Medical Image Processing

[1] https://github.com/ch-aitezaz/rbc-classification-using-deeplearning

Track 2: Industrial, Environmental, and Emerging Technologies

NO	ID	TITLE	AUTHORS
1.	1571201613	Anomaly Detection in Crude Palm Oil Production Using EWMA Control Chart Based on Temporal Convolutional Network Residuals	Adristy Rizki Fahriyah and Muhammad Ahsan
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4.	1571206046	Comparative Study of SARIMA and LSTM for Forecasting Seasonal Paddy Yield	Mohammad Nasir Abdullah, Roslah Arsad, and Ilya Zulaikha Zulkifli
5.	1571213779	From State of the Art to Practice in AI-Water Projects: Challenges and the AI4Water Approach	Salah ELSAYED, Slaheddine KHLIFI, Eva ONAINDIA DE LA RIVAHERRERA, Sana OUNAIES, Ivan SERINA, Salah Eddine TACHI, Fatma TRABELSI

Anomaly Detection in Crude Palm Oil Production Using EWMA Control Chart Based on Temporal Convolutional Network Residuals

Adristy Rizki Fahriyah[1][0009-0006-6167-5310] and Muhammad Ahsan[2][0000-0003-3444-2766]

Institut Teknologi Sepuluh Nopember, Surabaya, 60111, Indonesia

Abstract. Crude Palm Oil (CPO) one of the top world commodities with timescale market fluctuations and shifts in the production pattern after 2020. Recent studies have highlighted the need for rigorous monitoring and detection of production anomalies. This study proposes and evaluates an anomaly detection system in which a Temporal Convolutional Network (TCN) is integrated with an Exponentially Weighted Moving Average (EWMA) control chart. This study comprises two significant steps. To establish a normal production behavior baseline, the TCN model is trained on production data from 2007 to 2019 (Phase I). The model then predicts 2020 values until 2023 (Phase II) and compares them with actual production values. The residuals were then monitored using the EWMA control chart, which correctly flagged known anomalies in the baseline period. In the period following 2019, departures were frequently beyond EWMA limits, indicating significant changes in production. The TCN based approach outperformed the standard ARIMA models, particularly in forecasting the complex production trends observed after 2020.

Keywords: Temporal Convolutional Network (TCN), Anomaly Detection, EWMA Control Chart.

Robust Multivariate Statistical Process Control for Portland Composite Cement Manufacturing: A Simultaneous Max-Half-Mchart Approach Based on the Minimum Regularized Covariance Determinant

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Abstract. Ensuring consistent quality in cement production is important in the manufacturing industry because cement quality has a significant impact on building strength, durability, and reliability. Conventional univariate control charts frequently prove insufficient for multivariate data, particularly in processes with numerous interdependent quality attributes. To address this, the present study applies the Max-Half-MChart combined with the Minimum Regularized Covariance Determinant (MRCD) estimator to monitor the production quality of Portland Composite Cement (PCC). The Max-Half-Mchart is designed to detect process variations that may not be identified by conventional approaches, while MRCD provides a more stable covariance estimation under high-dimensional data and the presence of outliers. An examination of Phase I and Phase II production data revealed many out-of-control signals linked to mean shifts, variability shifts, and concurrent alterations in both mean and variability. Further inspection revealed that the Blaine fineness most significantly contributed to these Out-of-Control observation, driven by its relatively large variability compared with other quality parameters. The multivariate process capability indicators were assessed, resulting in MP_P = 0.97 and MP_{Pk} = 1.65. The numbers show that the process mean is nearing the goal specification and complies with industry standards. However, an MP_P value below one signifies that variability persists at a reasonably high level. Although the current process meets specified standards, additional enhancements are required to improve process stability and minimize PCC output variation.

Keywords: Quality Control. Max-Half-Mchart, Minimum Regularized Covariance Determinant

Forecasting Palm Oil Production Using A Hierarchical Time Series Approach Extreme Gradient Boosting And Neural Network Autoregressive With Exogenous Input

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Abstract. Shifts in rain patterns can affect palm oil production. Thus, to be able to forecast accurately, we need to be able to understand data hierarchies and seasonal patterns across production regions. This study suggests using Extreme Gradient Boost (XGboost) along with Neural Network Autoregressive with eXogenous Input (NNARX) and exogenous rain variables as well as a Bottom-Up Hierarchical Time Series (HTS) forecasting model. This study centers on comparing the performance of XGboost and NNARX , using a rolling window forecasting method with a 4-year window studying the yearly rainfall and the multi-tiered structure of 9 estates within 3 regions of a plantation. The model is based on 2016 to 2024 yield data (calculated by the amount of production and area harvested) along with the rainfall data. This study aims to evaluate model performance by using metrics such as mean absolute percentage error (MAPE), root mean square error (RMSE), and pattern similarity metrics. The results demonstrated that XGboost has a greater performance in these criteria as evidenced by the average MAPE and RMSE values of 18.38 and 0.29 as compared to NNARX which produced an average MAPE and RMSE of 24.51 and 0.37 across all the areas of study. The model best able to capture both rainfall lag effects and seasonal patterns is XGboost. The 2025 forecasts produced to demonstrate HTS aggregation for the best model are plausible and reflect a stable trend for production over the time period. For palm oil companies, these results enable Harvesting and Logistics and Climate Risk Mitigation to be managed at an advanced level through data.

Keywords: Hierarchical Time Series, NNARX, Palm Oil, Production Forecasting, Rainfall, Rolling Window Forecasting, XGBoost.

Comparative Study of SARIMA and LSTM for Forecasting Seasonal Paddy Yield

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Abstract. Accurate forecasting of paddy yield is crucial for strengthening food security and guiding resource allocation in agriculture. This study provides a systematic evaluation of two forecasting approaches, namely the Seasonal Autoregressive Integrated Moving Average (SARIMA) model and the Long Short-Term Memory (LSTM) neural network. Historical net paddy yield data from five locations in Perlis, Malaysia, covering the years 2010 to 2022 with biannual cropping seasons, were used as the dataset. Preprocessing steps included cleaning, standardization, and partitioning into training and testing sets. SARIMA models were constructed following the Box-Jenkins methodology with model order identified using ACF, PACF, and information criteria, while LSTM models employed sliding-window transformation, data normalization, and hyperparameter tuning. Forecasting performance was assessed through Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE). Results showed that SARIMA produced lower errors in three locations characterized by strong seasonal patterns, while LSTM provided superior performance in two locations where nonlinear yield dynamics were more pronounced. Both methods generated five-year forecasts, with SARIMA producing stable seasonal projections and LSTM yielding narrower uncertainty intervals in favourable locations. The findings highlight the complementary strengths of statistical and deep learning approaches in agricultural forecasting and provide empirical evidence to support decision-making in model selection for paddy yield prediction.

Keywords: Agricultural Forecasting, Deep Learning, Long Short-Term Memory, Paddy Yield, Seasonal ARIMA

From State of the Art to Practice in AI-Water Project: Challenges and the AI4Water Approach

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Abstract. Coastal water systems in the Mediterranean are under mounting stress from non-stationary climate drivers, growing demand, saltwater intrusion, and challenging conventional management approaches. Artificial intelligence offers promising tools - from physics-aware deep learning and Earth-Observation fusion to constrained reinforcement learning and decision optimization - but operational uptake is hindered by recurrent gaps in robustness, uncertainty reliability, explainability, safety under constraints, and data/model interoperability. This position paper bridges state of the art and practice by delivering a critical synthesis of AI for water management and by proposing the AI4Water approach, an integrated framework designed for deployment in four representative coastal contexts in Tunisia, Algeria, Italy, and Egypt. The framework combines hybrid, physics-guided and Earth-Observation-fused prediction with probabilistic verification, tail-risk reporting, and safe multi-objective control formulated as constrained decision problems, all embedded in a standards-based Decision Support System co-designed with stakeholders. Rather than reporting new experimental results, we articulate a stance and a roadmap that translate known weaknesses into actionable evaluation protocols and design guidelines aimed at early-warning, scenario analysis, and transparent policy support. By focusing on verifiable performance, interoperability, and user-centred governance, AI4Water charts a practical path to make AI methods trustworthy and useful for day-to-day decisions in coastal water management.

Keywords: AI for Water, coastal aquifers, Earth-Observation, physics-guided learning, uncertainty, explainability, constrained reinforcement learning, decision support systems, autonomy-aware DSS, human-in-the-loop.

Track 3: Time Series Analysis and Forecasting

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Optimizing Commuter Line Capacity Planning Using LSTM and Genetic Algorithm

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Abstract. Frequent and unpredictable daily fluctuations in passenger demand pose a major challenge for capacity planning in urban rail systems . This study examines whether incorporating Google Trends data as exogenous variables can improve short-term forecasts for Commuter Line passengers in Greater Jakarta. We employ a Long Short-Term Memory (LSTM) model with hyperparameters optimized through manual tuning or a Genetic Algorithm (GA). Daily data from January 2021 to July 2025 include passenger counts and six Google Trends indicators. Four scenarios were evaluated: Model 1 (LSTM with manual tuning without Google Trends), Model 2 (LSTM with manual tuning with Google Trends), Model 3 (GA-optimized LSTM without Google Trends), and Model 4 (GA-optimized LSTM with Google Trends). Cross-correlation analysis revealed strong associations between search trends and passenger numbers; however, adding Google Trends did not consistently enhance accuracy. Model 4 achieved the best performance (RMSE 119,652; MAPE 10.85%), while Model 3 was highly comparable (RMSE 127,710; MAPE 11.51%), differing by only 0.66 percentage points. Based on the principle of parsimony, Model 3 is recommended as the optimal solution. GA-based optimization proved to be the most influential factor, delivering substantial gains over manual tuning. The final forecast using Model 3 effectively captured daily fluctuations and upward trends, confirming its applicability as a reliable decision-support tool for operational capacity planning.

Keywords: Capacity Planning, Commuter Line, Google Trends, Hybrid GA-LSTM, Nonlinear Forecasting.

Air Quality Forecasting with Hybrid Statistical-Deep Learning Models

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Abstract. The air quality in Jakarta City, particularly at the DKI4 Station (Lubang Buaya), exhibits significant fluctuations due to the growth of motor vehicles and industrial activities. This study aims to compare the performance of five time series forecasting models, namely RNN, LSTM, GRU, NNAR, and N-BEATS in predicting daily concentrations of PM_{10} and O_3 over the period 2011–2025. Data were obtained from the Satu Data Jakarta portal and were cleaned using using seasonal decomposition imputation method. Model performance was evaluated using MAE, RMSE, MAPE, and sMAPE metrics on both training and testing datasets. The results show that the NNAR model outperformed the others in predicting PM_{10}, achieving the lowest MAPE on the testing data (23.56%). The N-BEATS model demonstrated the best performance in learning historical data (MAPE for PM_{10}: 5.38%, O_3: 7.83%) and remained competitive in forecasting O_3 on the testing set (MAPE: 64.24%). In contrast, the RNN, LSTM, and GRU models tended to exhibit performance degradation on testing data, with the GRU recording the highest MAPE for O_3 (97.37%). These findings indicate that hybrid statistical and deep learning models, such as NNAR and N-BEATS, are more effective for forecasting complex, volatile, and seasonal air quality data. Therefore, the choice of forecasting model should be based on both the data structure and the prediction objective, whether short-term or long-term.

Keywords: air quality index, deep learning, hybrid model, n-beats, nnar, rnn, time series forecasting

Crude Oil Price Prediction Using Time Series Statistical Modelling Techniques

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Abstract. Crude oil price prediction is a significant topic in the Global Economy. Various factors affect crude oil prices in the market such as economic cycle, Inventory data, Production data, Technical Indicators, country relations, geopolitics etc. Crude oil price forecasting is a difficult but well-rewarded task. This study aims to build a crude oil price predictive model, for which linear models were built using ARIMA and SARIMA. The nonlinear properties of the crude oil price were handled using LSTM models. Here, Crude Oil price is predicted using ARIMA, SARIMA and LSTM models on U.S. Energy Information Administration daily/weekly Crude Oil data. The performance of ARIMA, SARIMA and LSTM models are compared, and it is found that LSTM outperforms all in terms of accuracy, as measured by the Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Percent- age Error (MAPE). During this study, we also built univariate and multivariate LSTM models. It is also concluded that, since production data is limited to the US only, this does not give a clear picture of production data across the globe. More reliable production data, including from OPEC countries, is required before it can be included in the model. Other reliable input parameters could also be considered in the future to further improve the accuracy of the crude oil price forecasting model.
Keywords: Crude Oil Price Prediction, Predictive Model, Linear Models.

Bitcoin Volatility Forecasting Using a Hybrid Generalized Autoregressive Conditional Heteroscedasticity – Long Short-Term Memory (GARCH-LSTM) Model

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Abstract. Bitcoin is one of the decentralized blockchain-based cryptocurrencies. The underlying blockchain technology enhances transparency and security in digital transactions; however, Bitcoin's price is highly volatile, making it a high-risk asset for investors. Therefore, volatility analysis is crucial for risk management and investment decision-making. This study aims to forecast Bitcoin return volatility using a hybrid Generalized Autoregressive Conditional Heteroscedasticity – Long Short-Term Memory (GARCH-LSTM) model with historical price data from 2020–2024. The GARCH model is employed to capture the time-varying dynamics of volatility, while the LSTM is applied to recognize complex nonlinear patterns in the log return data. In its implementation, the residuals from ARIMA(2,0,0) are used as inputs to GARCH(1,1) to generate volatility estimates. The resulting estimates are subsequently input into the LSTM model, which is configured with a single-layer architecture, two input lags (corresponding to one- and eight-days prior), and the Adam optimization algorithm. Evaluation using HMAE and HMSE indicates that the hybrid GARCH-LSTM model performs well. A 31-day ahead forecast in January 2025 shows a relatively smooth downward trend in volatility with fluctuations within a narrow range. Thus, this model has proven effective in modeling Bitcoin's short-term volatility.

Keywords: Hybrid GARCH-LSTM, Volatility, Bitcoin.

Forecasting Air Quality Index Using LSTM and CNN-LSTM Methods

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Abstract. The atmosphere's condition indisputably impacts people's health and well-being. Surabaya is an industrial city with factories and numerous on-going and planned transportation operations with potential to section air quality control. This is to balance the need to control air quality with the need for control to action air quality and to plan control measures. The primary goal of this research is to develop univariate deep learning models for forecasting the Partial Standard Index (PSI) in Surabaya (LSTM and hybrid CNN-LSTM) using daily data from the Dinas Lingkungan Hidup in Surabaya from air quality monitoring stations for the main pollutants (PM_{10}, SO_2, CO, O_3, and NO_2). The modeling for each of the parameters was completed through the stages of Kalman Smoothing imputation, Min-Max normalization, optimal lag selection and hyper-parameter tuning. The results of the predictions of each of the models were evaluated and comparisons were made to determine the best models for each of the parameters, and it was identified that the CNN-LSTM was the superior in the prediction of all air pollutants. The result of this study is that the use of CNN-LSTM provides a grounded and practical basis for the construction of prediction models in air quality control and re-flects on the commitment to promote the sustainable monitoring of the envi-ronment in the city of Surabaya.

Keywords: Air Pollution, Surabaya, Air Quality Forecasting, CNN, LSTM, CNN-LSTM.

Forecasting Natural Gas for Power Generation Using Attention-Based Deep Learning Model

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Abstract. Energy demand continues to grow with population growth, rapid urbanization, and he growth of various industrial sectors in many countries. Natural gas remains a crucial component of the energy mix due to its ability to eLiciently generate electricity and support industrial activities, while producing lower emissions than other fossil fuels. In Mexico, the role of natural gas is even more decisive. The vast majority over 60% of the country's electricity is generated from this source, while nearly 70% of its gas needs must be met through imports from the United State. This dependence makes Mexico vulnerable to various shocks, ranging from global price changes and foreign policy to distribution disruptions. Daily natural gas consumption data for the 2022–2025 period exhibits a seasonal and nonlinear pattern, making traditional linear forecasting methods insuLiciently accurate. This study evaluated three deep learning models with attention mechanisms especially LSTM-Attention, GRU-Attention, and TCN-Attention to predict daily natural gas consumption in Mexico. As a result, TCN-Attention provides the best performance with the lowest error rate, namely MAPE (0.78%) and a high R^2 value (0.977). These findings have the potential to improve the accuracy of short-term forecasting, support more eLicient energy planning, and help mitigate risks from supply uncertainty and price fluctuations.

Regularized Self-Exciting Threshold Autoregressive Modeling: A Simulation Study with Application on Air Quality Case Modeling

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Abstract. A Group LASSO (GL)-based Regularized Self-Exciting Threshold Autoregressive (SETAR) model (GL-SETAR) is presented in this work so as to enhance parameter estimation and prediction performance in non-linear time series analysis. The model is based on estimating threshold parameters in SETAR through Group LASSO regularization to promote sparsity and facilitate the asymptotic selection of set of threshold variables. This integration is to reduce overfitting, which is common in time series. Model performance was assessed through simulation with two scenarios (sample size $n = 200$ and $n = 2000$). In both scenarios, the GL-SETAR model has shown a lower RMSE than the root mean square error (RMSE) than the conventional SETAR model. The results showed that the proposed regularization model has a better stability and robustness in estimating the threshold parmeters and regime coeffcients. The model was also used to $PM_{2.5}$ concentration data, and nonlinear as well as step changes in pollutant dynamics were adequately captured with superior predictive performance compared to the conventional SETAR. Overall, the GL-SETAR model reliably and efficiently models complex environmental systems by integrating regularization principles into nonlinear dynamic modeling.

Keywords: Group LASSO, Nonlinear Time Series, $PM_{2.5}$, SETAR

A Machine Learning Approach to NASDAQ Index Prediction: XGBoost Model with Moving Average and Lagged Price Features

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Abstract. This study aims to forecast the movement of the NASDAQ Composite Index using the Extreme Gradient Boosting (XGBoost) algorithm enhanced with feature engineering techniques. The research utilizes historical data from 2015 to 2024, incorporating technical indicators such as moving averages (MA20, MA50), lagged closing prices (Close–1, Close–3), and trading volume to capture both short-term and medium-term market dynamics. The methodological framework involves four stages: data collection, data preprocessing, model development, and performance evaluation. Hyperparameter tuning was conducted using grid search cross-validation to optimize model parameters. The model's predictive accuracy was assessed using three statistical error metrics—Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE). The results indicate strong forecasting performance, with training RMSE = 91.16, MAE = 65.52, and MAPE = 0.76%, and testing RMSE = 1,485.34, MAE = 915.92, and MAPE = 5.20%. These findings confirm that the XGBoost model effectively captures nonlinear patterns in the NASDAQ index, though it exhibits a conservative bias during extreme bullish movements. Overall, the study demonstrates that XGBoost, combined with relevant technical indicators, offers a robust and interpretable approach for financial market forecasting. The model's reliability and generalization capacity make it valuable for investors, analysts, and policymakers seeking data-driven insights into market trends. Future research is encouraged to enhance the model with macroeconomic and sentiment-based variables to improve adaptability under volatile conditions.

Keywords XGBoost, NASDAQ Composite Index, Financial Forecasting, Machine Learning, Feature Engineering

Intra-hour Global Horizontal Irradiance Forecasting using CNN-based Feature Extraction with Multi-Model Feature Selection and LSTM Prediction

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Abstract. Accurate forecasting of Global Horizontal Irradiance (GHI) is critical for efficient solar energy management and grid stability. This paper presents an advanced hybrid framework that combines Convolutional Neural Network (CNN)-based feature extraction, multi-model feature selection, and Long Short-Term Memory (LSTM) prediction. Unlike previous approaches, the proposed model integrates four machine learning algorithms (Random Forest (RF), Decision Tree (DT), Logistic Regression (LR), and Gradient Boosting Machine (GBM)) to perform ensemble feature importance ranking. From each algorithm, 50 important features are extracted, merged, and fed into an LSTM network to predict GHI 20 minutes ahead. Experimental results reveal that the proposed model (Multi-Model Feature Selection and CNN-LSTM Forecasting) achieves RMSE = 193.38 W/m² and R^2 = 0.498, significantly outperforms the Smart Persistence Model (SPM) baseline with RMSE = 209.68 W/m² and R^2 = 0.327. The proposed model Increases the spatial-temporal interpretability and robustness of intra-hour GHI forecasting under varying tropical weather conditions.

Index Terms—Solar irradiance forecasting, all sky imagery, CNN-LSTM, intra hour, global horizontal irradiance, machine learning, hybrid model.

Track 4: Time Series Analysis and Forecasting

NO	ID	TITLE	AUTHORS
1.	1571206098	Volume-Ratio-Variance Based Outlier Factor for Anomaly Scoring	Pajaree Onsoy and Krung Sinapiromsaran
2.	1571212519	Bivariate Generalized Weibull Regression Modeling and Identification of Factors Affecting Life Expectancy and Poverty	Elisabeth Vianey Mali, Purhadi and Setiawan
3.	1571213648	Successive Difference Covariance Matrix for Monitoring High-Dimensional Spectral Data: A Functional Hotelling's T^2 Approach	Ayu Afrinah, Muhammad Mashuri and Muhammad Ahsan
4.	1571213650	RKHS-Based Adaptive Penalized Spline-Kernel Regression Applied to Human Development Index	Muhammad Sopian Sauri, I Nyoman Budiantara and Vita Ratnasari
5.	1571213824	Improving Fast Double Bootstrap for h Chart Based Control Limits Using Robust Memoryless Property Estimator	M. Y. Matdoan, M. Mashuri and M. Ahsan

Volume-ratio-variance based Outlier Factor for Anomaly Scoring

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Abstract. Anomaly detection in multi-dimensional datasets presents a significant challenge for traditional machine learning algorithms. The low density of data points makes it difficult for supervised or unsupervised models to learn a representation of "normal" behavior, often leading to poor performance and high rates of false positives. This paper introduces a novel, density-based modeless-AI algorithm designed to assign anomaly scores to all data points without the need for a complex, pre-trained model. Our proposed algorithm uses the variance of the hypervolume-ratio as the anomalous score. The hypervolume is computed from the ball with the fixed number of data points or mass. The hypervolume-ratio distribution is then generate from the current data point to the rest of data points in the dataset. A higher score indicates a greater degree of anomaly, while a lower score indicates a data point is more common to other data points. This modeless-AI framework circumvents the limitations of model-based methods by focusing on the intrinsic structure of the data points. This approach provides a more robust and efficient solution for identifying rare and unexpected events in a variety of domains. Experimental results show that the top 10 highest scores from the proposed algorithm could identify all outliers from synthesized datasets, like those scores from the state-of-the-art outlier scoring methods, such as MAOF, MOF, ABOD, and LOF. Moreover, it could retrieve more outliers from four real-world datasets.

Keywords: Anomaly detection, modeless-AI, hypervolume-ratio distribution, Unsupervised learning.

Bivariate Generalized Weibull Regression Modeling and Identification of Factors Affecting Life Expectancy and Poverty

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Abstract. Bivariate Generalized Weibull Regression (BGWR) is a regression with two response variables that are correlated and distributed according to the Generalized Weibull distribution. This model produces global parameter estimates for all observation locations. The purpose of this study is to estimate parameters and test hypotheses in the BGWR model and apply it to life expectancy and poverty rates to identify factors that affect life expectancy and the percentage of poor people in Central Java Province and the Special Region of Yogyakarta. The BGWR model parameters were estimated using Maximum Likelihood Estimation (MLE), specifically the Berndt-Hall-Hall-Hausman (BHHH) technique for numerical iteration. Hypothesis testing used the Maximum Likelihood Ratio Test (MLRT). The results showed that at a 5% significance level, testing with MLRT simultaneously rejected the null hypothesis of the BGWR model, and partial testing showed that there was a significant effect of average length of schooling, economic growth rate, health worker ratio, and gross high school enrollment rate on life expectancy. Meanwhile, for the poverty rate, the significant factors are average length of schooling, economic growth rate, open unemployment rate, health worker ratio, and gross high school enrollment rate.

Keywords: Bivariate Generalized Weibull Regression, Life Expectancy, Poverty Rate.

Successive Difference Covariance Matrix for Monitoring High-Dimensional Spectral Data: A Functional Hotelling's T^2 Approach

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Abstract. Monitoring high-dimensional spectral data is challenging due to strong temporal correlations and the numerical instability of classical covariance estimators, which often lead to inflated control limits and reduced sensitivity. This study introduces a robust monitoring framework that integrates Functional Data Analysis (FDA) with the Successive Difference Covariance Matrix (SDCM) to capture local correlations, suppress baseline drift, and improve covariance stability. Functional representation is obtained using B-spline smoothing, followed by Multivariate Functional PCA (MFPCA) for dimension reduction. Hotelling's T^2 control charts are then constructed with control limits calibrated to achieve an in-control average run length (ARL_0) of approximately 370. Simulation studies (1,000 curves times 150 grid points times 3 features) and a real Near-Infrared (NIR) spectroscopy case study (80 samples times 700 wavelengths) show that SDCM-FDA detects 12 out-of-control samples, outperforming CM-FDA (7 detections) and the classical non-FDA method (1 detection). Overall, SDCM-FDA improves shift-detection sensitivity by 71% while preserving stable in-control performance, demonstrating its suitability for Industry 4.0 spectral process monitoring.

Keywords: Functional Data Analysis, B-spline smoothing, Multivariate Functional Principal Component Analysis, Hotelling T^2, Successive Differences Covariance Matrix.

RKHS-Based Adaptive Penalized Spline-Kernel Regression Applied to Human Development Index

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Abstract. Problems in modeling data with heterogeneous patterns necessitate the development of adaptive and flexible estimation methods. This study introduces a hybrid estimator combining spline smoothing and kernel methods for nonparametric regression, specifically designed to accommodate variations in predictor variable patterns. Spline smoothing is employed for predictors exhibiting variable trends, while the kernel estimator is applied to those with random patterns. The hybrid estimator is constructed using the Penalized Likelihood method and evaluated using the 2024 Human Development Index (HDI) data from East Java Province. Model performance, assessed through Generalized Cross Validation (GCV) and the coefficient of determination, demonstrates that the proposed method achieves a minimum GCV of 0.0184 and a coefficient of determination of 85.06%. These findings highlight the superiority and flexibility of the hybrid estimator in modeling data with heterogeneous characteristics and suggest its potential applicability in various other fields facing similar analytical challenges.

Keywords: GCV, Kernel, Maximum Penalised Likelihood (MPL), Nonparametric Regression, Spline Smoothing

Improving Fast Double Bootstrap for Chart based Control Limits Using Robust Memoryless Property Estimator

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Abstract. Process parameters in *h* charts are usually estimated using conventional methods, such as maximum likelihood parameter estimation, Benneyan estimation, or minimum variance unbiased estimation. However, these methods have weaknesses when the data contains outliers, which can cause the estimation results to be biased and affect the accuracy of the control limits. To overcome this, an *h* chart was developed using memoryless property parameter estimation, which is more robust to outliers. However, this control chart still has limitations because it uses the kσ approach with the assumption of a normal distribution. In practice, industrial data often does not meet the normality assumption, has a small sample size, and contains outliers. This makes control limits based on a parametric approach less accurate and prone to detection errors. As a solution to these limitations, the fast double bootstrap (FDB) method was developed to improve accuracy and computational efficiency. However, FDB-based control limits still have weaknesses, as this method is sensitive to outliers and non-normal data distributions, so that the resulting control limits can fluctuate and be inconsistent between bootstrap replications. Therefore, this study developed an *h* chart with flexma bootstrap-based control limits. Flexma bootstrap is performed by generating a number of process parameters from the first resampling in the double bootstrap stage. Next, the average of these parameter estimators is calculated and used to determine the control limits on the *h* chart. The study uses simulation studies and applied studies on container handling in quarantine fields. The results of the study show that flexma bootstrap-based control limits are more sensitive and capable of detecting more out-of-control points compared to other control limits. In addition, container handling at PT. X is still under control.

Keywords: *h* chart, flexma bootstrap, memoryless property

Track 5: Advanced AI Architectures, Interpretability, and Large Models

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7.	1571221973	LabourLens AI: A Generative AI Assistant for Labour Market Intelligence	Liyana Safra Zaabar, Nur Hurriyatul Huda Abdullah Sani, Muhammad Amirul Asraf bin Awang Chik @ Alias, Mohd Radziq bin Alias, Muhammad and Khairul Syafiq bin Mustafa

Hybrid Deep Learning and Classical Machine Learning Approach for Deepfake Detection

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Abstract. Deepfake technology has evolved over the past several years. Create hyperrealistic but fake digital content that poses significant risks in some areas such as hoax, fraud, scams, and identity theft. Detecting deepfake media is a challenge due to the increase of advanced technology and realism, which makes it difficult to differ from real media. This study proposes a combination method of MobileNetV2 as a deep learning-based architecture and machine learning classifiers, which are Support Vector Machine (SVM), Random Forest (RF), and XGBoost (XGB), for classifying videos. We conducted several experiments with the Celeb-DF dataset under two conditions: the original dataset and the soft-balanced dataset. The experiment also held under two conditions, the first without the utilization of CVGrid and the second one with the utilization of CVGrid. The result proved that MobileNetV2 is effective as a feature extraction with the increased performance of each model. Each model able to perform well in Soft-Balanced Dataset, while in the Original Dataset the model has the tendency to overfitting and the balanced dataset is more effective for training the model. The best model from our experiments is Random Forest with the highest score. Balancing datasets and optimizing hyperparameters through cross-validation are essential for accurate deepfake detection, with MobileNetV2 effectively extracting features from video frames at lower computational cost.

Keywords: Deepfake detection, Celeb-DF dataset, machine learning, support vector machine (SVM), random forest (RF), XGBoost, MobileNetV2, MTCNN

MLLM Interpreter: A Model-Agnostic Method to Explain Multimodal Large Language Models

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Abstract. We present MLLM Interpreter, a model-agnostic framework conditioned on a selected text-span, cross-modal attribution in multimodal large language models (MLLMs). Unlike methods that explain only text, only vision, or consider explanations only at the level of the entire response — our approach quantifies how visual segments and verbal tokens jointly support a user-selected answer text-span. The pipeline is purely black-box: it proposes image regions via open-vocabulary detection with mask refinement, forms interpretable text units, perturbs features through targeted masking, scores the effect using a semantic value function, and estimates contributions by fitting a linear surrogate model in the Shapley framework over sampled coalitions. It requires neither parameters, gradients, nor access to attention weights, enabling uniform application to closed- and open-source MLLMs. For evaluation, we introduce modality-specific metrics: verbal and visual scores reward relevant items placed above a neutral threshold. Ablations across value functions, zero-shot detectors, Shapley estimators, and sampling budgets show consistently strong, robust scores. The method is time efficient in practice, supports manual feature selection when needed, and provides actionable evidence for auditing, diagnosing hallucinations, and debugging. MLLM Interpreter advances transparent, target-specific, and multimodal interpretability for modern language models.

Keywords: Multimodal Large Language Model, MLLM, LLM, VLM, Interpreter, explainable AI, model-agnostic, SHAP

Modular Numeric Planning in Python: A Framework for Learning-Based Heuristics

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Abstract. In this paper we introduce LeapNP, a lightweight framework fully implemented in Python that natively supports both classical and numeric planning tasks and exposes a simple, fully modular interface, designed to ease the integration of deep learning methods. Every component, from grounding to state representation, heuristics, and search algorithms, can be swapped out or extended, allowing researchers to plug in virtually any custom component, from novel data structures and heuristics to bespoke search algorithms, with only a few lines of code. We also introduce two variations of the standard Greedy Best-First Search algorithm, designed to work with deep learning heuristics. This design choice stems from a limitation of existing state-of-the-art planners: most are written in low-level languages and highly optimized for speed, which makes them difficult to modify and a poor fit for rapid prototyping with deep-learning methods. By lowering this engineering barrier, our planner enables faster experimentation, smoother integration in particular of learning components, and ultimately accelerates research at the intersection of automated planning and deep learning.

Keywords: Learning in Planning and Scheduling, Mixed discrete/continuous Planning, Python Library, Graph Neural Networks.

Explainable AI and Gated Recurrent Units for Predicting Stock Movements in the IDX ESG Leaders Index

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Abstract. The rise of ESG-driven investment in Indonesia's capital market has made it harder to predict stock prices, as they often exhibit volatility and complex patterns. Investors need forecasting methods that are both accurate and easy to understand. This study builds a forecasting framework for five IDX ESG Leaders Index stocks using a Gated Recurrent Unit (GRU) deep learning model, along with Explainable AI (XAI) tools to reveal the factors that influence the predictions. The model was tested with three data splits (70:30, 80:20, and 90:10) and evaluated using Mean Absolute Percentage Error (MAPE). The results show that the 70:30 scenario consistently yields the most accurate forecasts. XAI analysis using Permutation Importance highlights low price, high price, and trading value as the most important factors, though their relative importance differs across companies. These findings show that the GRU model performs well at forecasting ESG-related stock prices in Indonesia, and that using XAI helps clarify the results by showing which factors matter most.

Keywords: Explainable AI, Gated Recurrent Unit, Stock Price, Forecasting.

LiteRAB: A Lightweight Residual Attention Network for Real-Time Image Dehazing Authors and Their Affiliations

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Abstract. Images captured in foggy or hazy environments experience significant visibility loss and contrast reduction, which can negatively impact automated vision systems used in surveillance, remote sensing, and autonomous navigation. Although deep learning has achieved significant progress in image restoration, single-image dehazing remains difficult due to the need for fine texture details, accurate edge preservation, smoothness in homogeneous regions, and artifact-free reconstruction. Also existing deep models achieve high performance at the cost of heavy computation, making them unsuitable for real-time or embedded applications. To overcome these issues, this paper introduces LiteRAB, a lightweight residual attention-based network designed for efficient single-image dehazing. The architecture integrates three specialized components: a multi-representation feature encoder-er, a visibility restoration module, and an image reconstruction module. Together, these modules enable robust feature extraction while maintaining computational efficiency. LiteRAB design employs multi-activation fusion and multi-dilated convolutions to efficiently capture haze-related features while maintaining color fidelity and structural details. It achieves high-quality restoration on standard benchmark NH-HAZE (real-world) and FRIDA (synthetic) datasets, offering an effective balance between visual accuracy and model complexity. Comparative results on these datasets demonstrate that LiteRAB achieves comparable or superior PSNR/SSIM performance to larger architectures while maintaining real-time efficiency (~60 ms per image on a single GPU) and clarity.

Keywords: end-to-end dehazing; lightweight dehazing networks; single-image dehazing; computer vision; image restoration

A Hybrid Framework for Feature Extraction: Integrating LDA-Based Topic Modeling with Clustering for Enhancing SVM Classification on Small Datasets

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Abstract. Short-text classification is often challenged by class imbalance and semantic sparsity, especially in small datasets. Traditional topic modeling methods like Latent Dirichlet Allocation (LDA) struggle to produce clear, distinguishable feature representations under these constraints. To overcome this, we introduce a hybrid feature extraction framework that integrates LDA with K-Means clustering, optimized using the Elbow method to improve topic coherence and classification robustness. We evaluated the approach using a support vector machine (SVM) classifier on the Sanders Twitter Sentiment dataset, testing across dataset sizes from 20 to 500 samples. Results demonstrate significant gains even with very limited data: at 20 samples, the hybrid method boosts F1-score from 0.486 (LDA alone) to 0.579 and accuracy from 0.491 to 0.562. This improvement holds consistently across all sizes, peaking at 500 samples with 85.7% accuracy, 82.5% F1-score, 84.2% precision, 84.5% recall, and a silhouette score of 0.75. These findings underscore the hybrid approach's effectiveness in enhancing semantic feature quality and sustaining strong classification performance, particularly in low-data settings

Keywords: Feature extraction, Latent Dirichlet Allocation, topic modeling, K-Means clustering, text classification, sentiment analysis.

LabourLens AI: A Generative AI Assistant for Labour Market Intelligence in Malaysia

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Abstract. The emergence of generative artificial intelligence technologies has spurred a rapid transformation of possibilities for data accessibility and public service provisioning. The concept paper introduces LabourLens AI as an assistant system based on generative AI technologies that is designed to revolutionize the labour market intelligence ecosystem of Malaysia. LabourLens AI, developed by the Department of Statistics Malaysia, is powered by Azure OpenAI, Cognitive Search, and other Microsoft Azure services, enabling real-time conversational access to labour market statistics. The platform, designed via the Retrieval-Augmented Generation architecture, allows for the democratization of data access, enables evidence-based policymaking, and enhances user interaction via natural language. The case presents a technical framework, implementation process, and business value of deploying domain-specific AI systems in the public sector.

Keywords: Generative AI, Labour Market Intelligence, Public Sector Innovation, RAG Architecture, Azure AI.

Track 6: Applied Data Science for Health, Public Services, and Social Impact

NO	ID	TITLE	AUTHORS
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2.	1571201607	A BHHH-Optimized Geographically Weighted Poisson Generalized Inverse Gaussian Regression for Localized Maternal Mortality Risk Mapping	Yusrianti Hanike, Purhadi and Achmad Choiruddin
3.	1571201697	Classification of Stroke Based on Clinical and Demographic Risk Factors Using a Binary Response Multivariate Adaptive Regression Splines (MARS) Model	Sri Sulastri, Bambang Widjanarko Otok and Achmad Choiruddin
4.	1571208786	Poverty Population Segmentation Using the CLARANS Clustering Method	Syarifah Diana Permai, Jeklin Harefa Bina Nusantara, Alexander Alexander, Kania Agatha
5.	1571219711	Survival Analysis Methods for Lung Cancer Data Using Imputation Techniques	Muniba M. Ahmed, Muna A. N. Rayashi and Faiz Elfaki

Modeling Spatial Heterogeneity of Crime Cases Using a Geographically Weighted Artificial Neural Network (GWANN)

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Abstract. The phenomenon of crime in Central Java shows spatial variation influenced by social, economic, educational, and demographic factors. This study models the number of crime cases in 2024 using Geographically Weighted Regression (GWR) and Geographically Weighted Artificial Neural Network (GWANN), comparing their performance. The independent variables include the Human Development Index (HDI), percentage of poor population (PPM), poverty depth index (PI), expected years of schooling (EYS), and population density (PD), based on official data from BPS-Statistics Indonesia. The GWR results reveal spatial heterogeneity, where the effects of variables vary across districts and cities, yielding an R^2 of 0.3700 and an RMSE of 140.6663. In contrast, GWANN effectively captures both spatial and non-linear relationships, achieving superior performance with an R^2 of 0.9970 and an RMSE of 9.5579. These results indicate that the GWANN model outperforms the GWR model in the modeling of crime cases in Central Java. The results also suggested that, in addition to spatial heterogeneity, the relationship between socioeconomic factors and crime is essentially nonlinear. Therefore, GWANN is more suitable for research into complex spatial phenomena, and further emphasizes the importance of using up-to-date, flexible spatial modeling methods in applied research.

Keywords: Crime cases, Geographically Weighted Regression, Geographically Weighted Artificial Neural Network.

A BHHH-Optimized Geographically Weighted Poisson Generalized Inverse Gaussian Regression for Localized Maternal Mortality Risk Mapping

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Abstract. Maternal mortality remains a persistent public health challenge in East Java, where substantial differences in health service access and socioeconomic conditions create uneven risk across districts. To capture these geographic disparities, this study applies the Geographically Weighted Poisson Generalized Inverse Gaussian Regression (GWPGIGR), an extension of mixed-Poisson modeling that accommodates both overdispersion and underdispersion while allowing coefficients to vary across space. A BHHH-based maximum likelihood procedure is employed to obtain stable parameter estimates without relying on second-order derivatives. Model tuning is guided by an AIC-driven bandwidth selection strategy, and maternal population size is incorporated as an exposure variable to ensure comparability of risk levels. Using maternal mortality data from 38 districts in East Java for the year 2023, combined with key health indicators such as antenatal care coverage, nutritional status, sanitation, and health workforce availability, the proposed framework reveals striking spatial contrasts. The GWPGIGR model achieves substantially lower AIC than PR, PGIGR, and GWPR, and produces risk maps that highlight clusters of high vulnerability in rural districts. These findings underscore the importance of spatially adaptive modeling for identifying localized determinants of maternal mortality and provide a statistical foundation for designing more targeted health interventions.

Keywords: BHHH, GWPGIGR, Maternal Mortality, Mixed Poisson, Spatial Heterogeneity

Classification of Stroke Based on Clinical and Demographic Risk Factors Using a Binary Response Multivariate Adaptive Regression Splines (MARS) Model

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Abstract. Multivariate Adaptive Regression Splines (MARS) is a non-parametric method capable of capturing nonlinear relationships and complex interactions between variables through the formation of adaptive function bases and is commonly used to model data with continuous response variables. However, the application of MARS to categorical data, particularly binary responses, is still relatively rare. This study aims to explore the potential of Binary Response MARS in classifying stroke types (ischemic stroke and hemorrhagic stroke) in patients at Dadi Regional General Hospital, Makassar, South Sulawesi Province. The predictor variables used include age, gender, uric acid, hypertension, cholesterol, and diabetes mellitus. The analysis indicates that cholesterol, diabetes mellitus, hypertension, age, and uric acid are significant risk factors, with strong interactions observed among cholesterol, diabetes mellitus, and hypertension. The resulting MARS model achieved an accuracy of 85%, demonstrating the effectiveness of this approach in capturing nonlinear relationships and interactions among the risk factors. These findings confirm that MARS can be a promising alternative for binary response classification, while expanding its application in the development of non-parametric statistical methods in health data analysis.

Keywords: MARS, Stroke, Binary Response, Clinical Factors, Demographic Factors.

Poverty Population Segmentation Using the CLARANS Clustering Method

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Abstract. Poverty is one of the most common problems in countries, including Indonesia. One indicator of a country being developed, developing or underdeveloped is measured by the level of poverty in that country. This poverty problem is very complex and is a concern to be overcome. Therefore, it is stated in one of the SDGs, namely No Poverty. No exception in Indonesia, the problem of poverty is still one of the main problems. This study applies the CLARANS algorithm to classify districts and cities in Indonesia based on poverty indicators, providing insights for government poverty reduction strategies. The analysis uses several variables consisting of the education and economic sectors. CLARANS was chosen due to its ability to handle large datasets and its robustness for outliers. In addition, the Parallel Coordinates plot is also used to determine the characteristics of each cluster formed. The results of this study can help the government in mapping poverty conditions so that they can provide policies according to the conditions of the district and city.
Keywords: Poverty, Clustering, CLARANS, Parallel Coordinates Plot.

Survival Analysis Methods for Lung Cancer Data Using Imputation Techniques

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Abstract. In this paper, various survival analysis methods were applied to model lung cancer patient data with disease-free survival times. To address missing values in the dataset, imputation techniques were employed. The data with and without imputed values were fitted to several potential models, including nonparametric, semi-parametric, and parametric survival models, to determine the most appropriate based on key variables. Model selection was followed by hypothesis testing to evaluate the goodness of fit. The analysis indicated that the Cox proportional hazards model was the most suitable for this dataset, particularly when incorporating specific covariates. This conclusion was supported by results from the Likelihood Ratio Test (LRT), Wald test, Score test, and residual diagnostics. Additionally, several assumptions underlying the Cox model were found to be reasonably satisfied.

Keywords: Lung Cancer; Survival Models; Imputation methods; Model Assumptions; Goodness of fit.

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