2026 The 6th Asia Conference on Information Engineering

ACIE 2026

Tokyo, Japan | January 7-9, 2026

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Welcome Address

Dear Delegates,

It is with great pleasure that we extend a warm welcome to you for the 2026 The 6th Asia Conference on Information Engineering (ACIE). This year's conference will be held from January 7th to 9th, 2026, in Tokyo, Japan. We sincerely thank each of you for your active participation, which is essential to the success of this event.

In an era of rapid technological and social transformation, the field of information engineering continues to serve as a crucial driver of innovation, industrial growth, and the enhancement of daily life. This conference aims to provide an international forum for academic exchange, enabling researchers, engineers, and industry professionals to share cutting-edge insights, discoveries, and practical experiences. Through collaborative dialogue, we hope to advance knowledge and inspire future developments in this dynamic discipline.

We are delighted to announce that the conference will feature distinguished keynotes, who will present their latest research and perspectives. Their presentations are designed to stimulate discussion and encourage deeper exploration within the field. The program includes multiple oral sessions, including online and onsite sessions, offering abundant opportunities for engagement and exchange among all attendees. We encourage you to participate actively, share your views, and contribute to the vibrant discussions throughout the conference.

Finally, we would like to express our heartfelt gratitude to the organizing committee for their tireless efforts and dedication. We also extend our thanks to the reviewers for their valuable contributions, and to all participants for being part of this important gathering. It is our hope that this conference will serve as a fruitful platform for networking, collaboration, and the cultivation of ideas that will shape the future of information engineering.

Sincerely,

ACIE 2026
Organizing Committee

Conference Schedule (UTC+9)

Day 1 January 7, Wednesday		
	- Online -	
15:00-16:00	Online Test	**ZOOM ID: 868 5177 1190**
	- Onsite -	
16:00-17:00	Sign-in & Collecting Conference Material	**Corridor (2nd floor)**

Day 2 January 8, Thursday		
	- Onsite -	
	Host: Prof. Mianxiong Dong, Muroran Institute of Technology, Japan	**Room 2A (2nd floor)**
9:35-10:15	**Keynote Speech I: Prof. Jonathan Wu, University of Windsor, Canada** *Speech Title: Deep Learning and Optimization Techniques for Next-Generation Sensor Fusion*	
10:15-10:55	**Keynote Speech II: Prof. Andres Iglesias, University of Cantabria, Spain (Online)** *Speech Title: Swarm Intelligence for Shape Reconstruction*	
10:55-11:20	*Group Photo & Coffee Break*	
11:20-12:00	**Keynote Speech III: Prof. Xudong Jiang, Nanyang Technological University, Singapore (Online)** *Speech Title: CNN and Transformer: Revolutions of Machine Learning and AI*	
12:00-13:30	*Lunch Time*	***Room 2A* (2nd floor)**
13:30-15:30	**Posters** "Data-driven Image Processing and Multimedia Applications" A0154-A、A0425-A	**Corridor (2nd floor)**
	Session 1 "Machine Learning Theories and Computational Models in Modern Information Systems" A0045-A、A0225、A0390、A0451、A0255、A0183-A、A0131-A	**Room 2G (2nd floor)**
	Session 2 "AI-based Advanced Digital Communication Systems and Software Design" A0011、A0031-A、A0061、A0261、A0271、A0475、A0485、A0071	**Room 2E (2nd floor)**

Day 3 January 9, Friday		
	- Online -	
17:00-19:15	**Session 3** "AI-based Intelligent Information Systems and Data Models" A0193、A0215、A0385、A0235、A0400、A0495、A0551、A0415、A0441	**ZOOM ID: 868 5177 1190**

ZOOM ID: 868 5177 1190, ZOOM link: https://us02web.zoom.us/j/86851771190

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Onsite Conference Notice

Conference Venue

TKP Tokyo Station Conference Center

Address: 1-8-16 Yaesu, Chuo-ku Tokyo Shinmakicho Building 10-12F Tokyo 103-0028

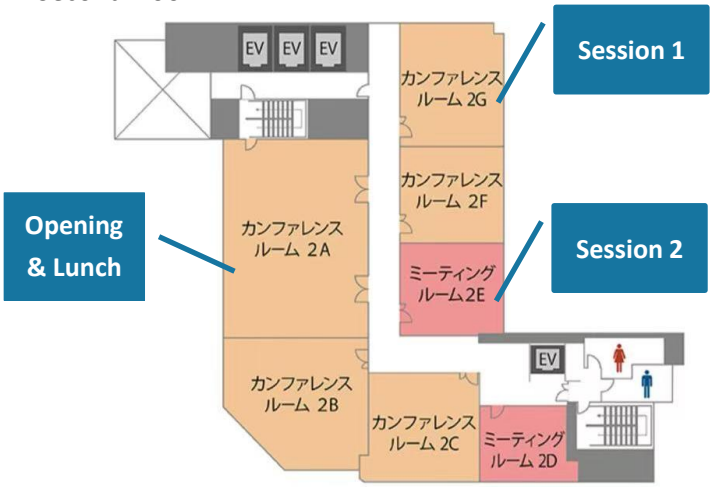
*Please note that this is a conference center and does not offer accommodation. Attendees are requested to book nearby accommodation according to their own needs.

Time Zone

Japan Time: UTC + 9

Conference Rooms

Second Floor



Oral Presentation

a) Timing: a maximum of 15 minutes in total, including 3 minutes for Q&A. Please make sure your presentation is well timed.

b) All oral session rooms are equipped with data projectors with a standard VGA connector. The speakers could also bring and use their own laptops or other presentation devices. Please check the compatibility of your laptop and the project before the session starts.

c) Videos: If your Power Point files contain videos, please make sure that they are well formatted and connected to the main files.

Important Notes

a) Please wear formal clothes or national characteristics of clothing.

b) Please take care of your belongings during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants.

c) Please wear your participation badge during the conference. There will be NO access for people without a badge. NEVER discard your badge at will.

d) Accommodation is not provided. Delegates are suggested make early reservation.

e) Please show the badge and meal coupons when dining. Please be advised that lost coupons will not be replaced.

Online Conference Notice

Platform

ZOOM, Download link:

- https://zoom.us/download
- https://zoom.com.cn/download (for Chinese authors)

Online Meeting Room

Online Room: ZOOM ID: 868 5177 1190, ZOOM link: https://us02web.zoom.us/j/86851771190

Online Meeting Needs

- A computer with internet connection and camera
- Headphone/earphone
- A quiet place
- Stable internet connection
- Proper lighting and background

Test Your Presentation

Date: January 7, Wednesday, 15:00-16:00 (UTC+9)

Prior to the formal meeting, online presenters shall join the test room to ensure everything is on the right track.

Conference Recording

The whole conference will be recorded. We appreciate you proper behavior and appearance.

*The recording will be used for conference program and paper publication requirements. The video recording will be destroyed after the conference and it cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose. It will only be recorded by the staff and presenters have no rights to record.

Keynote Speech I

January 8, Thursday | 9:35-10:15 | Room 2A (2nd floor)

Prof. Jonathan Wu, University of Windsor, Canada

Fellow of the Canadian Academy of Engineering

Speech Title: Deep Learning and Optimization Techniques for Next-Generation Sensor Fusion

Abstract: Recent advances in multisensor data fusion—spanning infrared imaging, SAR, hyperspectral data, and LiDAR—are significantly improving object detection, classification, and scene understanding across domains such as urban monitoring and autonomous navigation. Emerging techniques, including deep learning, graph-based models, and attention mechanisms, have strengthened the integration of diverse data sources, yet key challenges persist in handling heterogeneous inputs and meeting real-time performance demands. This keynote will survey state-of-the-art fusion strategies and the role of generalized-inverse-based optimization, highlighting major technical hurdles, illustrative case studies, and promising research directions aimed at enabling scalable, high-efficiency perception systems.

Biography: Dr. Jonathan Wu received his PhD in Computer Vision and Intelligent Systems from the University of Wales, UK. He is a Distinguished Professor of Electrical and Computer Engineering and has held a Tier 1 Canada Research Chair in Automotive Sensors and Information Systems since 2005. Dr. Wu is the founding director of the Computer Vision and Sensing Systems Laboratory at the University of Windsor, Canada.

He has authored one book on 3D computer vision and published more than 400 peer-reviewed papers—including 275 SCI-indexed journal articles—covering computer vision, machine learning, and intelligent systems. His work has achieved a Google Scholar h-index of 71 and has been cited more than 19,275 times to date.

Dr. Wu has served as an associate editor for IEEE Transactions on Cybernetics, IEEE Transactions on Circuits and Systems for Video Technology, and IEEE Transactions on Neural Networks and Learning Systems. He is also an elected Fellow of the Canadian Academy of Engineering.

Keynote Speech II

January 8, Thursday 10:15-10:55 Room 2A (2nd floor)

Prof. Andres Iglesias, University of Cantabria, Spain

Speech Title: Swarm Intelligence for Shape Reconstruction

Abstract: Shape reconstruction plays a crucial role in various domains, including computer graphics and animation, computer vision, and image processing. It involves the capture or recovery of the shape and appearance of real-world objects from diverse inputs, which can be geometric (such as a cloud of scanned data points), visual (a single image or a collection from multiple viewpoints), or a combination of both. However, this process is widely recognized as challenging and computationally expensive. A promising avenue to tackle this issue consists of the integration of partial differential equations with artificial intelligence (AI) methods, which have gained significant attention in recent years due to remarkable developments in the field of AI, including deep learning, generative AI, real-time object detection, biometric recognition, and more, which are reshaping the current landscape of today's digital world in ways that were unimaginable just a few years ago.

One of the most remarkable AI approaches is swarm intelligence, a groundbreaking computing technology with applications spanning academic and industrial fields. Swarm intelligence systems consist of simple agents that interact locally with each other or their environment, exhibiting basic behavioral patterns and operating autonomously in a decentralized and self-organized manner. Despite the simplicity of individual agents, their local interactions give rise to a collective intelligence, enabling the swarm to perform sophisticated tasks and develop complex behavioral patterns unattainable to the individual agents. This speech will explore some of the most recent advances in the field. The discussion will encompass diverse academic, professional, and industrial domains, including computer-assisted design and manufacturing, computer animation, computer vision, medical imaging, and swarm robotics. Additionally, the presentation will touch upon future trends and potential avenues for further research in this exciting field.

Biography: Andres Iglesias is Professor of Computer Science and Artificial Intelligence at the University of Cantabria, Santander, Spain, where he leads the "Computer Graphics & Artificial Intelligence" research group, and invited/guest professor at Toho University, Funabashi, Japan. He is also the current chair of the IFIP Technical Committee 5 - Information Technology Applications, Workgroup 5.10- Computer Graphics and Virtual Worlds. His research is highly inter/multidisciplinary, having published journal papers in 33 different categories of WoS Journal Citation Reports, including most categories of Computer Science, Mathematics, Physics and Engineering. His research activity includes more than 320 international scientific papers, 27 books (by Elsevier, Springer, IEEE, and Thomson Publishers), 4 patents and 36 research projects (mostly public-funded), totalling 5.86 million Euros. He has also edited 15 special issues of journals, 13 of them JCR-indexed, and has been chairman/organizer of +70 international conferences and workshops, including several top CORE-A and CORE-B conferences, program committee member of +300 international conferences, reviewer of +200 papers in JCR journals and +900 papers of international conferences. He is also associate editor and editorial board member of several international scientific journals. He has been a project expert evaluator for the European Union (FP7, Horizon 2020) and for several national research agencies in USA (NSF), Spain (ANEP, ANECA), Germany (DFG), Canada (ORF), UK (UKRI), etc. During the last years, he has pioneered the worldwide research on the application of AI techniques to curve and surface reconstruction. His research has been applied to challenging problems in industrial design and manufacturing, medical sciences, swarm robotics, fractal images, dynamical systems, and other fields. He is included in the prestigious "Stanford-Elsevier World's Top 2% Scientists" list in the field of "Artificial Intelligence and Image Processing" for all annual editions from 2021 to 2025.

Keynote Speech III (Online)

January 8, Thursday 11:20-12:00 Room 2A (2nd floor)

Prof. Xudong Jiang, Nanyang Technological University, Singapore

IEEE Fellow

Speech Title: CNN and Transformer: Revolutions of Machine Learning and AI

Abstract: Discovering knowledge from data has many applications in various artificial intelligence (AI) systems. Machine learning from the data is a solution to find right information from the high dimensional data. It is thus not a surprise that learning-based approaches emerge in various AI applications. The powerfulness of machine learning was already proven 40 years ago in the boom of neural networks but its successful application to the real world is just in recent years after the deep convolutional neural networks (CNN) have been developed. This is because the machine learning alone can only solve problems in the training data but the system is designed for the unknown data outside of the training set. This gap can be bridged by regularization: human knowledge guidance or interference to the machine learning. This speech will analyze these concepts and ideas from traditional neural networks to the deep CNN and Transformer. It will answer the questions why the traditional neural networks fail to solve real world problems even after 30 years' intensive research and development and how CNN solves the problems of the traditional neural networks and how Transformer overcomes limitation of CNN and now becomes the foundations of all AI large models.

Biography: Xudong Jiang (Fellow of IEEE) received the B.E. and M.Eng degrees from the University of Electronic Science and Technology of China (UESTC), and the PhD degree from Helmut Schmidt University, Hamburg, Germany. From 1998 to 2004, he was with the Institute for Infocomm Research, A*STAR, Singapore, as a lead scientist, and the head of the Biometrics Laboratory. He joined Nanyang Technological University (NTU), Singapore, as a faculty member, in 2004, where he served as the director of the Centre for Information Security from 2005 to 2011. He is currently a professor with the School of EEE, NTU and serves as the director of the Centre for Information Sciences and Systems of School of EEE, NTU. He has authored over 300 papers with over 70 papers in the IEEE journals including 14 T-PAMI papers and 20 T-IP papers, and over 40 papers in top conferences CVPR/NeurIPS/ICCV/ECCV/ICLR/AAAI. His papers have been cited over 17,000 times with H-index 71. He served as IFS TC member of the IEEE Signal Processing Society from 2015 to 2017, associate editor for IEEE Signal Processing Letter from 2014 to 2018 and associate editor for IEEE Transactions on Image Processing from 2016 to 2020. Currently, he is an IEEE Fellow, serves as senior area editor for IEEE Transactions on Image Processing and editor-in-chief for IET Biometrics. His current research interests include image processing, pattern recognition, computer vision, machine learning, and biometrics.

Posters

Data-driven Image Processing and Multimedia Applications

13:30-15:30 | January 8, Thursday | Corridor (2nd floor)

A0154-A Poster 01	*Tracing Two Decades of Electronic Commerce Research in Korea: A Time-Series and Topic Modeling Analysis* Jaeyoung An, **Dr. Hyaejung Lim** Yonsei University, Republic of Korea Abstract: Electronic commerce (EC) has become a pivotal domain in the digital economy, driving continuous innovation in both academia and industry. In Korea, the Journal of Internet Electronic Commerce Research has served as a leading academic platform, publishing interdisciplinary studies across business, law, computer science, information systems, and communications. To explore how Korean EC research has evolved in the era of accelerating AI adoption, this study analyzes 351 English written articles published between 2006 and April 2025 in this journal, collected from the Korea Citation Index platform. The analysis is expected to reveal several trends: (1) thematic evolution from B2B & marketplaces and trust & security to mobile commerce, social commerce, and AI & data analytics; (2) topic transitions reflecting web paradigms—Web 2.0 (infrastructure and payment systems), Web 3.0 (mobile commerce and personalization), and Web 4.0 (AI-driven recommendation and sustainability). This study contributes to academia by mapping the trajectory of EC research over nearly two decades and clarifying the interplay between technological paradigms and scholarly topics. It further offers practitioners insights into leveraging AI, data analytics, and mobile technologies to strengthen consumer trust and service personalization, while providing policymakers with evidence for designing adaptive regulations in digital commerce. Overall, the findings highlight how EC research in Korea mirrors global digital transformations and suggest future directions for sustainable and AI-driven commerce.
A0425-A Poster 02	*Immersive Augmented Reality as A Catalyst for Creative Culinary Design and Enhanced Learning Achievement* Yen-Cheng Chen, **Mr. Bo-Kai Lan** Chinese Culture University, Taiwan; Fu Jen Catholic University, Taiwan Abstract: Culinary education increasingly emphasizes creativity, multisensory thinking, and experiential skill development, educators face the challenge of cultivating learning environments that can meaningfully elevate students' design capabilities. Immersive augmented reality (AR) offers a transformative pedagogical approach by overlaying digital information onto real cooking contexts, thereby expanding learners' perceptual and cognitive resources. This study investigates how AR-supported instruction influences creative culinary design, with particular attention to students' ideation processes, innovation quality, and overall learning achievement. Drawing on experiential learning theory and embodied cognition, the research employs a quasi-experimental design comparing an AR-enhanced instructional group with a traditional demonstration-based control group. Students in the AR condition engage with interactive ingredient simulations, virtual procedural guidance, and visual overlays that support real-time decision-making during the cooking process. Data will be collected through creativity assessment rubrics, innovation-quality evaluations, and validated learning-performance measures. It is anticipated that immersive AR environments will stimulate more original idea generation, foster greater design sophistication, and strengthen learning outcomes by deepening cognitive engagement and reducing procedural ambiguity. By demonstrating how extended reality tools reshape creative learning trajectories in culinary education, this study contributes to emerging pedagogical models and offers actionable insights for integrating immersive technologies into professional cooking and hospitality training.

Session 1

Machine Learning Theories and Computational Models in Modern Information Systems

13:30-15:15 | January 8, Thursday | Room 2G (2nd floor)

Session Chair: Asst. Prof. S.M. Sayem, Bangladesh University of Professionals, Bangladesh

A0045-A 13:30-13:45	*An Entropy Curve based Fuzzy Clustering Algorithm for Robust Segmentation in Noisy Images* Sumit Sharma, **Dr. Bhupendra Gupta**, Subir Singh Lamba PDPM Indian Institute of Information Technology, India Abstract: The Fuzzy C-means (FCM) clustering algorithm is a well-established tech-nique for image segmentation, widely applied to natural, medical, and satellite images. However, its performance degrades in the presence of noise, prompt-ing the development of several modified variants. In this study, we propose an entropy curve–based modification of FCM that enhances the selection of initial cluster centers, thereby achieving more effective segmentation in noisy medical images. The method analyzes the entropy of gray-level distributions to extract informative initial centers, and further integrates entropy information into the membership and objective functions. This strategy accelerates convergence and improves segmentation quality by preserving structural details. The proposed approach has been evaluated on synthetic images, medical images, and natural images from the BSDS500 dataset. Experimental results demonstrate its robust-ness to noise and its superiority in boundary preservation, particularly in medical image segmentation.
A0225 13:45-14:00	*Enhanced LSTM Neural Network for Integrating Multi-Source Factors in Carbon Price Prediction* **Mr. Bundit Rotyoon**, Tanasanee Phienthrakul Mahidol University, Thailand Abstract: Carbon pricing is an important tool that is used to reduce greenhouse gas emissions by putting a cost on carbon dioxide. Carbon pricing sends a market signal that encourages industries and consumers to consider environmental impacts. Carbon prices are highly dynamic and influenced by many factors, such as energy prices, financial indicators, and environ- mental conditions. Understanding and predicting carbon price movements is essential for governments, investors, and industries to make informed decisions about sustainable development. This research develops an enhanced carbon price prediction model that integrates feature selection methods with a Long Short-Term Memory (LSTM) network. The model uses a 10 year data set (2014–2024) that contains 29 variables from the energy, economic, and environmental domains, such as the prices of the European Union Allowance (EUA), energy market data, stock indices, bond yields, and air quality measures. Experimental results show that the proposed feature-integrated and weight-initialized LSTM variants significantly outperform the baseline LSTM. The best model (ReliefF + LSTM) reduces the MSE from 0.0415 to 0.0032. The weight-initialized models also improve both accuracy and efficiency while reducing computation time. These results confirm that integrating feature-selection outputs into LSTM design enhances both prediction accuracy and computational performance.
A0390 14:00-14:15	*StrokeNet-CT: An EfficientNetV2-Based Framework with Adaptive Windowing and Attention Mechanisms for Binary Stroke Classification on NCCT Images* **Mr. Kantapat Kwansomkid**, Kharittha Jangsamsi, Sanan Srakaew King Mongkut's University of Technology Thonburi, Thailand Abstract: Stroke is still one of the most common neurological emergencies, and rapid image interpretation plays a major role in determining the treatment a patient can receive. Although Non-Contrast CT (NCCT) is the first imaging choice in most emergency rooms, the early signs of ischemia are often so subtle that they are easily overlooked. In this work, we introduce

	StrokeNet-CT, a model based on EfficientNetV2B0 that has been modified to better suit NCCT characteristics. Two additional components—the Dynamic Windowing Module, which adjusts image contrast automatically, and the Stroke-Focused Attention Block, which highlights areas where faint ischemic patterns may occur—were incorporated to address well-known limitations of NCCT. The model was trained on 4,829 images and demonstrated an accuracy of 91.40%, outperforming standard CNN architectures trained under the same conditions. While the model is not intended to replace radiologists, the results suggest that it could serve as a practical aid in settings where specialized imaging or experienced readers are not always available.
A0451 14:15-14:30	*Transformer-Based Prediction of Competition Results: A Case Study on Horse Racing* **Mr. Kazuki Takahashi**, Takuya Yokoyama, Qiu Chen Kogakuin University, Japan Abstract: Predictive modeling is a key challenge in many real-world domains such as disaster forecasting, stock market analysis, and medical diagnosis. Horse racing represents one such domain where outcome prediction is challenging due to the complex interplay of factors like horse and jockey condition, weather, and track surface. While large volumes of historical race data are publicly available and increasingly leveraged in AI-based research, accurately capturing nonlinear relationships among mixed-type features remains a significant challenge. Traditional machine learning approaches—including decision trees, random forests, and gradient boosting—often struggle to model high-dimensional interactions between categorical and numerical variables. To address these limitations, we propose a Transformer-based prediction framework using TabTransformer, which utilizes self-attention mechanisms to learn intricate dependencies within tabular data. As a case study, we apply our method to horse racing data provided by the Japan Racing Association (JRA). Compared with 12 conventional machine learning models, our approach achieves a return rate of over 111%, while maintaining comparable prediction accuracy. These results demonstrate the practical effectiveness of Transformer-based architectures in enhancing both profitability and predictive performance for structured competition outcomes, offering valuable insights for data-driven betting and decision-making applications.
A0255 14:30-14:45	*Enhancing Logo Detection Using Contrastive Language–Image Pre-Training* **Mr. Wattanachai Santiapiboon**, Tanasanee Phienthrakul Mahidol University, Thailand Abstract: The increasing prevalence of subtle, dynamic, and contextually embedded logos in digital media poses a challenge for conventional object detection methods, which often require frequent retraining to handle new designs, scale variations, and diverse backgrounds. This study leverages Contrastive Language–Image Pre-Training (CLIP) for video-based logo detection, enabling flexible, retraining-free retrieval by mapping visual and textual inputs into a shared embedding space. An image pyramid strategy is integrated to improve multi-scale detection capability. Three approaches were evaluated: (1) B-CLIP, a sliding-window CLIP method; (2) CYCLD, which incorporates region proposals before CLIP filtering; and (3) PY-CLIP, which combines CLIP with the image pyramid for scale-aware detection. Logo candidates were ranked via cosine similarity in CLIP's multimodal space. Experimental results demonstrate that PY-CLIP achieves the highest mean accuracy (0.91) while reducing execution time by 59.4% compared to B-CLIP (117.9 vs. 290.3 minutes). CYCLD attains a runtime of 41.5 minutes but yields lower recall and F1-scores than PY-CLIP. These findings highlight that combining CLIP with pyramid-based detection offers a practical, efficient, and scalable solution for real-world logo detection tasks.
A0183-A 14:45-15:00	*A Robust Clustering Approach based on Minimum Spanning Tree* Rakhi Yadav, **Dr. Subir Singh Lamba** PDPM IIITDM Jabalpur, India Abstract: Clustering methods are generally sensitive to the data distribution and the pre-fixed parameters such as the number of clusters, neighborhood radius etc.; a slight deviation in the choice of such parameters results in a drastic change in the final results. To deal with such problems, we require methods that are more robust against the choice of the parameters. This paper suggests a density based clustering approach, which does not require number of clusters

	as prerequisite, (i.e., users do not need to give number of clusters beforehand); the approach itself finds out the most appropriate number of clusters. The proposed approach is based on the Minimum Spanning Tree (MST) with a pre-fixed neighboring radius (which is remaining the same for any data distribution) and hence the approach gives consistent results. The proposed approach is more robust as compared to any other approach as there is no need to give an initial number of the clusters and neighboring radius. Also, the results of the proposed approach out-perform the other widely used approaches, tested on synthetic and real standard data sets.
A0131-A 15:00-15:15	*Style-diversified Image Translation for Plant Disease Recognition under Extreme Data Scarcity* Shih-Yun Lin, Yun-Ming Chou, **Assoc. Prof. Chih-En Kuo** National Chung Hsing University, Taiwan Abstract: To address data scarcity and class imbalance in plant disease recognition, we proposed an end-to-end synthesis and augmentation pipeline. The core of this pipeline is a novel Style-Injected Cycle-Consistent Generative Adversarial Network (SI-CycleGAN) paired with a Style Sampler. This combination extracts and diversifies disease features from a minimal number of real samples to generate a large volume of high-quality, synthetic diseased leaf images from healthy ones. The synthetic data is then combined with the CutMix augmentation method to effectively train a downstream classification model. Our method was validated in two parts: 1) We assessed synthetic image quality, where our model significantly outperformed baselines like CycleGAN and UNIT, achieving an FID score of 40.96 compared to over 130 for the control groups; 2) We evaluated the impact on a downstream classification task. In an extreme data-scarce scenario with only 10 real samples, our pipeline increased the model's F1-score from a baseline of 59.59% to 91.24%. This result closes approximately 92% of the performance gap compared to the optimal condition (F1-score of 93.88%), demonstrating a powerful solution for developing robust recognition models in practical, data-constrained agricultural applications.

Session 2

AI-based Advanced Digital Communication Systems and Software Design

13:30-15:30 | January 8, Thursday | Room 2E (2nd floor)

Session Chair: Prof. Jonathan Wu, University of Windsor, Canada

A0011 13:30-13:45	*IoT-Based Real-Time Induction Motor Vibration Monitoring System* **Assoc. Prof. Apinai Rerkratn**, Vanchai Riewruja, Wandee Petchmaneelumka, Mr. Suriya Taecharoenwiriyakun, Sirichai Tammaruckwattana King Mongkut's Institute of Technology Ladkrabang, Thailand Abstract: This paper proposes an IoT-based real-time induction motor vibration monitoring system. Vibration is one of the critical parameters that play a critical role in the predictive maintenance of rotating machinery. Due to their complexity and high cost, many current vibration monitoring systems are unsuitable for practical use in small industrial plants. This paper presents a system for real-time vibration monitoring for small rotating machinery operated by an induction motor based on IoT technology. The proposed system consists of an ESP32 microcontroller and an ADXL345 triaxial accelerometer to measure vibration and use it to calculate the vibration velocity. The computed vibration velocity is sent to the Blynk dashboard via Wi-Fi for real-time monitoring of vibration velocity using a gauge and chart. Furthermore, the 4 LED status indicators based on ISO 10816 standards allow users to assess vibration severity and take preventive maintenance actions quickly. In addition, the proposed system adds an auto-calibration function for compensation for static background vibrations, improving measurement accuracy. The proposed system offers a cost- effective, easily deployable alternative for machine health monitoring in small-scale industrial environments.
A0031-A 13:45-14:00	*A Predictive Maintenance Framework for Automotive Engines Using IoT Sensor Data* **Ms. Swetha Nayappulliyil Viswanathan**, T. Goto, K. Tsuchida, D. Sakthi Kumar Toyo University, Japan Abstract: The advancement of intelligent transportation systems has highlighted the growing importance of predictive maintenance in the automotive sector. Traditional maintenance strategies — such as reactive or scheduled servicing — are often inefficient, leading to unnecessary downtime or unexpected engine failures. This project presents a data-driven predictive maintenance framework that utilizes IoT sensor data to assess the health of automotive engines through artificial intelligence (AI) techniques. While the system does not directly integrate IoT hardware, it utilizes pre-collected or simulated sensor data that closely resembles real-time inputs from in-vehicle sensors monitoring parameters such as engine temperature, oil pressure, vibration, and lubricant condition. Using these realistic sensor readings, the study evaluates and compares the performance of multiple machine learning models. By comparing model performances, the framework identifies the most effective AI algorithm for predicting engine condition. The goal is to enable data-driven maintenance decisions that can be integrated into real-time vehicle monitoring systems in future applications. This research demonstrates how machine learning, when applied to IoT-generated data, can significantly improve the reliability, safety, and cost-efficiency of automotive engine maintenance. In doing so, it contributes to the field of information engineering by showcasing how AI-driven frameworks can transform IoT data into actionable insights for intelligent transportation systems.
A0061 14:00-14:15	*AI-powered Financial Consultancy Services for Improved Financial Decision Making: Role of AIassisted Human Consultant* S.M. Sayem, **Assist. Prof. Sadman Kabir**, **Md. Tafshir Jaman Takib**, Israt Jahan Ria, Nusrat Jahan, Mohammad Ishtiaque Rahman Bangladesh University of Professionals, Bangladesh Abstract: This study examines the role of AI-powered financial consultancy services (Voice Bot,

	Robo Advisor, Data Encryption, Financial Planning and Strategy) in influencing financial decision-making in the context of Bangladesh. Specifically, it explores how AI-assisted Human Consultant mediates the relationship between those AI-backed tools and financial decision outcomes. A structured questionnaire was distributed among general users of available financial services in Bangladesh and 355 responses were collected. Demographic data was analyzed using SPSS, while the core analysis was conducted using the Partial Least Squares Structural Equation Modelling (PLS-SEM) approach via SmartPLS4. The findings reveal that Voice Bot and Financial Planning and Strategy have a significant positive influence on financial decision making, both directly and through the mediating effect of AI-assisted Human Consultant. Conversely, Robo Advisor failed to show any positive significance, highlighting users' reluctance to follow automated financial decisions. Data Encryption also lacked direct influence, but it demonstrated a positive influence when mediated through AI-assisted Human Consultant. These findings affirm the hybrid intelligence theory in financial consultancy, where AI tools enhance the human input rather than replacing it. This study provides practical insights for fintech firms, financial institutions and financial service providers on fostering client trust in AI. This study also offers policy implementation guidelines for ethical, inclusive adoption of AI in the financial sector.
A0261 14:15-14:30	*Digital Transformation of Local Transport: A Real-Time Ticketing System at Bangkok Minibus Terminal* **Dr. Tantikorn Pichpibul**, Nareerat Prechatavanitchakul Bangkok University, Thailand Abstract: This paper presents the design and deployment of a real-time ticketing system implemented at the Bangkok Minibus Terminal as part of the digital transformation in local transport operations. The previous process relied on handwritten tickets and manual seat charts, which often caused delays, duplicated records, and input errors across multiple providers. The proposed web-based platform integrates route selection, seat management, route scheduling, and automated printing of driver and customer documents through a touchscreen interface optimized for daily use. A comparative evaluation was conducted using operational data collected over one week, based on 2,886 recorded transactions. Results show that the system reduced the average transaction time from 33.17 seconds to 7.78 seconds, representing a 76.5% improvement in processing speed. Manual operations exhibited an error rate of 9.1%, while no errors were observed in the digital process. The findings confirm that a real-time digital platform can significantly improve efficiency, accuracy, and data reliability in small-scale public transport operations.
A0271 14:30-14:45	*A Study on the Use of Web Applications with Microservices Architecture to Enhance Sustainability in Electronic Document Management Systems within Educational Institutions* **Dr. Kanitta Hinon**, Kittinan Petsri, Wittawat Chantamoolla King Mongkut's University of Technology North Bangkok, Thailand Abstract: This research aims to study the use of a web application developed with a microservices architecture to support sustainability in document resource management within educational institutions. At present, most documents are stored in electronic form, which necessitates efficient and sustainable management solutions. In this study, the implementation of a web application using microservices architecture was aligned with green education policies to promote an educational ecosystem that fosters learning and transformation. The design principle focused on developing online services for both students and staff within the institution by employing a microservices-based web application framework. This approach enhances the system's manageability, particularly in the presentation layer, application layer, and data layer. The web application was developed to improve overall efficiency. The frontend structure was built using HTML for responsiveness and visual rendering, enhanced with JavaScript for interactivity. For the backend, the electronic document management system was implemented using PHP, which integrates with multiple APIs such as user authentication for system access, viewing of historical usage data, and maintaining user service logs for future convenience. Additionally, the system incorporates notification features through Gmail and LINE Notify services. From the preliminary evaluation and usability testing, the system functioned as intended according to the design objectives. The backend successfully connected to the institution's open APIs, ensuring convenient access for both students and staff. The results of the study on the satisfaction of users who participated in the preliminary usability testing of the electronic document management system web application within the educational institution

	revealed that the modules related to authentication & user profile, booking search & inquiry, booking management, and document management achieved a very high level of suitability. Meanwhile, the modules concerning feedback & reporting and notification demonstrated a high level of suitability.
A0475 14:45-15:00	*STAR-RIS Assisted Joint Uplink and Downlink Communications with NOMA* Chia-Wei Chang, **Prof. Feng-Tsun Chien** National Yang Ming Chiao Tung University, Taiwan Abstract: This paper investigates a full-duplex (FD) simultaneously transmitting and reflecting reconfigurable intelligent surface (STAR-RIS)-assisted non-orthogonal multiple access (NOMA) system supporting simultaneous uplink and downlink transmissions under quality-of-service (QoS) constraints. Users are grouped via cluster-based NOMA, and a unified optimization framework is proposed to jointly design the transmit beamforming, decoding order, STAR-RIS transmission/reflection coefficients, and transmit power allocation. By decomposing the non-convex problem into three subproblems, an alternating optimization (AO) approach is employed. Simulation results show that the proposed scheme outperforms half-duplex (HD) and orthogonal multiple access (OMA) baselines in terms of rate performance, and show that the proposed scheme is power-efficient, thereby offering insights into duplex mode selection and resource allocation for next-generation intelligent wireless networks.
A0485 15:00-15:15	*A Comparative Evaluation of Consumer-Grade AMD and NVIDIA GPUs for Academic AI Training* **Mr. Cedric John C. Cangco**, Hanz Ian B. Silva, Kim Miguel P. Sobrepena, Jefferson A. Costales Mapua University, Philippines Abstract: This paper benchmarks the NVIDIA RTX 5060 Ti and AMD RX 9060 XT using three representative academic AI workloads: ResNet-152 on the Oxford-IIIT Pet dataset, DistilBERT on a 2K AG News subset, and YOLOv8n on a 5K COCO subset. All models were trained under identical settings on Windows 11. The RTX 5060 Ti consistently achieved faster training times, higher efficiency, and more stable behavior across all experiments. The RX 9060 XT recorded strong peak throughput in certain tasks, but its overall performance was limited by early ROCm Windows support and incomplete attention-kernel optimizations for transformer models. The findings highlight the importance of software ecosystem maturity, in addition to raw hardware specifications, when selecting consumer GPUs for academic AI training.
A0071 15:15-15:30	*Smart Trash Robot* **Dr. Sirichai Tammaruckwattana**, **Mr. Ekarin Vichachuai**, Apinan Seekhieo, Jirawat Patipatpong, Chonlasit Choodee, Supachai Ruangrit, Apinai Rerkratn, Narin Tammaruckwattana King Mongkut's Institute of Technology Ladkrabang, Thailand Abstract: This paper proposes a smart trash robot system to improve the current issues in trash/waste management across various locations, including meeting rooms, buildings, and residential areas. These issues include the distance between trash bins and the incapability to monitor their working status in real-time. This often leads to overfilling waste, unpleasant odors, and diminished aesthetic appeal in public spaces. To address these challenges, we have developed the "Smart Trash Robot", designed to enhance user convenience and maintain environmental cleanliness. The robot can notify users when the bin is full via ultrasonic sensors and a mobile application. Additionally, it can autonomously move to designated locations using LiDAR sensors, which work in tandem with motorized wheels, thus reducing the need for users to travel long distances to manage waste and easy to access in all areas which route of operate can designate. The robot also features an automatic bag-sealing system, providing users with greater ease in handling trash. Furthermore, it helps maintain a clean and pleasant environment by preventing waste overflow and odors, while its touchless lid operation via infrared sensors for hygiene and safety as priority. With its integration of advanced technology, the Smart Trash Robot significantly improves waste management efficiency, reduces user workload, and fosters a cleaner, more aesthetically pleasing, and sustainable environment.

Session 3 (Online)

AI-based Intelligent Information Systems and Data Models

17:00-19:15 (UTC+9) | January 9, Friday

ZOOM ID: 868 5177 1190, ZOOM link: https://us02web.zoom.us/j/86851771190

Session Chair: Prof. Jinlian Du, Beijing University of Technology, China

A0193 17:00-17:15	*Partial Distance Correlation-Based Motion Pattern Detection in Basketball* **Ms. Kieu Thuy Thi Phan**, Thang Cong Pham, Hiep Xuan Huynh University of Economics Ho Chi Minh City, Vietnam Abstract: A new analytical framework based on Partial Dis- tance Correlation (PDC) is proposed for the task of basketball motion pattern detection. In this framework, motion is mod- eled at the trajectory level by integrating two complementary sources of information. First, nonlinear dependencies among trajectories are quantified through conditionally computed PDC in order to remove the influence of confounding variables such as velocity and acceleration. Second, kinematic similarity in the feature space is computed from a nine-dimensional motion descriptor and combined with the PDC component through a geometric fusion rule that is controlled by the parameter . Experiments are conducted on two datasets with different characteristics, namely BasketLiDAR obtained from a LiDAR sensing system and UCF101 BasketballDunk obtained from an RGB video source. The results indicate that PDC enables the identification of intrinsic kinematic dependencies among the motion patterns: Defense, Dribbling, Passing, and Shooting. The trajectories obtained from sensor-based data exhibit stronger and more stable linear dependency structures, while the trajectories obtained from video data display nonlinear behavior and a higher sensitivity to environmental noise. The analysis of the parameter further reveals that the contribution of nonlinear dependency information must be adaptively adjusted according to the complexity of the motion. These findings demonstrate that the proposed PDC Kinematic Fusion framework has strong potential for applications in computer vision research related to sports performance analysis and intelligent training support.
A0215 17:15-17:30	*Design and Application of a Semantic Model for Medical Record Knowledge Graph Querying* **Mr. Xiaolong Chu**, Jinlian Du, Fangyuan Luo, Xueyun Jin Beijing University of Technology, China Abstract: The Cypher language is widely applied in knowledge graph querying. However, it exhibits inherent limitations: insufficient semantic support in specific-domain scenarios and cumbersome expression of complex queries, which are unfavorable for the design of query engines. By analyzing the characteristics of clinical diagnosis and treatment query application based on medical record knowledge graph, a query meta operation for medical record (MR) knowledge graph and a query application semantic model generated by the combination of these meta operations were designed. Combined into a hierarchical semantic model, these meta-operations provide a clear and structured way to represent clinical queries. This model serves as an effective logical-layer abstraction for query engines, leveraging a production rule system to efficiently convert queries into Cypher execution plans. The rules define direct mappings from the model's constructs to Cypher syntax, enabling automatic translation of high-level query intentions into executable statements. Experiments show that this semantic model performs well in terms of expressiveness and accuracy for query applications oriented to the medical record knowledge graph, as well as in the operational robustness of the query engine built on it.
A0385 17:30-17:45	*Enhancing Information Flow Control in eBPF Programs via Taint Tracking Mechanisms* **Ms. Sai Veerya Mahadevan**, Yuuki Takano, Atsuko Miyaji Osaka University, Japan

	Abstract: The extended Berkeley Packet Filter (eBPF) frame-work augments Linux with safe, in-kernel programmability and rich observability across networking, tracing, and security hooks. Its flexibility, however, also enlarges the attack surface for unauthorized data access and leakage that may only emerge under runtime context. The kernel verifier and static information-flow control (IFC) analysis reason about safety at load/attach time, but cannot observe dynamic, context-dependent flows. We propose a lightweight, deployable dynamic taint-tracking IFC layer for eBPF that (i) tags sensitive inputs at sources (e.g., map updates, selected helper parameters), (ii) maintains compact per-task propagation state, and (iii) checks common sinks (e.g., write/send*) to detect policy-violating flows. The design relies on kprobes/uprobes via BCC/bpftrace—no kernel modifications—and complements static verification. We present a PoC-oriented implementation plan, a policy model, and a measurement plan. The paper includes sample benchmark values and outcomes to illustrate expected behavior for a design-under-implementation.
A0235 17:45-18:00	*Sum Rate Maximization for Active RIS-assisted Multi-Pair NOMA SWIPT Networks* **Mr. Jean Paul Twarayisenze**, Wei Kang, Jin Li, Nan Liu Southeast University, China Abstract: This paper investigates a simultaneous wireless information and power transfer (SWIPT)-enabled non-orthogonal multiple access (NOMA) system equipped with multiple pairs of users, with single-antenna transmitting sources (TSs) sharing both information and energy to their respective receiving users (RUs) assisted by an active reconfigurable intelligent surface (RIS). We aim to maximize the system sum rate (SSR) by jointly optimizing the power allocation at the TSs, the active beamforming at the RIS, the power splitting (PS) ratios at the RUs, and the successive interference cancellation (SIC) user-decoding order, which results in non-convex optimization problem. To solve this problem, we propose a two-phase iterative algorithm (IA), where the SIC user-decoding order is designed in the first phase by adopting semi-definite relaxation (SDR) method, while in the second phase, the power allocation, active RIS reflecting matrix, and PS ratios are alternately optimized by invoking fractional programming (FP), Lagrange dual transformation (LDT), Karush-Kuhn-Tucker (KKT) conditions, and closed-form solution. We conduct numerical simulations, where the results reveal that the proposed scheme improves the SSR performance significantly compared to other benchmark schemes.
A0400 18:00-18:15	*A Unified Workload Metric for Goods Receiving Optimization: The CLP Model and Decision-Support Application* Nicola Magaletti, Giancarlo Caponio, Angelo Amodio, Valeria Notarnicola, Mauro di Molfetta, **Assist. Prof. Angelo Leogrande** LUM University Giuseppe Degennaro, Italy Abstract: This paper presents a decision support system (DSS) for optimizing capacity planning in intralogistics receiving operations. Central to the system is the Content Load Parameter (CLP), a unified metric combining quantity, volume, and weight into a single workload indicator, enabling more accurate and comparable assessments across unloading, control, and storage tasks. The DSS integrates simulation capabilities to evaluate alternative operational scenarios, detect bottlenecks, and support staffing and scheduling decisions. Through dashboards and performance metrics, it provides real-time insight into workload–capacity alignment. The results show that embedding the CLP within a DSS framework enhances workload estimation and improves decision-making in complex inbound logistics environments, offering a practical response to limitations in previous research.
A0495 18:15-18:30	*Energy-Based Contextual Modeling for Context-Aware Recommender Systems* **Mr. Linh Thuy Thi Nguyen**, Lan Phuong Phan, Hiep Xuan Huynh Can Tho University, Vietnam Abstract: Context-aware recommender systems (CARS) have emerged as essential tools for personalized recommendations, where contextual signals such as time, location, and user situation are incorporated to capture the dynamic nature of user preferences. Among existing approaches, contextual modeling is considered the most principled paradigm as context is directly integrated into the prediction function. However, current methods are limited by several challenges: data sparsity is exacerbated by tensor factorization, only linear interactions are

	captured by factorization machines, and theoretical interpretability is lacking in deep learning approaches. To address these limitations, EBM-CARS (Energy-Based Modeling for Context-Aware Recommender Systems) is proposed in this paper. Two theoretical foundations are unified in this framework: Energy-Based Models (EBMs), where user – item – context compatibility is measured through energy functions with lower energy indicating stronger preference, and Szekely-Rizzo energy statistics, by which scale invariance ´ and statistical consistency are guaranteed. The energy landscape is shaped through contrastive learning, whereby the intractable partition function computation is bypassed. Extensive experiments were conducted on three benchmark datasets: MovieLens-25M, Amazon Product Reviews, and Yelp. Improvements of 10–18% in recommendation accuracy over state-of-the-art methods (FM, DeepFM, NFM, xDeepFM) were achieved, and the effectiveness of energy-based contextual modeling is validated through comprehensive ablation studies.
A0551 18:30-18:45	*Optimal Deployment Strategy for UAV-Based Smoke Grenades Using Geometric Criterion and Hybrid Optimization Algorithm* **Ms. Zhuoyi WANG** Hohai University, China Abstract: The optimization of deployment strategies for Unmanned Aerial Vehicle (UAV)-delivered smoke grenades in tactical defense scenarios presents a significant challenge. This paper proposes a systematic framework that integrates precise geometric criteria with a hybrid optimization algorithm to address this problem. First, a comprehensive mathematical model is established, encompassing the three-dimensional kinematics of the missile, UAVs, smoke clouds, and the cylindrical target. A "complete obscuration" condition is rigorously defined based on line segment-sphere intersection geometry. Second, the objective of maximizing the total effective obscuration duration is formulated as a complex nonlinear optimization problem. To solve it, a hierarchical optimization strategy is designed: a Particle Swarm Optimization (PSO) algorithm performs global parameter exploration, followed by local refinement using a Sequential Quadratic Programming (SQP) algorithm. For multi-UAV cooperative scenarios, a combinatorial optimization method combining Depth-First Search (DFS) with neural network-based heuristic pruning is proposed to efficiently identify near-optimal cooperative strategies. Numerical simulations across five progressively complex scenarios validate the effectiveness of the proposed approach. The results demonstrate a substantial improvement in obscuration performance: from a baseline of 1.39 seconds (fixed parameters), to 4.59 seconds for optimized single grenade deployment, 6.68 seconds for single UAV deploying multiple grenades, 14.28 seconds for three UAVs cooperating, and finally 21.41 seconds for a comprehensive multi-UAV, multi-grenade deployment. This work provides a complete modeling and solution framework for the decision-making optimization of intelligent UAV-based smoke defense systems.
A0415 18:45-19:00	*NAWOA-XGBoost: A Novel Model for Early Prediction of Academic Potential in Computer Science Students* **Dr. Junhao Wei**, Yanzhao Gu, Ran Zhang, Mingjing Huang, Jinhong Song, Yanxiao Li, Wenxuan Zhu, Yapeng Wang, Zikun Li, Zhiwen Wang, Xu Yang, Ngai Cheong Macao Polytechnic University, Macao, China Abstract: Whale Optimization Algorithm (WOA) suffers from limited global search ability, slow convergence, and tendency to fall into local optima, restricting its effectiveness in hyperparameter optimization for machine learning models. To address these issues, this study proposes a Nonlinear Adaptive Whale Optimization Algorithm (NAWOA), which integrates strategies such as Good Nodes Set initialization, Leader-Followers Foraging, Dynamic Encircling Prey, Triangular Hunting, and a nonlinear convergence factor to enhance exploration, exploitation, and convergence stability. Experiments on 23 benchmark functions demonstrate NAWOA's superior optimization capability and robustness. Based on this optimizer, an NAWOA-XGBoost model was developed to predict academic potential using data from 495 Computer Science undergraduates at Macao Polytechnic University (2009–2019). Results show that NAWOA-XGBoost outperforms traditional XGBoost and WOA-XGBoost across key metrics, including Accuracy (0.8148), Macro F1 (0.8101), AUC (0.8932), and G-Mean (0.8172), demonstrating strong adaptability on multi-class imbalanced datasets.

A0441 19:00-19:15	*ASKSSA-CNN-BiLSTM: A Novel Time Series Forecasting Model for Stock Price Prediction based on An Enhanced Sparrow Search Algorithm* **Mr. Zikun Li**, Wenxuan Zhu, Ran Zhang, Yanzhao Gu, Jinhong Song, Yanxiao Li, Yapeng Wang, Yifu Zhao, Qingyang Xu, Zhiwen Wang, Xu Yang, Junhao Wei South China Normal University, China Abstract: Stock price forecasting is highly challenging due to the nonlinear, noisy, and rapidly fluctuating characteristics of high-frequency financial time series. To address these issues, this study proposes ASKSSA-CNN-BiLSTM, a hybrid model that integrates an enhanced Sparrow Search Algorithm (ASKSSA) with a CNN-BiLSTM architecture. ASKSSA improves the original SSA by incorporating Good Nodes Set initialization, a Sine-Cosine producer update strategy, adaptive t-distribution perturbation, and a triangular-walk-based edge update mechanism, significantly strengthening global exploration and convergence stability. The model is evaluated using high-frequency CSI 300 stock data recorded every 10 minutes. Experimental results show that ASKSSA effectively optimizes the hyperparameters of the CNN-BiLSTM network, enabling the model to better capture short-term fluctuations and bidirectional temporal patterns. Compared with CNN-BiLSTM, Adam-CNN-BiLSTM, and SSA-CNN-BiLSTM, the proposed ASKSSA-CNN-BiLSTM achieves the lowest RMSE (1.0512E-01) and the highest accuracy (94.0967\%). These results demonstrate that ASKSSA-CNN-BiLSTM provides a robust and efficient solution for high-frequency stock price prediction and offers strong potential for broader time-series prediction applications.

Delegates

Suriya Taecharoenwiriyakun	King Mongkut's Institute of Technology Ladkrabang, Thailand
S.M. Sayem	Bangladesh University of Professionals, Bangladesh
Sirichai Tammaruckwattana	King Mongkut's Institute of Technology Ladkrabang, Thailand
Jong Hyuk Park	Seoul National University of Science and Technology, Republic of Korea
Tae Hyun Kim	Hanyang University, South Korea
Sanghee Kim	Kyonggi University, South Korea
Hyokyung Bahn	Ewha University, Republic of Korea
Jerry Cheng	New York Institute of Technology, USA

MEMO

MEMO