APARM Special Session I

Special Session Basic Information:

Session Title	Data-driven for complex industrial systems

Introduction and topics

Digital transformation and smart manufacturing are increasingly driven by data-centric AI that integrates multi-modal sensing, machine learning, and advanced analytics for predictive modelling, condition monitoring, and process optimization. While these approaches enable predictive maintenance, diagnostics, defect detection, quality control, and yield/process optimization, their industrial deployment is often hindered by scarce or costly labelled data, heterogeneous data quality across tools/sites, and the demand for interpretable, reliable, and actionable predictions. This special session brings together cutting-edge methodologies and real-world applications that enhance industrial AI with domain knowledge and physics priors, including physics-informed learning, neural operators, and hybrid data & physics modelling. Topics include RUL prediction, health index construction, anomaly detection, virtual metrology, transfer/federated learning for cross-fleet generalization, multimodal learning (vibration, acoustic, thermal, vision, logs), and trustworthy AI for safety-critical assets. Emphasis is placed on deployable solutions, digital twins/edge AI, and industrial case studies demonstrating measurable impact on reliability, availability, cost, and risk.

Special Session Chair(s):

Photo

Name	Chia-Yu Hsu
Prefix	Dr.
Department	Department of Industrial Engineering and Engineering Management
Organization	National Tsing Hua University
City/Region	Hsinchu/Taiwan

Organizer's Brief Biography

Dr. Chia-Yu Hsu is a Professor in the Department of Industrial Engineering and Engineering Management at National Tsing Hua University. Dr. Hsu received funding by LEAP Program and MOST to be a Solution Architect in NVIDIA Corporation (USA) in 2017-2018. He accumulated experience of AI and data-drive for smart manufacturing. His main research interests include machine learning & deep learning, big data analytics for semiconductor yield enhancement, predictive maintenance, fault detection and diagnosis, advanced process control (APC) for high-tech companies. Dr. Hsu has been actively involved in many university-industry collaborative research projects in the high-tech industries including semiconductor manufacturing, panel display, printed circuit board and inspection machine in which they employ their expertise in solving real problems with domain experts. Dr. Hsu has received many awards including Shu-Syun Chen Chair, Chinese Institute of Industrial Engineers, Individual Quality Award, Chinese Society for Quality (CSQ), Young Outstanding Researcher Award, Operations Research Society of Taiwan, Dr. Schetman Young Researcher Award by National Taipei University of Technology, Dr. Ta-You Wu Memorial Award by Ministry of Science and Technology, Feng-Zhang Lu Memorial Medal by Chinese Management Association, Young Outstanding Researcher Award sponsored by Chinese Institute of Industrial Engineers (CIIE), Young Outstanding Researcher Award sponsored

by Computer Scoiety of the Repulic of China (CSROC), Young Outstanding Researcher Award sponsored by Yuan Ze University, and Sayling Wen's Award for Young Outstanding Researcher sponsored by Service Science Society of Taiwan. He has also received 4 Invention Patents of USA. He is also an Associate Editor of IEEE Transactions on Automation Science and Engineering, Associate Editor of European Journal of Industrial Engineering

Name	Kuo-Yi Lin
Prefix	Dr.
Department	Department of Industrial Engineering and Management
Organization	National Kaohsiung University of Science and Technology
City/Region	Kaohsiung/ Taiwan

Organizer's Brief Biography

Dr. Kuo-Yi Lin is an Associate Professor in the Department of Industrial Engineering and Management at National Kaohsiung University of Science and Technology. He has been recognized as 2023-2025 World's Top 2 percent Scientist, reflecting the international impact and academic influence of his research. His academic work focuses on integrating artificial intelligence with engineering decision making to address complex real world problems. Dr. Lin's main research interests include machine learning and deep learning, intelligent fault diagnosis, predictive maintenance, time series analysis, and data driven optimization for smart manufacturing and industrial systems. His recent studies emphasize incomplete and heterogeneous data environments, generative artificial intelligence, and human centered intelligent decision support, with applications spanning semiconductor manufacturing, smart logistics, and adaptive learning systems. Dr. Lin has been actively involved in university industry collaborative research projects, working closely with domain experts to translate advanced analytical methods into practical solutions.

Name	Kotomichi Matsuno
Prefix	Dr.
Department	Department of Business Administration
Organization	Rissho University
City/Region	Tokyo/Japan

Organizer's Brief Biography

Dr. Kotomichi Matsuno is an Associate Professor in the Department of Business Administration at Rissho University and an Adjunct Researcher at the Institute of Value Creation Management, Waseda University. He also serves as Vice President of the Asian Association of Management Science and Applications (AAMSA). He specializes in intelligent operations management, with research focusing on the design, implementation, and deployment of decision-making systems that integrate optimization modeling, machine learning, and simulation. With extensive expertise in production, logistics, and supply chain optimization, he has led and contributed to numerous industry–academia collaborative projects in Japan and internationally (2019–2027), addressing next-generation production systems, agri-food supply chain networks, etc. His research achievements have been recognized through multiple Best Paper Awards at major international conferences, including APIEMS, ACMSA and IEOM. He maintains an active record of academic publications and international conference presentations, contributing to the advancement of intelligent production and distribution systems.