Special Session VIII

Special Session Basic Information:

专栏题目 **Session Title**	中文：工业 PHM 中的先进人工智能协同应用：从图学习到大语言模型 英文：Advanced AI for Industrial PHM: From Graph Learning to Large Language Models

专栏介绍和征稿主题
Introduction and topics

中文：旋转机械等复杂系统的运维面临着非线性退化建模、多源异质数据融合以及跨工况泛化等严峻挑战。本专题旨在汇聚人工智能领域的最新突破，探索其在结构健康监测（SHM）、故障诊断及剩余寿命（RUL）预测中的前沿应用。该专栏尤其关注整合“数据驱动”与“物理机理”的新兴技术，如兼具非线性解析能力的 Kolmogorov-Arnold 网络、捕捉时空关联的图神经网络、以及具备常识推理能力的工业大模型 (LLM)。本专题致力于为学术界和工业界搭建学术应用的桥梁，共同探讨如何构建更具解释性、鲁棒性、不确定性感知性和强大推理能力的智慧运维系统。

英文：The maintenance of complex systems like rotating machinery faces critical challenges, such as nonlinear degradation modeling, multi-source data fusion, and generalization across different working conditions. This special session aims to gather the latest breakthroughs in AI and explore their cutting-edge applications in reliability engineering, Structural Health Monitoring (SHM), fault diagnosis, and Remaining Useful Life (RUL) prediction. We are especially interested in new technologies that combine "data-driven" with "physics-informed" methodology, such as Kolmogorov-Arnold Networks (KAN) for nonlinear analysis, Graph Neural Networks (GNN) for capturing spatiotemporal relations, and Industrial Large Language Models (LLM) for reasoning. This special session is dedicated to building a bridge between academia and industry to discuss how to create intelligent maintenance systems that are more interpretable, robust, and capable of uncertainty-aware reasoning.

Special Session Chair(s):

姓名 **Name**	Cheng-Geng Huang
称谓 **Prefix**	Associate Professor
部门 **Department**	School of Automation Engineering
单位 **Organization**	University of Electronic Science and Technology of China
城市/地区 **City/Region**	Chengdu, China

Organizer's Brief Biography

中文：黄承赓副教授长期从事装备故障诊断预测与健康管理（DPHM）、工业大数据与人工智能、大语言模型与智能体及其在 DPHM 领域的工程化应用研究。近年来主持了国家自然科学基金青年基金、中国博士后科学基金和两项国防军工横向委托项目等项目，以牵头单位子课题负责人参与了国家重点研发计划等国家重大项目；以第一或通讯作者在 Advanced Materials 和 IEEE Transactions on Industrial Electronics 等权威学术顶刊上发表 SCI 检索论文 12 篇（Google 学术总引 2746 次，合计 9 篇论文入选 ESI 高被引论文）。荣获了包括中国机械工程学会工业工程分会最佳学术论文奖在内的 4 项国际学术奖励。申请和授权发明专利 10 项。担任《Journal of Reliability Science and Engineering》期刊青年编委。研制了风电装备集成健康监测平台与连续性肾脏替代治疗设备非接触式监控系统，分别在中船重工和华西医院实现落地转化，为大国重器与尖端医疗设备服役安全保障起到了重大作用。

英文：Dr. Chenggeng Huang is an Associate Professor focusing on DPHM, Industrial Big Data, and LLM-based agents for industrial applications. He has held numerous projects, including NSFC-funded research and various defense and national R&D programs. He has published 12 high-impact SCI papers in journals like Advanced Materials and IEEE

TIE, with 2,746 google-scholar-citations and 9 ESI Highly Cited Papers. He is a winner of four international academic awards and holder of 10 patents, Dr. Huang serves on the Youth Editorial Board of the Journal of Reliability Science and Engineering. His practical contributions include health monitoring platforms for wind turbines and medical CRRT devices, successfully implemented at CSIC and West China Hospital to ensure the safety of critical industrial and healthcare infrastructure.

姓名 **Name**	Jun Zhu
称谓 **Prefix**	Associate Professor
部门 **Department**	School of Civil Aviation
单位 **Organization**	Northwestern Polytechnical University
城市/地区 **City/Region**	Xi'an, Shaanxi Province, China

Organizer's Brief Biography

中文：朱军，男，1990 年出生，西北工业大学民航学院副教授，硕士生导师，江苏省双创博士人才，连续 2022-2025 年入选斯坦福全球前 2%顶尖科学家，于 2020 年获得新加坡国立大学博士学位。主要研究领域包括工业大数据分析、人工智能算法、飞行器故障数据可解释生成、迁移故障诊断、剩余寿命预测等。近年来，主持国家自然科学基金青年项目、军口纵向、陕西省自然科学基金青年项目等多项项目；已在 IEEE Transactions on Industrial Electronics、Mechanical Systems and Signal Processing、IEEE Transactions on Industrial Informatics 等国内外权威学术期刊上发表高水平论文 20 余篇，论文总被引 2800+，其中以第一/通讯作者发表论文 13 篇，单篇最高引用次数 700+，7 篇入选 ESI 高被引论文。担任《IEEE Transactions on Instrumentation and Measurement》副主编。获 IEEE TIM 2024 Andy Chi 最佳论文奖。获江苏省航空航天学会青年科技奖。

英文：Jun Zhu, male, born in 1990, is an Associate Professor and Master Supervisor at the School of Civil Aviation, Northwestern Polytechnical University. He is a talent of Jiangsu Shuangchuang Doctoral Program and has been listed among the World’s Top 2% Scientists by Stanford University for four consecutive years from 2022 to 2025. He received his Ph.D. degree from the National University of Singapore in 2020. His main research interests include industrial big data analytics, artificial intelligence algorithms, interpretable fault data generation for aircraft, transfer learning-based fault diagnosis, and remaining useful life prediction. In recent years, he has presided over several research projects, including the Youth Project of the National Natural Science Foundation of China, military longitudinal projects, and the Youth Project of Shaanxi Provincial Natural Science Foundation. He has published more than 20 high-level academic papers in authoritative journals such as IEEE Transactions on Industrial Electronics, Mechanical Systems and Signal Processing, and IEEE Transactions on Industrial Informatics, with a total citation of over 2,800. Among them, 13 papers are as the first or corresponding author, with a single paper cited more than 700 times, and 7 papers are selected as ESI Highly Cited Papers. He serves as an Associate Editor of IEEE Transactions on Instrumentation and Measurement, and is the recipient of the IEEE TIM 2024 Andy Chi Best Paper Award and the Young Science and Technology Award of Jiangsu Society of Aeronautics and Astronautics.

姓名 **Name**	Lei Wang
称谓 **Prefix**	Assistant Researcher
部门 **Department**	School of Mechanical Engineering
单位 **Organization**	Southwest Jiaotong University
城市/地区 **City/Region**	Chengdu, China

Organizer's Brief Biography

中文：王磊助理研究员长期从事“故障机理建模”+“非平稳信号处理”+“人工智能”的高端装备故障预示与运行安全保障研究。主持国家自然科学基金青年基金、四川省自然科学青年基金项目、中国博士后基金面上项目，作为研究骨干参与铁路创新发展联合基金项目、国家重点研发计划项目等。以第一/通讯作者在 Mechanical Systems and Signal Processing、Knowledge-Based Systems 等国际权威学术期刊上发表 SCI 检索论文 15 篇（Google 学术总引 1041 次， 2 篇入选 ESI 高被引论文，11 篇中科院一区 Top 论文），申请和授权国家发明专利 3 项。

英文： Dr. Lei Wang is an assistant Researcher who has long been engaged in research on fault prognosis and operational safety assurance for high-end equipment, integrating fault mechanism modeling, non-stationary signal processing, and artificial intelligence. He has led several research projects, including NSFC-funded research and CPSF-funded research, and has also participated as a key researcher in projects such as the Joint Fund for Railway Innovation and Development and the National Key R&D Program of China. As the first or corresponding author, he has published 15 SCI-indexed papers in high-impact international journals, including *Mechanical Systems and Signal Processing* and *Knowledge-Based Systems*. His work has received over 1,041 citations on Google Scholar, with 2 papers recognized as ESI Highly Cited Papers and 11 papers ranked as Top-tier (Q1) publications by the Chinese Academy of Sciences. He holds 3 authorized Chinese national invention patents.

姓名 Name	ChangHao Men
称谓 Prefix	research associate
部门 Department	Air Defense and Anti-Missile Gun System General Department
单位 Organization	Northwest Institute of Mechanical & Electrical Engineering
城市/地区 City/Region	Xianyang, China

Organizer's Brief Biography

中文：门昌昊助理研究员从事火炮装备可靠性与健康管理相关领域的研究，涵盖某火炮装备多源异构监测信息融合方法研发、基于深度学习的装备运行状态监测与未来趋势预测、装备数字孪生系统开发、多源异构数据融合以及设备运维自主决策等方向。近年来，他负责项目的总体结构设计与可靠性提升方面的工作，在学术成果方面，以第一作者或通讯作者在本领域高水平国际/国内期刊和会议发表学术论文多篇。在知识产权方面，申请国家发明专利及软件著作权 10 余项。目前在火炮装备某重点型号的智能化健康管理领域的持续耕耘，为行业发展贡献着自己的力量。

英文： Dr. Men Changhao specializes in artillery system reliability and health management research, focusing on multi-source heterogeneous monitoring information fusion for specific artillery systems, deep learning-based equipment operational status monitoring and trend prediction, equipment digital twin system development, multi-source heterogeneous data fusion, and autonomous maintenance decision-making; in recent years, he has led overall structural design and reliability enhancement efforts for key projects, with academic contributions including multiple first/corresponding-author publications in high-impact international/domestic journals and conferences and 10+ applied national invention patents and software copyrights, actively advancing industry development through ongoing efforts in intelligent health management for key artillery models.