

## Special Session VIII

### Special Session Basic Information:

#### 专栏题目

#### Session Title

中文：混合智能驱动的系统诊断，预测与预防性维护

英文：Hybrid intelligence for system diagnostics, prognostics and predictive maintenance


#### 专栏介绍和征稿主题

#### Introduction and topics

中文：人工智能（AI）的发展推动了数据驱动方法在系统诊断、预测与健康管理中的广泛应用，并为预测性维护带来了显著进展。数据驱动方法能够有效学习复杂模式、检测异常并预测系统的潜在风险。然而，单纯依赖数据的方法往往面临可解释性不足、物理合理性欠缺以及在故障数据有限时性能受限等挑战。为解决这些问题，混合智能作为一种变革性范式逐渐兴起。它通过深度融合物理模型、领域知识与数据驱动人工智能，能够构建更具鲁棒性、可解释性和可信度的诊断、预测与决策框架。本专题旨在汇聚学术界与工业界的研究者与实践者，展示最新研究进展、创新方法与典型案例，探讨物理知识与人工智能融合所带来的新机遇，共同推动预测性维护的发展。

英文：The development of Artificial Intelligence (AI) has accelerated the adoption of data-driven methods in system diagnostics, prognostics, and health management, bringing significant advancements to predictive maintenance. Data-driven approaches have shown strong capabilities in learning complex patterns, detecting anomalies, and forecasting potential system risks. However, methods that rely solely on data often encounter challenges such as limited interpretability, insufficient physical plausibility, and performance degradation under conditions of scarce failure data. To address these issues, Hybrid Intelligence has emerged as a transformative paradigm. By deeply integrating physics-based models, domain expertise, and data-driven AI, Hybrid Intelligence enables the construction of diagnostic, prognostic, and decision-making frameworks that are more robust, explainable, and trustworthy. This session aims to bring together researchers and practitioners from both academia and industry to present recent research progress, innovative methodologies, and representative case studies, and to explore the new opportunities arising from the fusion of physical knowledge and AI, ultimately advancing the field of predictive maintenance.

#### Special Session Chair(s):

	姓名 Name	Qing Ni
	称谓 Prefix	Prof.
	部门 Department	School of Artificial intelligence, OPTics and ElectroNics
	单位 Organization	Northwestern Polytechnical University
	城市/地区 City/Region	Xi'an

#### Organizer's Brief Biography

中文：倪清，教授、国家级青年人才，斯坦福Elsevier全球顶尖2%科学家，2024年荣获皇家物理协会会刊评选的“新锐科学家”称号。发表相关研究论文50余篇，SCI引用3300余次，H因子30，10余篇论文入选ESI热点或高被引论文。现担任多个JCR Q1期刊的副主编及编委，包括《IEEE Transactions on Industrial Informatics》、《Engineering Applications of Artificial Intelligence》、《Journal of Intelligent Manufacturing》等，也担任多个国际知名期刊青年编委。研究方向涵盖数字孪生、物理信息神经网络、大语言模型、设备可靠性与健康管理等前沿领域。


英文：Qing Ni is a Professor at Northwestern Polytechnical University, a National Young Talent, and is ranked among the Top 2% of Global Scientists by the Stanford-Elsevier List. In 2024, she was awarded "Emerging Scientist" by Journal of the Royal Physical Society. She has published over 50 research papers, which have received more than 3,300 SCI citations, with an H-index of 30. Over 10 of her papers have been recognized as ESI Hot or Highly Cited Papers. She currently serves as an Associate Editor or Editorial Board Member for several JCR Q1 journals, including IEEE Transactions on Industrial Informatics, Engineering Applications of Artificial Intelligence, and Journal of Intelligent Manufacturing, among others. She also holds the position of Youth Editor for multiple internationally renowned journals. Her research interests cover cutting-edge areas such as digital twins, physics-informed neural networks, large language models, equipment reliability, and health management.

	姓名 Name	Zhenggeng Ye
	称谓 Prefix	Associate researcher
	部门 Department	School of Management
	单位 Organization	Zhengzhou University
	城市/地区 City/Region	Zhengzhou

### Organizer's Brief Biography

中文：叶正梗，郑州大学管理学院副研究员，工业工程系主任。研究方向：基于机理和传感信号的制造系统建模、分析与优化，以实现制造系统的过程监测和控制、系统诊断和预测、质量改进和性能优化。以第一或通讯作者在TII、RESS、ADEI、ESWA、QTQM等国际期刊发表SCI论文10余篇。主持国家自然科学基金面上项目和青年项目各1项、河南省科技攻关1项，以第一作者完成中国专业学位案例中心收录案例3项。获得管理科学与工程学会博士论文支撑计划、APARM2024最佳会议论文、QR2MSE2024最佳会议论文等荣誉。

英文：Zhenggeng Ye is an associate researcher of Industrial Engineering with the School of Management, Zhengzhou University. His research interests include mechanism-based and sensor-based modeling and analysis of manufacturing systems for process monitoring/control, system diagnostics/prognostics, quality improvement, and performance optimization. He has published over 10 SCI papers as first author or corresponding author in leading international journals, including TII、RESS、ADEI、ESWA、QTQM, etc. He has served as Principal Investigator for one General Program and one Youth Program of the NSF of China, and one Science and Technology Research Project of Henan Province. He has served as the first author for three teaching cases indexed by China Professional Degree Case Center Supported by China Academic Degrees and Graduate Education Development Center. He has received several awards including recipients of the Doctoral Dissertation Support Program of the Society of Management Science and Engineering of China, APARM2024 Best Paper, QR2MSE2024 Best Paper, etc.

	姓名 Name	Chenyang Ma
	称谓 Prefix	Associate Prof.
	部门 Department	School of Computer Science and Technology
	单位 Organization	Xi'an University of Posts & Telecommunications
	城市/地区 City/Region	Xi'an

### Organizer's Brief Biography

中文：马晨阳，西安邮电大学副教授，2022-2023年作为联合培养博士赴新加坡国立大学工业系统工程与管理系开展研究工作，并于2024年于西北工业大学获得管理学博士学位。研究方向包括设备健康监测，剩余寿命预测，可靠性建模与优化等。以第一作者先后发表相关论文多篇（含TOP期刊论文4篇），分别出版在可靠性领域国际期刊RESS、ITR、Measurement等；多次参加国际学术会议并作报告，获得了SRSE 2023会议的“最佳论文奖”。目前担任《Journal of Reliability Science and Engineering》青年编委。

英文：Chenyang Ma is an Associate Professor at Xi'an University of Posts and Telecommunications. She conducted research as a jointly-trained doctoral student in the Department of Industrial Systems Engineering and Management at the National University of Singapore from 2022 to 2023, and obtained her Doctor of Management degree from Northwestern Polytechnical University in 2024. Her research focuses on equipment health monitoring, remaining useful life prediction, reliability modeling and optimization, among other areas. As the first author, she has published several papers (including 4 TOP journal articles) in international journals in the field of reliability, such as RESS, ITR, and Measurement. She has frequently participated in international academic conferences and delivered presentations, receiving the "Best Paper Award" at the SRSE 2023. She currently serves as a Youth Editorial Board Member for the Journal of Reliability Science and Engineering.

	姓名 Name	Wenhao Lu
	称谓 Prefix	Associate Prof.
	部门 Department	School of Automotive Engineering
	单位 Organization	Suzhou Vocational Institute of Industrial Technology
	城市/地区 City/Region	Suzhou

**Organizer’s Brief Biography**

陆文灏，苏州工业职业技术学院副教授，西北工业大学在职博士，汽车工程学院汽检技术教研室主任，江苏省高校“青蓝工程”中青年学术带头人培养对象。研究方向:旋转机械健康状态监测。主持江苏省教育科学“十四五”规划课题1项、江苏省高校哲社课题2项、苏州市科技局课题1项；指导学生获得江苏省职业院校技能大赛一等奖、江苏省职业院校创新大赛三等奖。

英 文：Wenhao Lu is an Associate Professor at Suzhou Vocational Institute of Industrial Technology and a part-time Ph.D candidate at Northwestern Polytechnical University. Serving as the Director of the Automotive Inspection Technology Teaching and Research Office in the School of Automotive Engineering, he has been selected as a candidate for the Jiangsu Provincial "Qing Lan Project" for cultivating middle-aged and young academic leaders. His research focuses on health monitoring of rotating machinery. He has served as Principal Investigator for one Jiangsu Province Education Science 14th Five-Year Plan Project, two Philosophy and Social Science Research Projects of Jiangsu Universities, and one project of Suzhou Science and Technology Bureau. Additionally, he has guided students to win first prize in the Jiangsu Vocational Colleges Skills Competition and third prize in the Jiangsu Vocational Colleges Innovation Competition.