Special Session IX

Special Session Basic Information:

专栏题目 **Session Title**	中文：数字孪生赋能的高端装备智能运维与可靠性分析 英文：Digital Twin and Reliability-Oriented Intelligent Operation for High-End Equipment

专栏介绍和征稿主题
Introduction and topics

中文： 高端装备的智能化与复杂化对智能运维与可靠性分析提出了更高要求。数字孪生作为实现物理系统与虚拟模型深度融合的关键技术，为装备的全生命周期健康管理、故障预测与智能维护提供了前所未有的机遇。通过实时数据驱动、多物理场建模与 AI 算法的结合，数字孪生技术正在重塑可靠性工程的方法论与实践路径。

本专栏旨在汇聚数字孪生在高端装备可靠性运维中的前沿研究与应用实践，推动数字孪生与可靠性工程的交叉创新。我们欢迎涵盖理论方法、技术突破、系统构建及工程应用的高质量稿件，征稿主题包括但不限于：

- 高端装备数字孪生建模理论与方法
- 数字孪生驱动的故障预测与健康管理
- 多源数据融合与实时仿真技术在数字孪生中的应用
- 数字孪生支持下的智能维护决策与运维优化
- 数字孪生与强化学习、贝叶斯网络等 AI 方法的结合
- 可靠性建模与不确定性量化在数字孪生中的实现
- 工业互联网与云边协同架构下的数字孪生系统

英文：The increasing intelligence and complexity of high-end equipment impose higher requirements on reliability-oriented operation and maintenance. Digital twin, as a key enabling technology for deep integration of physical systems and virtual models, offers unprecedented opportunities for lifecycle health management, fault prediction, and intelligent maintenance of equipment. Through the combination of real-time data, multi-physics modeling, and AI algorithms, digital twin technology is reshaping the methodology and practice of reliability engineering.

This special session aims to bring together cutting-edge research and practical applications of digital twins in the reliability operation and maintenance of high-end equipment, promoting cross-innovation between digital twin and reliability engineering. We welcome high-quality contributions covering theoretical methods, technological breakthroughs, system construction, and engineering applications. Topics of interest include, but are not limited to:

- Digital twin modeling theory and methods for high-end equipment
- Digital twin-driven fault prediction and health management
- Multi-source data fusion and real-time simulation technology in digital twins
- Intelligent maintenance decision-making and operation optimization supported by digital twins
- Integration of digital twins with AI methods such as reinforcement learning and Bayesian networks
- Reliability modeling and uncertainty quantification in digital twins
- Digital twin systems under industrial internet and cloud-edge collaboration architectures

Special Session Chair(s):

姓名 **Name**	冯珂 (Ke Feng)
称谓 **Prefix**	教授 (Professor)
部门 **Department**	机械工程学院 School of Mechanical Engineering
单位 **Organization**	西安交通大学 Xi'an Jiaotong University

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Organizer's Brief Biography

中文：冯珂，西安交通大学教授、博士生导师，国家级青年人才、玛丽居里学者、全球前2%顶尖科学家，本硕毕业于电子科技大学，博士毕业于新南威尔士大学。曾在英属哥伦比亚大学、新加坡国立大学、帝国理工学院等知名学府任职。研究方向涵盖数字孪生、信号处理、故障诊断、疲劳磨损分析等领域。2023 年荣获皇家物理协会会刊评选的“新锐科学家”称号。现担任《IEEE Transactions on Industrial Informatics》、《Information Fusion》、《Structural Health Monitoring》等多个国际期刊的副编辑及编委。研究成果发表在《IEEE Transactions on Fuzzy Systems》、《Mechanical Systems and Signal Processing》等重要学术期刊上。主持多项国际合作项目，包括 Horizon Europe、UKRI 等，及国家自然科学基金优青项目（海外）和国家重点研发计划课题等，曾获得“中国航空学会科技奖二等奖” 和“振动工程学会科学技术奖二等奖”。

英文： Ke Feng (Senior Member, IEEE) is a Full Professor at Xi'an Jiaotong University, China. He is a Marie Curie Fellow (Imperial College London & Brunel University London). He received a Ph.D. degree from the University of New South Wales, Australia, in 2021. He worked at the University of British Columbia and the National University of Singapore in 2022 and 2023, respectively.

His main research interests include digital twins, vibration analysis, structural health monitoring, dynamics, tribology, signal processing, and machine learning. He is recognized as the Emerging Leader (2023) by the Measurement Science and Technology journal. He serves as an Associate Editor or Editorial Board Member for several international journals, including *IEEE Transactions on Industrial Informatics*, *Information Fusion*, *IEEE Internet of Things Journal*, *Journal of Intelligent Manufacturing*, *Structural Health Monitoring*, *IEEE Transactions on Instrumentation and Measurement*, *IEEE Sensors Journal*, etc.

姓名 **Name**	王先芝(Xianzhi Wang)
称谓 **Prefix**	副教授 (Associate Professor)
部门 **Department**	自动化学院(School of Automation)
单位 **Organization**	西安邮电大学(Xi'an University of Posts and Telecommunications)
城市/地区 **City/Region**	西安，中国

Organizer's Brief Biography

中文：王先芝，现任西安邮电大学自动化学院副教授、硕导。西北工业大学博士（校优秀毕业生），加拿大多伦多大学联合培养博士。主要研究领域为 PHM、熵值理论、寿命预测、工业大数据，先后发表 SCI 论文 36 篇，出版英文学术专著 1 部，授权发明专利 3 项，参与制定国家标准 1 项，主持国家自然科学基金青年基金 1 项、陕西省自然科学基金青年基金 1 项。担任《Journal of Reliability Science and Engineering 》、《 ICCK Transactions on Systems Safety and Reliability》期刊青年编委。

英文：Xianzhi Wang is currently an associate professor and master's supervisor at the School of Automation , Xi'an University of Posts and Telecommunications. He received the PhD degree in Mechanical Electronic Engineering from Northwestern Polytechnical University. He ever worked at University of Toronto as a jointly trained PhD student. His main research field includes PHM, entropy theory, remaining useful life prediction, and industrial big data. He has published 36 journal papers and an academic book. He served as a young editorial board member of the *Journal of Reliability Science and Engineering*, *ICCK Transactions on Systems Safety and Reliability*

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称谓 Prefix	博士后 (Postdoctoral Researcher)
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单位 Organization	北京航空航天大学(Beihang University)
城市/地区 City/Region	北京，中国

Organizer's Brief Biography

中文：张悦，北京航空航天大学可靠性与系统工程学院卓越百人博士后。博士毕业于北京航空航天大学，并赴新加坡国立大学联合培养。入选首批国家自然科学基金青年学生基础研究项目（博士研究生）以及首批中国科协青年人才托举工程博士生专项。主要从事不确定环境下集群系统智能运维：建模、算法与验证研究，研究成果已发表多篇高水平 SCI 论文，包括 ESI 前 0.1%热点论文 1 篇，ESI 前 1%高被引论文 2 篇。担任《Engineering》、《Computers & Electrical Engineering》等多本 SCI 期刊专刊客座编辑，参与撰写国家级丛书 2 套、英文专著 2 部，参与 10 余项国家重大工程项目、国家重点研发计划等课题，获省部级科技进步一等奖 1 项。

英文： Yue Zhang is a postdoctoral researcher at the School of Reliability and Systems Engineering, Beihang University. She earned her Ph.D. from Beihang University and participated in a joint training program at the National University of Singapore. She was selected for the first cohort of the National Natural Science Foundation of China's Young Student Basic Research Project (for doctoral students) and the first cohort of the China Association for Science and Technology's Young Talent Support Program (doctoral special track). Her research primarily focuses on intelligent operation and maintenance of cluster systems under uncertain environments: modeling, algorithms, and validation. Her findings have been published in multiple high-impact SCI-indexed papers, including one ESI Top 0.1% Hot Paper and two ESI Top 1% Highly Cited Papers. She serves as a guest editor for special issues of several SCI journals, such as *Engineering* and *Computers & Electrical Engineering*. She has contributed to two national-level book series and co-authored two English monographs. Additionally, she has participated in over 10 major national engineering projects and key national research and development programs, and has received one provincial/ministerial-level First Prize for Scientific and Technological Progress.