Special Session V

Special Session Basic Information:

专栏题目 **Session Title**	中文：智能体与系统可靠性 英文：AI Agents and System Reliability

专栏介绍和征稿主题
Introduction and topics

中文：

随着人工智能技术的迅速发展，智能体（AI Agents）在自动化系统、智能制造、网络安全、航空航天、医疗诊断等关键领域中的应用日益广泛。然而，这些系统对可靠性、安全性、鲁棒性与透明性的要求极高，传统的可靠性分析方法已难以满足 AI 系统的复杂特性与动态适应能力。

本专栏旨在聚焦智能体与系统可靠性之间的交叉研究，探讨 AI 在建模、预测、优化和增强系统可靠性中的关键作用，促进 AI 技术与可靠性工程的深度融合。我们欢迎理论研究、工程应用与案例研究等多种形式的稿件，尤其鼓励以下主题方向的投稿：

- 面向可靠性评估的 AI 智能体架构与学习机制
- 多智能体系统中的协同可靠性建模与优化
- AI 驱动的故障诊断、预测与健康管理（PHM）
- 强化学习与贝叶斯方法在可靠性分析中的应用
- 人机协同系统中的 AI 可靠性挑战
- 可信 AI、可解释性与系统鲁棒性
- 基于数据的可靠性建模与不确定性量化方法

英文：With the rapid advancement of artificial intelligence technologies, AI agents are being increasingly applied across critical domains such as automation systems, intelligent manufacturing, cybersecurity, aerospace, and medical diagnostics. However, these systems impose stringent requirements on reliability, safety, robustness, and transparency. Traditional reliability analysis methods are increasingly inadequate to address the complex and adaptive nature of AI-driven systems.

This special issue aims to explore the intersection between AI agents and system reliability, highlighting the pivotal role of AI in modelling, predicting, optimising, and enhancing system reliability. It seeks to promote the deep integration of AI technologies with reliability engineering by encouraging contributions from both theoretical and applied perspectives. We welcome a diverse range of submissions, including theoretical studies, engineering applications, and case-based research. Particularly encouraged are contributions in the following topic areas:

- AI agent architectures and learning mechanisms for reliability assessment
- Collaborative reliability modelling and optimisation in multi-agent systems
- AI-driven fault diagnosis, prognosis, and health management (PHM)
- Applications of reinforcement learning and Bayesian methods in reliability analysis
- Reliability challenges in human–AI collaborative systems
- Trustworthy AI, interpretability, and system robustness
- Data-driven reliability modelling and uncertainty quantification methodologies

Special Session Chair(s):

姓名 Name	蒋剑 (Jian Jiang)
称谓 Prefix	研究员 (Professor)
部门 Department	先进计算与数字技术研究中心 Advanced Computing and Digital Technology Research Centre
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Organizer's Brief Biography

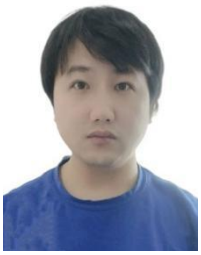
中文：蒋剑研究员是中国科学院长春光学精密机械与物理研究所先进计算与数字技术研究中心首席科学家，国家级领军人才、中科院领军人才及省级领军人才，兼任多项国家重大科技计划首席专家。他长期专注于人工智能与工程计算的深度融合，尤其在光学智能体、数字孪生、谱元法及系统可靠性（包括 PHM）等领域构建了原创性的理论体系与工程范式。

秉持“从物理模型出发、以智能算法为桥、实现系统级智能”的核心理念，蒋研究员在复杂系统智能建模、仿真加速与健康管理方面取得多项突破。他主持并完成两项亿元级国家级项目：一项面向某工业软件，另一项面向某数字化工程解决方案，有效解决了关键 AI 技术在工程可靠性领域的产业化进程，奠定了国际领先地位。

英文：Professor Jian Jiang serves as the Chief Scientist of the Advanced Computing and Digital Technology Research Centre at the Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP), Chinese Academy of Sciences. He holds the titles of National Leading Talent, CAS Leading Talent, and Provincial Leading Talent, and concurrently acts as the chief expert on several national key science and technology programs.

He has dedicated his career to the deep integration of artificial intelligence with engineering computation, developing original theoretical frameworks and engineering paradigms in the domains of optical intelligent agents, digital twin technologies, spectral element methods, and system reliability (including prognostics and health management, PHM).

Guided by his core philosophy—“beginning with physical models, bridging to intelligent algorithms, and achieving system-level intelligence”—Professor Jiang has secured multiple breakthroughs in the intelligent modeling of complex systems, simulation acceleration, and condition-based health management. He has led and completed two flagship national projects, each with a budget exceeding RMB 100 million: one focused on an industrial software platform and the other on a comprehensive digital engineering solution. These initiatives have effectively accelerated the industrialization of critical AI technologies within the field of engineering reliability and have established China's international leadership in this area.



姓名 Name	张驰知 (Chizhi Zhang)
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Organizer's Brief Biography

中文：张驰知，博士，中国科学院长春光学精密机械与物理研究所先进计算与数字工程研究中心副研究员。曾任英国赫尔大学讲师、博士后，具有丰富的国际科研与教学经历。其研究聚焦于人工智能驱动的工程系统建模与智能体可靠性评估，涵盖退化建模、数字孪生、健康管理（PHM）与可信 AI 系统的跨学科融合方法。

作为“AI 智能体可靠性”研究方向的代表性学者，提出了多种适用于复杂光电装备的退化过程建模框架，拓展了可靠性工程中对 AI 决策系统可预测性与鲁棒性的研究边界。他主持和参与了多项国际合作项目，包括 EPSRC、中科院省基金项目等，并在国际顶级期刊会议发表论文三十余篇。

他现担任中国科学院高层次人才候选人、吉林省长白山青年人才、省级 D 类人才，具备扎实的工程建模基础与面向实际应用的 AI 算法开发能力。其研究目标致力于推动可信 AI 技术在智能制造、光电系统、无人系统等关键领域的可靠性评估与部署。

英文：Dr Chizhi Zhang is an Associate Professor at the Advanced Computing and Digital Technology Research Centre, Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP), Chinese Academy of Sciences. He previously served as a Lecturer and Postdoctoral Research Fellow at the University of Hull, United Kingdom, and possesses extensive international experience in both research and teaching.

His research focuses on AI-driven modelling of engineering systems and the reliability assessment of intelligent agents, encompassing degradation modelling, digital twin development, prognostics and health management (PHM), and the interdisciplinary integration of trustworthy AI technologies.

As a leading researcher in the field of AI agent reliability, Dr Zhang has proposed a series of degradation modelling frameworks tailored to complex optoelectronic systems, thereby extending the boundaries of reliability engineering towards the predictability and robustness of AI-based decision-making systems. He has led and participated in several international collaborative projects, including those funded by the UK Engineering and Physical Sciences Research Council (EPSRC) and the Chinese Academy of Sciences.

Dr Zhang has authored over 30 research articles published in top-tier international journals and conferences. He has been recognised as a High-Level Talent Candidate by the Chinese Academy of Sciences, a Changbai Mountain Young Talent of Jilin Province, and a Provincial Class-D Talent. His work is underpinned by a strong foundation in engineering modelling and the development of application-oriented AI algorithms. His research aims to advance trustworthy AI technologies for reliability evaluation and deployment in critical domains such as intelligent manufacturing, optoelectronic systems, and autonomous platforms.

姓名 Name	Georgios Markou
称谓 Prefix	副教授 (Associate Professor)
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Organizer's Brief Biography

中文： Dr. Georgios Markou，塞浦路斯籍学者，现任塞浦路斯科技大学（CUT）土木与地理信息工程系教授，兼任比勒陀利亚大学副教授，曾任阿布扎比 ALHOSN 大学副教授、智利 UCSC 大学副教授，以及英国谢菲尔德大学访问研究员。早年在希腊国立雅典理工大学获得博士学位，长期从事计算力学、有限元建模与结构可靠性分析研究，具有深厚的土木工程与数值仿真背景。

近年来，Markou 教授将人工智能与结构工程深度融合，聚焦于 AI 驱动的结构健康监测、损伤识别、模型预测与工程系统可靠性建模等方向，探索 AI 智能体在结构诊断与维护决策中的可靠性边界问题。他开发的研究型有限元分析平台 ReConAn FEA，为复杂材料建模与结构响应预测提供了强大支撑，亦为 AI 智能体的可解释性与可信度评估奠定基础。

其研究覆盖面广泛，包括纤维增强复合材料建模、地基-结构相互作用、流固耦合、混凝土退化过程建模、大规模数值模拟与并行计算等，致力于推动 AI 技术在高可靠性结构系统中的可信部署。Markou 教授已在多个国际科研平台发表高水平成果，并具备丰富的项目经验与跨国工程咨询实践，现为塞浦路斯、南非等地注册工程师（Pr.Eng.）。

英文：Dr George Markou, currently serves as a faculty member at the Department of Civil Engineering and Geomatics,

Cyprus University of Technology (CUT), and as a Research Associate at the University of Pretoria, South Africa. He previously held academic positions as an Associate Professor at ALHOSN University in Abu Dhabi and UCSC in Chile, as well as a Visiting Researcher at the University of Sheffield, UK. He holds a Ph.D. in Computational Mechanics from the National Technical University of Athens (NTUA), Greece, and has a strong background in finite element modelling, numerical simulation, and structural reliability.

In recent years, Dr Markou's research has evolved towards the integration of artificial intelligence with structural engineering, focusing on AI-enabled structural health monitoring (SHM), damage detection, predictive modelling, and the reliability assessment of intelligent agents embedded in civil infrastructure. His development of the research finite element software ReConAn FEA supports advanced simulation of complex materials and structural responses, providing a foundation for evaluating the interpretability, robustness, and trustworthiness of AI agents in critical engineering contexts.

His broader research interests span FRP material modelling, soil–structure interaction, fibre-reinforced concrete behaviour, seismic analysis of RC buildings and bridges, fluid–structure interaction, and large-scale computational mechanics using parallel processing. Dr Markou's goal is to promote trustworthy AI methodologies in structural decision-making systems, ensuring their reliable deployment in high-consequence civil infrastructure. He is a registered Professional Engineer with ETEK (Cyprus) and ECSA (South Africa), and has published widely in the field of computational mechanics and AI-driven reliability assessment.