Special Session VI

Special Session Basic Information:

专栏题目 **Session Title**	中文：随机退化过程与统计建模 英文：Stochastic degradation process and statistical modeling

专栏介绍和征稿主题
Introduction and topics

中文： 随机退化过程与统计建模是可靠性工程、质量控制和风险管理领域的核心研究方向。随着现代工业系统复杂性的不断增加，传统的确定性模型已无法充分描述系统性能的动态演化过程。随机退化过程通过引入随机性来刻画系统性能在时间维度上的不确定性变化，为复杂系统的可靠性分析、寿命预测和维修决策提供了强有力的理论工具。

本专栏旨在汇聚国内外在随机退化过程建模、统计推断、预测方法和应用研究方面的最新成果，促进理论创新与实际应用的深度融合，推动该领域的学术发展和工程实践。

本专栏征集但不限于以下主题的报告：

1. 随机退化过程建模理论：新型随机过程模型的构建与性质分析、多元退化过程的联合建模、环境因子影响下的退化过程建模、非线性和时变参数退化模型

2. 统计推断方法：退化模型参数的估计理论与方法、退化建模中的贝叶斯推断方法、不完全数据条件下的统计推断、退化模型选择与检验

3. 可靠性分析与预测：基于退化数据的可靠性评估、剩余使用寿命预测方法、不确定性量化与区间预测、多源信息融合的预测建模

英文： Stochastic degradation processes and statistical modeling constitute a core research area in reliability engineering, quality control, and risk management. With the increasing complexity of modern industrial systems, traditional deterministic models are no longer adequate for describing the dynamic evolution of system performance. Stochastic degradation processes incorporate randomness to characterize the uncertain changes in system performance over time, providing powerful theoretical tools for reliability analysis, lifetime prediction, and maintenance decision-making of complex systems.

This special session aims to bring together cutting-edge research achievements from domestic and international scholars in stochastic degradation process modeling, statistical inference, prediction methods, and applications. It seeks to promote the deep integration of theoretical innovation and practical applications, advancing both academic development and engineering practice in this field.

This special session solicits presentations on, but not limited to, the following topics:

1. Stochastic Degradation Process Modeling Theory: Construction and property analysis of novel stochastic process models、Joint modeling of multivariate degradation processes、Degradation process modeling under environmental factors、Nonlinear and time-varying parameter degradation models

2. Statistical Inference Methods： Parameter estimation theory and methods for degradation models、 Bayesian inference methods in degradation modeling、Statistical inference under incomplete data conditions、Model selection and hypothesis testing

3. Reliability Analysis and Prediction: Reliability assessment based on degradation data、 Remaining useful life prediction methods、Uncertainty quantification and interval prediction、Multi-source information fusion in predictive modeling

Special Session Chair(s):

姓名 Name	Ancha Xu
称谓 Prefix	Professor
部门 Department	School of Statistics and Mathematics
单位 Organization	Zhejiang Gongshang University
城市/地区 City/Region	Hangzhou

Organizer's Brief Biography

中文：徐安察，浙江工商大学统计学教授，博士生导师。研究方向包括：可靠性数据分析与建模、贝叶斯在线学习、深度学习理论与应用。迄今以第一作者或通讯作者在 NRL、JQT、EJOR、IISE Transactions、ITR 等国际可靠性及统计主流杂志上发表 SCI 论文 50 余篇，其中 ESI 高被引论文 5 篇。已主持国家自然科学基金面上项目两项、青年项目一项，浙江省自然科学基金重点项目一项，其他省部级项目四项。获浙江省自然科学奖、福建省自然科学奖、第一届全国统计科学技术进步奖等。目前担任中国运筹学会可靠性分会副理事长和国内统计英文期刊《Statistical Theory and Related Fields》Associate Editor。

英文： Ancha Xu is a Professor of Statistics and Ph.D. supervisor at Zhejiang Gongshang University. His research interests include reliability data analysis and modeling, Bayesian online learning, and deep learning theory and applications. He has published over 50 SCI papers as first author or corresponding author in leading international journals in reliability and statistics, including NRL, JQT, EJOR, IISE Transactions, and ITR, with 5 papers recognized as ESI highly cited papers. He has served as Principal Investigator for two General Programs and one Youth Program of the NSF of China, one Key Project of the Zhejiang Provincial NSF, and four other provincial projects. He has received several awards including the Zhejiang Provincial Natural Science Award, Fujian Provincial Natural Science Award, and the First National Statistical Science and Technology Progress Award. He currently serves as Vice President of the Reliability Branch of the Operations Research Society of China, and Associate Editor of the domestic English statistical journal *Statistical Theory and Related Fields*.

姓名 Name	Liangliang Zhuang
称谓 Prefix	Dr.
部门 Department	School of Economics and Management
单位 Organization	Nanjing University of Science and Technology
城市/地区 City/Region	Nanjing

Organizer's Brief Biography

中文： 庄亮亮，现为南京理工大学经济管理学院博士后研究人员，2025 年于浙江工商大学统计与数学学院获得统计学博士学位。曾于 2021 年在香港理工大学物流及航运学系担任研究助理，并于 2024 年至 2025 年作为联合培养博士研究生赴新加坡国立大学工业系统工程与管理系开展研究工作。主要研究方向包括工业系统的可靠性统计分析、复杂系统的预测性维修策略、贝叶斯分析方法及面向可靠性的优化建模。相关研究成果发表于 IISE Transactions、European Journal of Operational Research、Journal of Quality Technology 等国际权威期刊。

英文： Liangliang Zhuang is a postdoctoral researcher at the School of Economics and Management, Nanjing University of Science and Technology. He received his Ph.D. degree in statistics from Zhejiang Gongshang University in 2025. He gained international research experience as a research assistant at the Department of Logistics and Maritime

Studies, The Hong Kong Polytechnic University in 2021, and later as a joint Ph.D. student at the Department of Industrial Systems Engineering and Management, National University of Singapore from 2024 to 2025. His research interests include reliability statistics, predictive maintenance, Bayesian analysis, and reliability-oriented optimization modeling. His work has been published in journals such as IISE Transactions, European Journal of Operational Research, and Journal of Quality Technology.