2026 10th International Conference on RELIABILITY ENGINEERING

Hangzhou, China July 19-21, 2026

ICRE RELIABILITY ENGINEERING

# Special Session 4

# Innovation and Practice of Data-Driven Soft Computing Methods in Renewable Energy Forecasting

## Goal

The rapid expansion of Renewable Energy Systems (RESs), such as solar Photovoltaic (PV) and wind power has significantly increased the importance of accurate forecasting for reliable grid operation, energy trading, and optimal energy management. However, the inherent intermittency and uncertainty associated with RESs make forecasting problematic. Traditional statistical models often fail to capture the complex mathematical "nonlinear" relationships between timestamp, weather variables, system conditions, and the associated power production. These forecasting challenges can lead to sudden power imbalances and added strain on grid operations. Recent advances in data-driven soft computing techniques have demonstrated strong potential to address these challenges. For instance, Machine Learning, Deep Learning (DL), and Artificial Intelligence (AI) approaches, e.g., Artificial Neural Networks (ANNs), Echo State Networks (ESNs), and Ensemble Learning, have been successfully proposed and successfully applied in practice to improve forecasting accuracy and robustness. Additionally, modern optimization techniques and metaheuristic algorithms such as Particle Swarm Optimization (PSO), Cuckoo Search (CS), Genetic Algorithm (GA), and emerging nature-inspired optimizers have enhanced model hyperparameter tuning and feature selection processes, thereby boosting the forecasting accuracy and robustness. The renewable energy sector is advancing due to better data and faster computing, which helps forecasting models learn more accurately and operate closer to real time. These improvements allow operators to respond quickly to changing solar or wind conditions, making reliable forecasting tools increasingly important. The aim of this special session is to bring together researchers and practitioners to share, exchange and communicate their current challenges and problems, their original and high-quality solutions in the field of data-driven modeling, forecasting, and optimization methods for RESs, demonstrating how soft computing approaches can enhance renewable energy prediction and system performance in practice, for solar, wind, and other renewable energy technologies. It will also offer space for discussion on emerging trends, practical deployment issues, and lessons learned from real-world implementations. By gathering multiple perspectives, the session seeks to advance the development of accurate, scalable, and reliable forecasting solutions.

## Topics

- RESs, including solar and wind systems
- Data-driven soft computing methods for renewable energy forecasting
- Machine learning, deep learning, and artificial intelligence techniques for renewable energy forecasting
- Metaheuristic optimization for model hyberparameter tuning and feature selection
- Short-, medium-, and long- term energy forecasting models
- Hybrid physical-data driven forecasting approaches
- Uncertainty quantification and probabilistic forecasting
- Data analytics and big data methods for RESs
- Smart grid applications and renewable energy integration
- Real-world industrial and operational applications of AI-based forecasting
- .....

## Chairs


Sameer Al-Dahidi
German Jordanian University, Jordan

Rajkumar B. Patil
Dwarkadas J. Sanghvi College of Engineering, India

Sheetal Bhandari
Pimpri Chinchwad College of Engineering, Savitribai Phule Pune University, India


## Publication

We provide a good opportunity by presenting your updated research knowledge and also by publishing it in the conference proceedings. submitted paper will be peer reviewed by conference committees, and accepted papers will be included into conference proceedings which will be indexed by SCOPUS and Ei compendex.

## Submission

1. Full paper (presentation and publication)
- The paper must be written in English.
- All submissions will undergo a peer-review process by the conference committee.
- The paper should be at least FIVE pages including all figures, tables, and references.
- The paper should be submitted as a PDF document in .pdf format.
- submitted paper must be unpublished.
- Accepted papers will be invited for oral presentation or poster presentation and will be included in the conference proceedings.

2. Abstract (presentation only)
- Abstracts will be considered for presentation (oral/poster) only without publication.
- The abstract must be written in English.
- Abstracts should be no more than 300 words and clearly outline the title, purpose, methods, and outcomes of the research or practice being described.
- All submissions will undergo a peer-review process by the conference committee.

* Welcome to submit the paper or abstract by Electronic submission system: https://www.zmeeting.org/submission/icre2026
More details about submission, please visit at: https://www.icre.org/sub.html

## Conference Program

July 19, 2026 I CONFERENCE + SHORT COURSE
July 20, 2026 I TECHNICAL EXCELLENCE & TRIBUTE
July 21, 2026 I INNOVATION & FUTURE OUTLOOK
July 17-22, 2026 I PHD SCHOOL PROGRAM

## Conference Venue

Hangzhou International Innovation Institute of Beihang University
Address:
No. 166, Shuanghongqiao Street, Pingyao Town, Yuhang District, Hangzhou City

### *Hangzhou, China*

Hangzhou, a renowned Jiangnan city blending millennia of heritage and poetic scenery, boasts three world cultural heritage sites. west Lake ripples with romance; Liangzhu Ruins hold ancient wisdom; the Grand canal carries folk vibes. Timeless song Dynasty elegance meets trendy fun, and delicious local cuisine delights the taste buds. A perfect mix of classic and modern, it awaits visitors from all over the world.

## Important Dates

Submission Deadline: April 10, 2026
Notification Deadline: April 1, 2026
Camera-ready Date: May 20, 2026

Sponsors LASAR³ Co-sponsors

杭州市北京航空航天大学国际创新研究院（北京航空航天大学国际创新学院）HANGZHOU INTERNATIONAL INNOVATION INSTITUTE OF BEIHANG UNIVERSITY

哈爾濱工業大學 HARBIN INSTITUTE OF TECHNOLOGY


Contact
conference secretary: Ms. Lesley
Email: icre_conf@outlook.com
web: http://www.icre.org

2026 10th International Conference on RELIABILITY ENGINEERING

Hangzhou, China July 19-21, 2026

ICRE RELIABILITY ENGINEERING

# 特别专题 4

# 数据驱动软计算方法在可再生能源预测中的创新与实践

## 专题目标

太阳能光伏、风电等可再生能源系统（RES）的快速发展，极大提升了精准预测对电网可靠运行、能源交易及优化能源管理的重要性。然而，可再生能源系统固有的间歇性与不确定性，给预测工作带来了困难。传统统计模型往往难以捕捉时间戳、气象变量、系统状态与对应发电量之间复杂的非线性关系。这类预测难题会导致电力突然失衡，并给电网运行带来额外压力。

近年来，数据驱动的软计算技术取得显著进展，已展现出应对上述挑战的强大潜力。例如，机器学习、深度学习（DL）与人工智能（AI）方法（如人工神经网络（ANN）、回声状态网络（ESN）和集成学习）已被成功提出并实际应用，有效提升了预测精度与鲁棒性。此外，粒子群优化（PSO）、布谷鸟搜索（CS）、遗传算法（GA）等现代优化技术与元启发式算法，以及新兴的自然启发优化算法，优化了模型超参数调优与特征选择过程，进一步提高了预测精度与鲁棒性。

随着数据质量提升与计算速度加快，可再生能源领域不断发展，预测模型能够更精准地学习并接近实时运行。这些改进使运行人员可快速响应太阳能、风能的变化，可靠的预测工具因此变得愈发重要。

本专题旨在汇聚研究者与工程技术人员，分享、交流在可再生能源系统的数据驱动建模、预测及优化方法领域面临的挑战与问题，以及原创、高质量的解决方案，展示软计算方法如何在实际中提升太阳能、风电及其他可再生能源技术的预测效果与系统性能。会议同时为探讨新兴趋势、实际部署问题及工程应用经验提供交流平台。通过汇集多方观点，本专题致力于推动高精度、可扩展、高可靠预测方案的发展。

## 专题主题

- 包括太阳能与风能系统在内的可再生能源系统（RES）
- 用于可再生能源预测的数据驱动软计算方法
- 用于可再生能源预测的机器学习、深度学习与人工智能技术
- 用于模型超参数调优与特征选择的元启发式优化算法
- 短期、中期与长期能源预测模型
- 物理－数据混合驱动预测方法
- 不确定性量化与概率预测
- 面向可再生能源系统（RES）的数据分析与大数据方法
- 智能电网应用与可再生能源并网
- 基于人工智能的预测方法在实际工业与工程运行中的应用
- ……

## 专题主席

Sameer Al-Dahidi
德国约旦大学，约旦

Sheetal Bhandari
萨维特里巴伊·弗勒浦那大学,印度

Rajkumar B. Patil
德瓦卡达斯·J·桑维工程学院，印度

## 会议出版

会议收录的文章将出版在会议论文集中出版，并提交EI Compendex, Scopus等其他检索机构审核检索。

## 投稿方式

1). 上传文章到电子投稿系统：https://www.zmeeting.org/submission/icre2026
2). 或发送文章至会议邮箱：icre_conf@outlook.com
提示：
1. 全文投稿（含报告与出版）
- 稿件须以英文撰写。
- 所有投稿均由会议委员会进行同行评审。
- 稿件篇幅不少于 5 页，包含所有图表及参考文献。
- 稿件须以 PDF 格式提交。
- 投稿稿件须为未发表的原创成果。
- 录用稿件将受邀进行口头报告或海报展示，并收录至会议论文集。
2. 摘要投稿（仅作报告）
- 摘要仅用于申请报告资格（口头报告 / 海报展示），不纳入出版范围。
- 摘要须以英文撰写。
- 摘要字数不超过 300 词，须清晰阐明所涉研究或实践的标题、研究目的、研究方法及研究成果。
- 所有投稿均由会议委员会进行同行评审。
• 详细信息请见----https://icre.org/sub.html

## 会议日程

2026年7月19日- 签到注册
2026年7月20日- 开幕式+主旨报告+作者报告
2026年7月21日- 开幕式+主旨报告+作者报告
2026年7月19-21日- 博士研究生项目

## 会议地址

杭州市北京航空航天大学国际创新研究院（北京航空航天大学国际创新学院）

地址：杭州市余杭区瓶窑镇双红桥街166号

### 中国杭州

杭州，一座融千年文脉与诗画风光的江南名城，三大世界文化遗产勾勒其独特魅力。西湖碧波漾诗意，良渚遗址藏远古智慧，大运河流淌南北烟火。宋韵风雅浸润红墙古社，新潮玩法解锁别样体验，鲜醇杭帮菜抚慰味蕾。古典与现代交织，漫步街巷皆是惊喜，正静待八方游客前来探寻。

## 重要日期

投稿截止日期：2026年4月10日
审稿通知日期：2026年5月05日
注册截止日期：2026年5月20日

Sponsors LASAR³ Co-sponsors 杭州市北京航空航天大学国际创新研究院（北京航空航天大学国际创新学院） 哈爾濱工業大學 HARBIN INSTITUTE OF TECHNOLOGY

Contact
conference secretary: Ms. Lesley
Email: icre_conf@outlook.com
web: http://www.icre.org