(24th – 25th February, 2023)

ISSETA 2023 Special Session on

Advanced Data-Driven and Probabilistic Approaches for Modern Power Systems

Aims and scope of the session:

Modern power systems are entering a data-intensive era where a vast volume of data from the grids is collected through advanced sensing technologies, such as smart metering data, phasor measurement data, and meteorological data related to renewable power generation. Such data contains comprehensive information about the power system equipment's health status, grid's static and dynamic characteristics, renewable generation patterns, customers' consumption patterns, etc. The adaption of data-driven models in modern power systems has gained extensive research attention due to their accuracy and ease in modeling highly nonlinear systems and their uncertainties. Data-driven models extract critical information from the data that characterize a strategy and establish relations among input, internal, and output variables without knowing their physical behavior. On this note, in-depth treatments of statistics, computational intelligence, optimization, signal processing, and data analytics are imperative. Though machine learning models are fundamental data-driven modeling frameworks, fractional calculus adds one more dimension to enrich existing data-driven models and is a dominating research area in recent times. The novel fractional calculus-based activation functions and training algorithms have been proven to be potential candidates for boosting the performance of data-driven modeling frameworks. Though the application of data-driven models inspired researchers to adopt mathematical tools in modern power systems, they are deterministic and fail to combat modern power system uncertainties. Recently, probabilistic methods have gained increasing interest owing to their ability to provide realistic decisions during power system analyses. Researchers have a great scope to apply data analytics and probabilistic approaches to solve model power system problems. Besides, the next-generation electric vehicles, coupled with end-user participation in the smart distributed power system operation such as demand-side response, are driving an accelerated transformation of the systems. Therefore, advanced data-analytics techniques are needed to convert such data to knowledge for practical applications.

Topics of interest:

This special session invites research papers from the following topics (but not limited) to recognize the importance of advanced data analytics and probabilistic methods in modern power systems.

1. Data preprocessing approaches for data-driven modeling.
2. Outlier detection and correction of volatile time series.
3. Power system planning and operation using data-driven models.
4. Long-term and short-term uncertainty analysis and modeling of renewable generations.
5. Modeling of predictable variation of power system uncertain inputs.
6. Utilization of data-driven models for renewable generation forecasting.
7. Point and probabilistic forecasting techniques.
8. Forecasting of renewable power generations using fractional-order neural networks.
9. Data-driven optimization framework for unit commitment considering demand and renewable generation uncertainties.
10. Probabilistic load flow under system and input uncertainties.
11. Generation and transmission expansion planning of modern power systems
12. Role of stochastic optimization for modern power system operation and decision-making.
13. Optimal placement and planning of distributed systems with renewable generations.
14. Risk-based security assessment in modern power systems.
15. Reliability assessment of modern power systems.

Special session organizers:

1. Dr. B Rajanarayan Prusty
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B Rajanarayan Prusty (Senior Member, IEEE) is presently working as an Associate Professor in the Department of Electrical and Electronics Engineering, Alliance University, Bengaluru. He obtained his Ph.D. from the National Institute of Technology Karnataka (NITK), Surathkal. His exceptional research work during his Ph.D. has led him to crown the prestigious POSOCO Power System Awards (PPSA) for 2019 under the doctoral category by Power System Operation Corporation Limited in partnership with FITT, IIT Delhi. In recognition of his research publications from 2017 to 2019, he was awarded the University Foundation day Research Award 2019 from BPUT, Odisha. He has 20 SCI journal publications and 35 conference publications to his credit. He has authored six book chapters published in CRC Press, Elsevier, and Springer. He has co-authored a textbook entitled "Power System Analysis: Operation and Control" in I. K. International Publishing House Pvt. Ltd. He has also edited a book entitled "Renewable Energy Integration to the Grid: A Probabilistic Perspective," in CRC Press, Taylor and Francis Books INDIA Pvt. Ltd. He has been an active reviewer since 2015 and has reviewed 300 manuscripts submitted to repute Journals and Conferences. Presently he is the Associate Editor of "Journal of Electrical Engineering & Technology," Springer. He is also the Academic Editor for the journals "Mathematical Problems in Engineering," Hindawi, "International Transactions on Electrical Energy Systems," Wiley-Hindawi, and "Journal of Electrical and Computer Engineering," Hindawi. He has handled more than 70 manuscripts in the capacity of Journal Editor. His research interest includes time series preprocessing and forecasting, high-dimensional dependence modeling, and probabilistic power system analysis.

2. Dr. Kishore Bingi
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Kishore Bingi received the B.Tech. Degree in Electrical and Electronics Engineering from Acharya Nagarjuna University, India, in 2012. He received the M.Tech. Degree in Instrumentation and Control Systems from the National Institute of Technology Calicut, India, in 2014, and the Ph.D. degree in Electrical and Electronic Engineering from Universiti Teknologi PETRONAS, Malaysia, in 2019. From 2014 to 2015, he worked as an Assistant Systems Engineer at the TATA Consultancy Services Limited, India. From 2019 to 2020, he worked as Research Scientist and Post-Doctoral Researcher at the Universiti Teknologi PETRONAS, Malaysia. From 2020 to 2022, he served as an Assistant Professor at Process Control Laboratory, School of Electrical Engineering, Vellore Institute of Technology, India. Since 2022 he has been working as a faculty member at the Department of Electrical and Electronic Engineering from Universiti Teknologi PETRONAS, Malaysia. His research area is developing fractional-order neural networks, including fractional-order systems and controllers, chaos prediction and forecasting, and advanced hybrid optimization techniques. He is an IEEE and IET Member and a registered Chartered Engineer (CEng) from Engineering Council UK.

3. Dr. Neeraj Gupta
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Dr. Neeraj Gupta is Ph.D. in power systems from the Indian Institute of Technology Roorkee, Roorkee, India. He is a senior member of IEEE. He was a faculty with the Thapar University from 2008 to 2009, Adani Institute of Infrastructure Engineering, Ahmedabad, India, in 2015, and NIT Hamirpur from 2015 to 2018, and presently, he has been working as an Assistant professor with the Electrical Engineering Department, National Institute of Technology, Srinagar, J&K, India. His work has been published in Q-1 international journals of repute like IEEE, Elsevier, etc. He is also the scientific advisory/organizing secretary of many reputed conferences in the country. He is the referee of reputed journals of IEEE, Elsevier, Taylor and Francis, IET, etc. His research interests include uncertainty quantification of power systems, probabilistic power system, solar, wind, and electric vehicle technologies, Artificial intelligence, Machine learning, prediction, etc.