PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

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3:30pm | PHYS 112

Explainable AI-driven Digital Twin-Enabling Technologies with for Nuclear Systems

Abstract

According to US DOE and NRC, the nuclear industry has yet to fully leverage the recent advances in artificial intelligence/ machine learning (AI/ML) techniques, and Digital Twin (DT) will play a significant role in risk-informed decision-making in this regard. For example, " NRC FY2021-23 Planned Research Activities" and "NRC Future Focused Research" state that "Methodology and Evaluation Tools for Digital Twin Applications" is one of the top priority strategic areas. However, the major challenges related to DT are (a) Incorporating trustworthy data analytics algorithm, (b) Treatment of noisy or erroneous data and data unavailability, (c) Uncertainty quantification, (d) Update module in DT by solving the "On-the-fly Inverse Problem," and (e) explainability and interpretability. This seminar will encompass the ongoing activities performed by Dr. Alam's group on different aspects of technical challenges in DT-enabling technologies for nuclear systems in terms of surrogate model development, physics-informed hybrid AI/ML, uncertainty quantification with sensitivity, and operational digital twin framework.

Dr. Syed Bahauddin Alam is an Assistant Professor of Nuclear, Plasma, & Radiological Engineering (NPRE) at University of Illinois Urbana-Champaign (UIUC). He is the Director of MARTIANS (Machine Learning & ARTificial Intelligence for Advancing Nuclear Systems) labor atory. He received Ph.D. and MPhil in Nuclear Engineering from the University of Cambridge. Prior to joining UIUC, he was an Assistant Professor at Missouri S&T and a Postdoc at French Atomic Energy Commission. Dr. Alam's research group has been supported by DOE, NRC, IAEA, Taylor Geospatial Intelligence, the State of Missouri, Illinois Computes, and Rhode Island. To date, he authored/co-authored 120+ articles. He received several awards and honors for his research and teaching. Dr. Alam received the "University Outstanding Teaching Award" two years consecutively by Missouri S&T. Previously, he was also the winner of the ANS Best Student Paper Award and ANS Best Technical Poster Award. He was awarded the Most Exemplary Graduate Fellow on "Nuclear Nonproliferation Fellowship " by KAIST. Furthermore, he was awarded the Cambridge Philosophical Society's Research Award for a Promising Piece of Doctoral Research. His work has also been featured in the "ICE Business Times" Magazine, and he was invited for a TV interview on Channel S (a UK-based TV Channel).