PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

Dr. Majdi Radaideh,

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Wednesday, October 15 2025
3:30 pm | WTHR 200

Advancing AI in Nuclear Reactor Design and Simulations: From Proof of Concept to Deployment

Abstract

As artificial intelligence and machine learning (AI/ML) continue to gain prevalence and spawn new applications, there is a growing emphasis on integrating these technologies into nuclear engineering research, particularly in nuclear reactor design and the acceleration of modeling and simulation tools. Dr. Radaideh's research group at the University of Michigan focuses on the intersection of Multiphysics reactor design, advanced computing leveraging AI/ML, and autonomous control. Our group aims to move from proof-of-concept AI to engineering-based production-level AI. In this seminar, Prof. RAD will begin with an overview of the research conducted in his lab, followed by in-depth case studies highlighting distinct projects. The first case study will focus on the use of reinforcement learning to optimize nuclear reactor designs, including strategies for scaling these algorithms for ensemble optimization and highperformance computing (HPC) systems to enable optimization on high-fidelity simulations. The second will explore new methods for interpretable AI, featuring the use of Kolmogorov-Arnold Networks to transform black-box AI models into symbolic equations, paving the way for licensable AI in nuclear applications. The final case study will delve into intelligent control algorithms for microreactors, aimed at enabling autonomous load-following operations. More applications will include the use of generative AI in understanding public opinion about nuclear power and for community engagement. Throughout the seminar, Prof. RAD will also highlight opportunities for collaboration between Purdue University and the University of Michigan Nuclear Engineering programs—and potentially beyond.

Dr. Majdi Radaideh (RAD) began his tenure-track appointment as an Assistant Professor in the Department of Nuclear Engineering and Radiological Sciences at the University of Michigan in January 2023. He leads the AIMS Lab (Artificial Intelligence and Multiphysics Simulations), which currently includes 3 research fellows, 10 Ph.D. students, 5 M.S. students, and 8 undergraduate researchers coming mainly from two backgrounds: Nuclear Engineering and Computer Science. Dr. RAD earned his Ph.D. in Nuclear Engineering from the University of Illinois at Urbana-Champaign, with minors in Computational Science & Engineering and Applied Statistics. Following his Ph.D., he held research and development appointments at MIT and ORNL, where he completed postdoctoral training and collaborated extensively with national labs and industry partners. In his first two years as a tenure-track faculty member, Dr. RAD secured over $3.3 million in external and internal research funding. His work has been recognized with numerous early-career awards, including the ANS 2025 Mathematics and Computation Young Member's Research Achievement Award, the 2023 DOE Distinguished Early Career Award, the 2025 Ted Quinn Early Career Award in Nuclear Instrumentation and Controls, the 2023 U.S. NRC Distinguished Faculty Development Award, the 2019 ANS National Mark Mills Award for the best Ph.D. thesis work in nuclear engineering, and several others.