

## Nuclear Engineering Seminar

### Dr. Fan Zhang

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**3:30 pm | PHYS 114**

When Robots Enter the Plant: Intelligent Nuclear Robotics for Safe and Efficient Operations

#### Abstract

As nuclear energy expands to meet growing energy demands, reducing operation and maintenance costs while maintaining safety is increasingly critical. Although robots have been used for limited tasks such as radiation surveys, their broader potential in nuclear power plant (NPP) operations remains under-explored. This talk will focus on how nuclear robotics, integrated with AI and digital twin, can enhance online monitoring and diagnosis, improving operational efficiency and reactor economics. Robotic systems expand sensing coverage, enable autonomous data collection, and reduce reliance on human labor in harsh environments, thereby decreasing human exposure and improving situational awareness and consistent inspection. To support these capabilities, a 3D NPP digital twin named iFANnpp has been developed to integrate robotic data, plant information, and physics-based models for advanced monitoring and analysis. Other key developments in nuclear robotics include radiation-aware navigation and radiation source localization for robotic deployment in nuclear environments.

Dr. Fan Zhang is an Assistant Professor and College of Engineering Cybersecurity Fellow at the Georgia Institute of Technology. She received her Ph.D. in Nuclear Engineering, along with a concurrent M.S. degree in Statistics, from the University of Tennessee, Knoxville in 2019. She directs the Intelligence for Advanced Nuclear (iFAN) Lab at Georgia Tech, where her research focuses on nuclear robotics, predictive maintenance, autonomous control, digital twins, and cybersecurity for safe, secure, and efficient operations. Dr. Zhang is actively involved in IAEA nuclear cybersecurity research and education and has made significant contributions to instrumentation & control, and cybersecurity for nuclear applications. She is the recipient of multiple prestigious awards, including the Ted Quinn Early Career Award from the American Nuclear Society (ANS), the inaugural Distinguished Early Career Award from the U.S. Department of Energy Office of Nuclear Energy, the ANS Landis Young Engineering Achievement Award, and ANS 40 Under 40. In 2023, Dr. Zhang was invited by the National Academy of Engineering to participate in the EU-U.S. Frontiers of Engineering Symposium as one of the nation's highly accomplished early-career engineers.