PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

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Wednesday, October 13, 2021

3:30pm | PHYS 112

Covert Cognizance: A Novel Monitoring and Modeling Paradigm for Critical Systems

Abstract

Can industrial systems be made self-aware, alert operators to misuse while cleverly lulling capable adversaries into a false sense of superiority? Achieving these goals forms the focus of covert cognizance (C2). The C 2 paradigm is an active cyber defense that aims to serve as an additional layer of physical process defense against highly sophisticated attacks such as advanced persistent threats where the attack vector has privileged access at the human-system interface level, representing the top of the hierarchy in terms of component access and sophistication. C 2 perturbs systems in a manner that induces cognizance by storing incorruptible information about the process such as its execution history in the process itself. It does so in a covert manner by exploiting the vast redundant space inherent to dynamical systems without the introduction of additional variables that may leave a footprint. Moreover, the perturbations are designed to be impervious to pattern-detection techniques like AI and ML to further reinforce the covertness requirement. This work falls under the broad framework of cyber-informed engineering approach adopted by the nuclear community.

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Education

Ph.D., 2004, Nuclear Engineering, North Carolina State University

M.Sc., 2002, Nuclear Engineering, North Carolina State University

B.Sc., 2000, Nuclear Engineering, University of Alexandria, Egypt

Research Interests

Validation and Uncertainty Quantification

Big Data Analytics and Data Assimilation

Cyberattack-resilient Control Systems

LWR Computational Reactor Physics