Energy and Power Group

Intelligent and Autonomous Cyber-Physical-Social Systems Paradigm for Securing Electrical Power Systems

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Abstract

While the integration of cyber technology enables greater efficiency as well as capacity for electrical power systems, it also creates a host of new vulnerabilities from cyber intrusion and corruption, which can potentially lead to devastating physical damage and even loss of life. Successful zero-day attacks on critical infrastructure such as the attack on Ukraine's power grid demonstrate the limitations of traditional centric defense solutions to effectively detect sophisticated intrusions in complex cyber-physical infrastructures. Driven by innovations in machine learning, data-driven solutions with innovations in machine learning show promise in preventing zero-day exploits. However, due to uncertainties and data deficiency in machine learning, the trustworthiness and assurance of these solutions are still challenging. For the last few years, I have been focusing on the interdisciplinary research of developing intelligent and autonomous cyber-physical-social systems paradigm for securing electrical power systems. In this talk, I plan to present some of our research work in the following four directions: (1) biologically-inspired intelligent soft computing-based security control and management for power systems, (2) microgrid social network with social-sensing-enabled situational awareness, (3) attack-resilient Quality-of-Experience (QoE)-driven opportunistic hybrid communication infrastructures for smart grids, and (4) blockchain-powered deep learning-enabled decentralized and privacy-preserving computing and networking infrastructure. I will also present some of our ongoing work and discuss our future research plans in this talk.

Biography

Jin Wei-Kocsis is an Assistant Professor in Electrical & Computer Engineering at University of Akron. She received the Ph.D. degree in Electrical & Computer Engineering at the University of Toronto, Canada, in 2014, her M.S. degree in Electrical Engineering at the University of Hawaii at Manoa, in 2008, and her B.E. degree at the Beijing University of Aeronautics and Astronautics, China, in 2004. She worked as a Postdoctoral Fellow in National Renewable Energy Laboratory (NREL) from April, 2014 to July, 2014. Her research interests include developing data-driven security and privacy-preserving solutions for cyber-physical-social smart energy systems, designing opportunistic and attack-resilient hybrid communication infrastructure for smart energy systems, designing social sensing-enabled situational awareness mechanism for smart grids, developing blockchain-powered decentralized and privacy-preserving computing and networking infrastructure, and developing low-complexity and secure deep learning techniques. Based on my research achievements, I have received NASA Early Career Faculty Grant, DoE/SuNLaMP Award, UA NSF I-Corps Grant, and Firestone Research Initiative Fellowship Award. I have also achieved multiple best paper awards for our journal and conference publications.