



DISTINGUISHED WEBINAR SERIES IN ARTIFICIAL INTELLIGENCE AND CYBER SECURITY

Empowering Power Electronics Dominated Grid Resilience and Cybersecurity

Mohammad B. Shadmand, Ph.D.,

**Assistant Professor & Director of Intelligent Power Electronics at Grid Edge
Research Laboratory, Department of Electrical & Computer Engineering,
University of Illinois Chicago**

Abstract

Frequency and voltage regulation and restoration while ensuring stability in power electronics dominated grids (PEDG) poses significant challenges, primarily due to inherent heterogenous structure and low inertia characteristics of inverters-based generation. This vulnerability introduces a new cyberattack surface, amplifying concerns over voltage and frequency stability and synchronization of grid-forming and grid-following inverters within low inertia PEDG systems. This talk addresses the resiliency and cybersecurity implications within low inertia PEDG and explores potential avenues for research to mitigate these challenges. Specifically, it delves into the utilization of artificial intelligence (AI) to enable self-driving grids, thereby bolstering grid resiliency and cybersecurity measures. The discussion will focus on the impact of cyberattacks on heterogeneous grid-following and grid-forming inverters equipped with hierarchical control schemes. An attack model targeting the synchronization and coordination of inverters within PEDG systems will be examined. Furthermore, data-driven solutions will be explored to harness the full capabilities of grid-forming and grid-following inverters, imbuing them with intelligence to enhance grid resiliency against disturbances and anomalies. Concluding remarks will outline a research roadmap aimed at realizing AI-inspired inverters, thus propelling the realization of resilient self-driving grids.

Biography:

Dr. Mohammad B. Shadmand received the Ph.D. degree in electrical engineering from Texas A&M University, College Station, USA in 2015. From 2017-2020, he was an assistant professor with the Department of Electrical and Computer Engineering, Kansas State University, USA. Since 2020, he has been an Assistant Professor with the Department of Electrical and Computer Engineering and Director of Intelligent Power Electronics at Grid Edge (IPEG) Research Laboratory at University of Illinois Chicago, USA. His current research interests include resilient control of power electronics dominated grids, resilient self-driving grid, collaborative control architecture for network of grid-following and grid-forming inverters, applications of machine learning techniques for inverters dominated power systems, situational awareness and intrusion detection systems for power electronics and smart grid. He has published more than 160 journal and conference papers, 3 book chapters, and his research grants and industrial projects are backed by more than \$16 million in funding from sources such as the U.S. Department of Energy, U.S. National Science Foundation, and Qatar National Research Fund. Dr. Shadmand is senior member of IEEE since 2020. He was the recipient of the Michelle Munson Serban Simu Keystone Research Scholar Award, Kansas State University, in 2017 and the 2019 IEEE Myron Zucker Faculty-Student Research Grant. He was also the recipient of 4 best paper awards at different IEEE conferences. He is the General Chair of the 50th Annual Conference of the IEEE Industrial Electronics Society (IEEE IECON 2024), Chicago, USA. In 2022, he has served as Guest Editor for special section on artificial intelligence & machine learning applications in smart inverters of IEEE Journal of Emerging and Selected Topics in Industrial Electronics. Currently, he is an Associate Editor for the IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS and IET Renewable Power Generation.

DATE:
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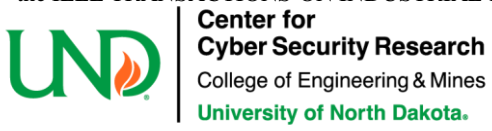
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For inquires please contact
UND.C2SR@und.edu