MARQUETTE UNIVERSITY

Electrical and Computer Engineering Department Colloquium

"Mitigating Cascading Failures in Power Grids via Markov Decision based Load-shedding"

Dr. Pankaz Das

Sr. Data Scientist – GE Healthcare

Tuesday, January 24th, 2023
2:00 – 3:00 p.m. Olin 202
Reception in Olin 204 3:00 – 3:30 p.m.

Abstract: Despite the reliability of modern power systems, large blackouts due to cascading failures (CFs) do occur in power grids with enormous economic and societal costs. We model cascading failures in power grids theoretically using a Markov decision process (MDP) framework with the aim of developing optimal load-shedding (LS) policies to mitigate CFs. We introduce appropriate actions affecting the dynamics of CFs and associated costs. Optimal LS policies are computed that minimize the expected cumulative cost associated with CFs. Numerical simulations on the IEEE 118 and IEEE 300 bus systems show that the actions derived by the MDP result in minimum total cost of CFs, compared to fixed and random policies. Moreover, the optimality of derived policies is validated by a cascading failure simulation based on DC power flow for the IEEE 118 bus system. Therefore, such actions developed by the proposed theoretical MDP framework can serve as a baseline for devising optimal LS strategies to mitigate cascading failures in power grids. In this talk, I will present the MDP framework and show numerical results. In addition, I would give a quick intro on my current works at GE HealthCare.

Bio: Pankaz Das received his B.Sc. in Electronics and Communication Engineering from Khulna University of Engineering and Technology, Bangladesh, in 2010. He received his Ph.D. in Electrical Engineering from the University of New Mexico in 2018. He was a post-doctoral research fellow in electrical and computer engineering at Marquette University. Currently, he is a Sr. Data Scientist at GE Healthcare. His research is focused on machine learning, predictive maintenance, cyber-physical systems, data-driven modeling, cascading failures. He has authored 11 journal articles, 13 conference proceedings with nearly 250 citations.