Energy and Power Group

WEEKLY SEMINAR SERIES – SPRING 2019

Friday, April 26, 2019, 9:10 a.m. – 10:10 a.m., ETB 1020

CONVEX RELAXATIONS FOR SEVERE DAMAGE ANALYSIS IN AC POWER NETWORKS

Dr. Carleton Coffrin
Staff Scientist at Los Alamos National Laboratory

Abstract

The analysis of severe multi-component damage on AC power networks is central to understanding the infrastructure's vulnerability to large-scale natural disasters and coordinated multi-agent attacks. However, solving the non-convex nonlinear AC power flow equations, after severe network damage, is a challenging task and presents a notable obstacle in vulnerability analysis. In this work we explore how recent power system analysis methods, based on convex optimization, can be leveraged for severe damage analysis of real-world AC power network datasets. A rigorous empirical evaluation across seven networks and thousands of damage scenarios demonstrates that convex relaxations of the AC power flow equations can provide a reliable and scalable method for bounding the amount of load shedding required in severe damage scenarios. Furthermore, this preliminary study suggests that the resilience of different power networks to severe damage scenarios may vary more than previously thought.

Biography

Carleton Coffrin (https://www.coffrin.com/) is a staff scientist in Los Alamos National Laboratory’s Advanced Network Science Initiative (https://lanl-ansi.github.io/) who received a PhD in Computer Science from Brown University in 2012 under the supervision of Pascal Van Hentenryck. His research interests focus on how optimization algorithms can be leveraged to improve the design, operation and resilience of critical infrastructure networks. To that end, his experience spans a variety of optimization topics including mathematical programing, constraint programming, and local search. Dr. Coffrin's work on power system optimization has been recognized by the IEEE PES 2014 Optimal Power Flow competition and Los Alamos National Laboratory's Early Career Researcher awards.