TEXAS A&M UNIVERSITY
Department of Electrical
& Computer Engineering

Friday, February 4, 2022 | 9:10 – 10:00 a.m. Central

Location: ETB 1020

Tractable Algorithms for Constructing Electric Power Network Models

Abstract

Common in many aspects of power systems research is reliance on mathematical network models to conduct simulations and analyses of the electrical grid. However, many existing test networks are small-scale, lack geographic information, and may omit many of the engineering parameters associated with each component. Thus, novel network creation algorithms are developed that primarily focus on electrical performance of the network, while using graph statistics as a feedback mechanism to iteratively improve the networks being constructed. The first set of algorithms modifies the classic network flow model ("KCL" constraints, in the terminology of circuit analysis), to form a linear programming-based method for constructing synthetic power networks. The second set of algorithms adds KVL constraints and constitutive relations for transmission circuit elements, drawing on a classical optimization-based minimal energy formulation of circuit equations that yields a successive quadratic programming calculation. Combined with sparsity-enhancement via a LASSO approach, these yield tractable network construction algorithms that can create large-scale, realistic, synthetic power system data sets.

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Jonathan Snodgrass completed his B.S. and M.S. degrees at Texas A&M University in 2012 and 2016, and M.S. and PhD degrees at the University of Wisconsin-Madison in 2018 and 2021. His primary research area is exploring applications of realistic large-scale synthetic network models, with current projects analyzing EMP and GMD events. Other research areas and interests include network planning, transmission expansion, optimization, power system markets and microgrids.