

A GNN-based Generative Model for Generating Synthetic Cyber-Physical Power System Topology

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Abstract—Synthetic networks aim at generating realistic projections of real-world networks while concealing the actual system information. This paper proposes a scalable and effective approach based on graph neural networks (GNN) to generate synthetic topologies of Cyber-Physical power Systems (CPS) with realistic network feature distribution. In order to comprehensively capture the characteristics of real CPS networks, we propose a generative model, namely Graph-CPS, based on graph variational autoencoder and graph recurrent neural networks. The method hides the sensitive topological information while maintaining the similar feature distribution of the real networks. We used multiple power and communication networks to prove and assess the effectiveness of the proposed method with experimental results.

Index Terms— Cyber-Physical Systems, Graph Neural Networks, Synthetic Networks.