

Physics-Informed Neural Networks for Power Systems

In this talk, we introduce machine learning methods that exploit the underlying physical models of power systems to (i) achieve an up to 100x speedup in power system dynamic security assessment, and (ii) provide worst-case guarantees of the neural network performance for power system optimization. We propose neural network training procedures that can make use of the wide range of mathematical models describing power system behavior, both in steady-state and in dynamics. Physics-informed neural networks require substantially less input data for training, while achieving high accuracy. Methods such as the ones we will discuss in this talk unlock the potential of neural networks to perform power system tasks at extremely fast computing times while maintaining verified accuracy.