Physics-informed Machine Learning applied to power systems: a tool for scarce data sets and realistic applications

Power systems in the midst of the ongoing energy transition are expected to become more difficult to predict and control. Having efficient and fast schemes for state estimation and for fault detection and location is therefore paramount. Machine Learning (ML) techniques have a potential key role to play in this domain. In this talk, we begin by expressing why data sets generated by power system operations differ from data sets in other fields where ML has proven to be efficient. We then test vanilla (physics-ignorant) ML methods, we use different popular ML architectures. We observe that all of them fail when tested on system configurations that are too different from those on which they were trained. Finally, we introduce several physics-informed ML methods and compare them with their physics-ignorant counterparts. They outperform them when tested over new configurations.