IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

The Machine Learning Approach to Dynamic Security Assessment

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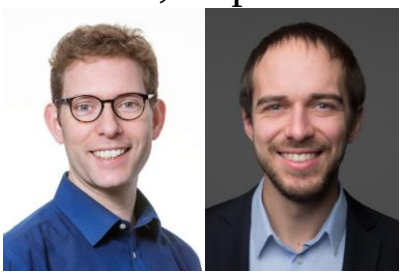

10:00 am-12:00 pm, PST, Monday, Dec. 2, 2019
(11:00 am – 1:00 pm, MST) (12:00 pm – 2:00 pm, CST) (1:00 pm - 3:00 pm, EST)

Abstract: The integration of large amounts of renewable energy makes flows of electrical power more variable and less predictable. This presents a large computational challenge for system operators, who must anticipate and mitigate insecure operating conditions using detailed time-domain simulations of the physical system.

In this tutorial we present a machine learning approach to addressing this challenge that is increasingly being used in the research community. After formulating the problem of dynamic security assessment (DSA), we show how time-consuming simulations can partially be replaced by machine-learned proxies or emulators. This approach separates the workflow into two parts: offline training and online application. For the offline part, we cover the process of learning classifiers, and methods to generate training data. For the online part, we describe novel approaches to control the risk due to imperfect proxies, and a means of embedding the proxies in the calculation of optimal control actions.

Bio: Simon Tindemans is an assistant professor at Delft University of Technology in the Netherlands, and a visiting researcher at the Alan Turing Institute in London, UK. He has previously worked at Imperial College London, where he was a Marie Curie Intra-European Fellow and Research Fellow. He has a background in theoretical biophysics, with an MSc in physics (cum laude) from the University of Amsterdam and a PhD from AMOLF/Wageningen University (2009). His research interests include machine learning for risk assessment, the efficient computation and apportioning of risks, and methods for the aggregate dispatch of flexible resources. He is an active member of the IEEE Risk Reliability and Probability Applications sub-committee and its working groups and task forces.

Jochen Cremer is a final year PhD student in the Control and Power Group (CAP) of the Department of Electrical and Electronic Engineering at Imperial College London. Before joining CAP group in 2017 he undertook research in mathematical optimization and control theory at Carnegie Mellon and MIT. He is an engineer at heart and holds a M.Sc. in Chemical Engineering, a B.Sc. in Electrical Engineering and a B.Sc. in Mechanical Engineering from RWTH Aachen University, Germany. His research interest lies in the intersection of machine learning and mathematical optimization applied to the operation of the power system.

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