IEEE PES Subcommittee on Big Data & Analytics for Power Systems
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# IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

## Deep Learning for Scenario Generation and Scenario Reduction in Short-Term Power System Operations

Prof. Wenyuan Tang
North Carolina State University

10:00 am-11:30 am, Friday, Feb. 26, 2021, Pacific Time
(7:00 pm - 8:30 pm, Friday, Feb. 26, 2021, Central European Time)
(2:00 am – 3:30 am, Saturday, Feb. 27, 2021, China Standard Time)

**Abstract:** With the increasing penetration of renewable generation, new operating paradigms for short-term power system operations have been proposed to address the integration challenges due to the intermittent and non-dispatchable nature of renewables such as wind. Those paradigms typically follow a stochastic programming approach, which requires a high quality scenario set which consists of representative sample paths into the near future. We first consider the scenario generation problem, in which we adapt the sequence generative adversarial network to generate sample paths of hourly wind power generation on the next day. On the other hand, a large number of scenarios may render the underlying optimization problem intractable, especially in the presence of integer variables such as unit commitment decisions. We then consider the scenario reduction problem, in which we develop a mixed autoencoder based fuzzy clustering architecture to trim down the number of scenarios while deteriorating the accuracy of the approximation as little as possible. The effectiveness of the deep learning models is validated through numerical studies.

**Bio:** Wenyuan Tang is an Assistant Professor in the Department of Electrical and Computer Engineering at North Carolina State University. He received the B.Eng. degree in electrical engineering from Tsinghua University in 2008, the M.S. degree in electrical engineering, the M.A. degree in applied mathematics, and the Ph.D. degree in electrical engineering from the University of Southern California in 2010, 2014, and 2015, respectively. He was a Postdoctoral Scholar at the University of California, Berkeley and Stanford University from 2015 to 2017. His research interests include power system economics, electricity markets, power system operation and control, and data analytics for power systems. He is an Editor of the IEEE Transactions on Sustainable Energy, and an Editor of the IEEE Power Engineering Letters.

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