

Data-Driven Estimation of Frequency Response from Ambient Synchrophasor Measurements

Hao Zhu, Ph.D.

Assistant Professor, Department of Electrical and Computer Engineering
The University of Texas at Austin

Friday, February 23, 2018, 2:00pm – 2:50pm, Location: BB 3.03.24

Abstract

With the wide deployment of synchrophasor technology, measurement-based dynamic modeling and studies have been becoming increasingly useful for real-time power grid operations. This talk considers the problem of recovering the power system frequency response from ambient synchrophasor measurements. Specifically, we develop the analytical conditions for establishing the equivalence between the cross-correlation of generator speed data and the system frequency response at any two locations. Our conditions, based on uniformly damped and excited oscillation modes, extend earlier work relying on the modeling of continuum electromechanical wave propagation to that of non-homogeneous power networks. Numerical results suggest that the validity of the cross-correlation approach would hold for more realistic conditions including non-uniform damping and higher-order generator modeling. Its practical value has been further corroborated by real data validation results which closely match with the actual propagation time of electromechanical waves recorded during the 2008 Florida blackout in the Eastern Interconnection system. We conclude the talk with some ongoing work on relaxed equivalence conditions and a direct application on frequency disturbance localization.

Biography



Hao Zhu is currently an Assistant Professor of Electrical and Computer Engineering at The University of Texas at Austin. She received a BE degree from Tsinghua University in 2006, and MSc (minor: Math) and PhD degrees from the University of Minnesota in 2009 and 2012, all in Electrical Engineering. She worked as a postdoc researcher from 2012-2013 at the University of Illinois at Urbana-Champaign and as an assistant professor of ECE from 2014-2017. Her current research interests are investigating and understanding the cyber-physical coupling of power grids for situational awareness and distribution system management, and as well as energy data analytics and the broad area of signal processing over networks. Dr. Zhu received the NSF CAREER Award in 2017, the Siebel Energy Institute Seed Grant and the US AFRL Summer Faculty Fellowship in 2016. She is also the faculty advisor and/or co-author of two best papers at the past North American Power Symposium (NAPS). She is currently a member of the steering committee of the IEEE Smart Grid representing the IEEE Signal Processing Society.