Wide-Area Modeling and Control of Large Power Systems Using Synchrophasor-based Real-Time Simulations

In this talk I'll present model reduction algorithms for constructing dynamic equivalent models of the US west coast power system using Synchrophasor measurements. The model will illustrate the so-called *wide-area* or clustered view of the WECC system, breaking the entire interconnection into several well-defined coherent areas that oscillate with respect to each other in face of disturbances. Such oscillations, typically referred to as inter-area oscillations, are well-studied for the traditional operations of the WECC. However, with gradual expansion in transmission infrastructure as well as tremendous penetration of renewable power in the west coast over the next decade, several dynamical properties of the WECC will change significantly, and so will the characteristics of the interarea oscillations and their stability margins. Such projected changes are neither well-understood from an analytical perspective nor well-established from an experimental or validation point of view. This talk will bridge this gap by investigating how real-time changes in operating conditions, unforeseen contingencies, and intermittency of renewable generation have an impact on the inter-area oscillations in WECC, and validate those observations using a RTDS-based experimental emulation framework.

Aranya Chakrabortty received his Ph.D degree in Electrical Engineering from Rensselaer Polytechnic Institute, Troy, NY in 2008. From 2008-2009 he was appointed as a postdoctoral research associate in the Aeronautics and Astronautics department of the University of Washington, Seattle. From 2009-2010 he served as an Assistant Professor at Texas Tech University. Since Fall 2010 Aranya has joined the Electrical and Computer Engineering department of North Carolina State University, Raleigh, NC as an Assistant Professor, where he is also affiliated to the FREEDM Systems Center. His research interests are in control theory and its applications to electric power systems.