ZHEN DAI

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WORK

Postdoctoral fellow

University of Toronto Oct 2019 – Oct 2020 Toronto, Canada

EDUCATION

Doctor of Philosophy

University of Toronto Sep 2013 – Aug 2019 Toronto, Canada

- Thesis: Line and Generator Outage Identification Using Synchrophasor Measurements

Master of Applied Science

University of Toronto Sep 2011 – Jan 2014 Toronto, Canada

- Thesis: Generic Wind Turbine Generator Model Comparison Based on Optimal Parameter Fitting

Bachelor of Engineering

Tsinghua University Sept 2007 – July 2011 Beijing, China

- Thesis: Power Flow Algorithm of Distribution Systems with Distributed Generations

RESEARCH INTERESTS

My past research interests include applying both model-based and data-driven methods aided by synchrophasor measurements in power system analysis (e.g., parameter estimation, load modeling, and event detection in the bulk power system). I am interested in delivering engineering approaches that raise situational awareness and better operating decisions in power systems by using synchronized measurements with high temporal resolution and accuracy.

Power System Modeling | Transient Stability Analysis | Synchrophasor Applications | Power Sytsem Optimization

EXPERIENCES

Departmental Minority Group Representative

Tsinghua University 2008 – 2010

Grad Student Representative

University of Toronto 2012 – 2015

Teaching Assistant

University of Toronto 2012 – 2020

I have been both a lab and tutorial TA since 2012 and received very positive feedback about my communication skills and knowledge of course materials. The list of courses for which I was a TA: power system optimization, energy systems & distributed generation, introduction to energy systems, fundamentals of electrical energy systems, industrial electronics, and energy conversion.

Activities

- Member, IEEE and IEEE PES
- Reviewer, IEEE Transactions on Smart Grid
- Reviewer, IEEE Transactions on Power Systems
- Participant, Rising Stars 2020 for women in EECS

PROJECTS

Rapid event identification using synchrophasor measurements

funded by Hydro One

- Performed power flow studies and transient stability analysis for benchmark systems and the Ontario power system using different simulation tools (e.g., MATPOWER, PSCAD and PSS/E)
- Developed novel line outage and generator outage identification algorithms based on various types of PMU measurements, which improved localization accuracy.
- The proposed methods are fast and can be implemented in parallel in utility control centers.

Load fluctuation modeling for multi-region power systems

funded by NSERC

- Proposed and validated a simple probabilistic framework to model load fluctuation given actual historical data
- The proposed quasi-linear relationship between load capacity and fluctuation standard deviation can be easily used in any benchmark systems

Generic wind turbine generator model comparison based on optimal parameter fitting

funded by Hydro One

- Implemented wind turbine generation using PSCAD and MATLAB
- Estimated WTG3 generator parameters based on measurements using Kalman filter, which were an improvement compared to initial guess

Emulate synchrophasor frequency transients

funded by NSERC

- Set up a PMU test system: cRIO + SQL server + OpenECA + SEL 451
- Designed simulation for various test systems and disturbances using PSCAD and PSS/E
- Implemented virtual PMU models that improved accuracy compared to simulated frequency

Other Projects

During my graduate study, I also completed projects about residential demand response based on time-of-use price in Ontario, unit commitment and visualization of frequency disturbance events, etc.

PUBLICATIONS

Journal Articles

- Dai, Z. and J. E. Tate (2020a). “Emulating Synchrophasor Frequency Measurements with Transient Stability Simulation”. In: *IEEE Transactions on Power Systems*. under revision.
- – (Mar. 2020b). “External System Generator Outage Localization Based on Tie-Line Synchrophasor Measurements”. In: *IEEE Transactions on Power Systems* 35.2, pp. 1597–1605. ISSN: 0885-8950, 1558-0679. DOI: 10.1109/TPWRS.2019.2942257. URL: https://ieeexplore.ieee.org/document/8843926/.
- – (May 2019). “A Data-Driven Load Fluctuation Model for Multi-Region Power Systems”. In: *IEEE Transactions on Power Systems* 34.3, pp. 2152–2159. ISSN: 0885-8950, 1558-0679. DOI: 10.1109/TPWRS.2018.2882560. URL: https://ieeexplore.ieee.org/document/8542721/.

Conference Proceedings

- Dai, Z. and J. E. Tate (2020c). “Line Outage Identification Based on AC Power Flow and Synchronized Measurements”. In: *2020 IEEE Power and Energy Society General Meeting*.