TONG HUANG

5500 Campanile Drive E-403E San Diego, CA 92182-1326
Email: thuang7@sdsu.edu
Website: `https://thuang-power.github.io`

RESEARCH INTERESTS

My research interests lie in the following intertwined areas: **data analytics**, **cyber security**, and the **modeling and control** of power grids with deep **inverter based resources**.

ACADEMIC APPOINTMENTS

San Diego State University, San Diego, CA *Aug. 2022 - now*
Assistant Professor (tenure-track) at the Department of Electrical and Computer Engineering

Massachusetts Institute of Technology, Cambridge, MA *Jan. 2022 - June 2022*
Postdoctoral Associate at MIT Laboratory of Information & Decision Systems

Texas A&M University, College Station, TX
Postdoctoral Researcher *Sep. - Dec. 2021*
Instructor for Application of Data Science in Modern Power Systems *Jan. - May 2020*
Research/Teaching Assistant *Sep. 2017 - Aug. 2021*

EDUCATION

Texas A&M University, College Station, Texas *Aug. 2017 - Aug. 2021*
Doctor of Philosophy in Electrical Engineering
Thesis: Physical and Cyber Anomaly Management in Massively Digitized Power Systems

Massachusetts Institute of Technology, Cambridge, Massachusetts *Sep. - Dec. 2018*
Visiting Ph.D. student at Laboratory of Information & Decision Systems

Texas A&M University, College Station, Texas *Aug. 2014 - May. 2017*
Master of Science in Electrical Engineering

North China Electric Power University, Baoding, China *Sep. 2009 - Jul. 2013*
Bachelor of Engineering in Electric Power Engineering and its Automation

INDUSTRY EXPERIENCE

Mitsubishi Electric Research Laboratories, Cambridge, Massachusetts *May - Aug. 2019*
Intern Researcher at Data Analytics group

- Developed a framework for parameter coordination of networked microgrids against disasters
- Drafted a conference paper (won the **Best Paper Award**) and a patent published

ISO New England, Holyoke, Massachusetts *Jan. - May 2018*
Intern Researcher at the Department of Business Architecture Technology

- Developed PCM-TSAT adaptor for studying cascading failure from a transient viewpoint
- Developed Sensitivity Analysis Tool for Vermont model improvement

TEACHING EXPERIENCE

San Diego State University EE380: Electric Energy Conversion

Instructor *Jan.-May.2023*

San Diego State University EE480: Power System Analysis

Instructor *Aug.-Dec.2022*

Texas A&M University EE489/689: Application of Data Science in Modern Power Systems
Instructor *Jan. - May 2020*

- Provided lectures; developed course materials; mentored students; and supervised TA

Teaching Assistant *Sep. - Dec 2017*

- Designed homework/quiz/exam; provided tutorials; graded homework/quiz/exam

PUBLICATIONS

Journal Papers:

[J10] **T. Huang**, D. Wu, and M. Ilic, Cyber-resilient Automatic Generation Control for Systems of Microgrids, in *IEEE Transactions on Smart Grid* (accepted, to appear).

[J9] L. Xie, **T. Huang**, P. Kumar, A. Thatte, and S. Mitter, "On an Information and Control Architecture for Future Electric Energy Systems," *Proceedings of the IEEE* (accepted, to appear).

[J8] L. Xie, **T. Huang**, X. Zheng, Y. Liu, M. Wang, V. Vittal, P. Kumar, S. Shakkottai, E. Xing, and Y. Cui, Accelerating the Electric Grid Carbon Neutral Transition through Domain-tailored Artificial Intelligence, *Pattern* (accepted, to appear).

[J7] **T. Huang**, S. Gao, and L. Xie,"A Neural Lyapunov Approach to Transient Stability Assessment of Power Electronics-interfaced Networked Microgrids," in *IEEE Transactions on Smart Grid*, vol. 13, no. 1, pp. 106-118, Jan. 2022.

[J6] **T. Huang**, J. Ramos-Ruiz, W. Ko, J. Kim, P. Enjeti, P. Kumar, and L. Xie,"Enabling Secure Peer-to-peer Energy Transaction through Dynamic Watermarking in Future Distribution Grids," in *IEEE Electrification Magazine*, vol. 9, no. 3, pp. 55-64, Sept. 2021.

[J5] **T. Huang**, N. M. Freris, P. R. Kumar and L. Xie, "A Synchrophasor Data-Driven Method for Forced Oscillation Localization Under Resonance Conditions," in *IEEE Transactions on Power Systems*, vol. 35, no. 5, pp. 3927-3939, Sept. 2020

[J4] **T. Huang**, B. Satchidanandan, P. R. Kumar and L. Xie, "An Online Detection Framework for Cyber Attacks on Automatic Generation Control," in *IEEE Transactions on Power Systems*, vol. 33, no. 6, pp. 6816-6827, Nov. 2018.

[J3] **T. Huang**, M. Wu and L. Xie, "Prioritization of PMU Location and Signal Selection for Monitoring Critical Power System Oscillations," in *IEEE Transactions on Power Systems*, vol. 33, no. 4, pp. 3919-3929, July 2018.

[J2] L. Xie, Y. Sun, X. Zheng, **T. Huang**, and T. Bruton, "Massively Digitized Power Grid: Opportunities and Challenges from Use-inspired AI," *Proceedings of the IEEE,* 2022.

[J1] X. Zheng, N. Xu, L. Trinh, D. Wu, **T. Huang**, S. Sivaranjani, Y. Liu, and L. Xie,"A multi-scale time-series dataset with benchmark for machine learning in decarbonized energy grids," in *Scientific Data*, Nature Publication Group, Jun. 2022.

Conference Papers:

[C9] A. Jena, **T. Huang**, S. Sivaranjani, D. Kalathil, and L. Xie, "Distributed Learning-based Stability Assessment for Large Scale Networks of Dissipative Systems," *2021 60th Conference on Decision and Control*.

[C8] J. Ramos-Ruiz, H. Ibrahim, J. Kim, **T. Huang**, P. Enjeti, L. Xie, and, P. Kumar, "Validation of a Robust Cyber Shield for a Grid Connected PV Inverter System via Digital Watermarking Principle," *2021 IEEE 12th International Symposium on Power Electronics for Distributed Generation Systems* (PEDG).

[C7] **T. Huang**, S. Gao, X. Long, and L. Xie, "A Neural Lyapunov Approach to Transient Stability Assessment in Interconnected Microgrids," in *54-th Hawaii International Conference on System Sciences* (HICSS 54), 2021. (**Best Paper Award**, *top* 0.76% of 1448 papers submitted)

[C6] **T. Huang**, H. Sun, K. Kim, D. Nikovski, and L. Xie, "A holistic framework for parameter coordination of interconnected microgrids against disasters," *IEEE Power and Energy Society General Meeting 2020*. (**Best Paper Award**, *top* 5% of around 1600 papers submitted)

[C5] J. Ramos-Ruiz, J. Kim, W. Ko, **T. Huang**, P. Enjeti, P. Kumar, and L. Xie, "An Active Detection Scheme for Cyber Attacks on Grid-tied PV Systems," in *IEEE CyberPELS*, Miami, FL, USA, 2020, pp. 1-6

[C4] **T. Huang**, B. Wang, J. Ramos-Ruiz, P. Enjeti, P. R. Kumar, and L. Xie, "Detection of Cyber Attacks in Renewable-rich Microgrids Using Dynamic Watermarking," *IEEE PES General Meeting* 2020.

[C3] W. Li, **T. Huang**, N. Freris, P. Kumar, and L. Xie "Data-driven Localization of Forced Oscillations in Power Systems," in *IEEE PES Innovative Smart Grid Technologies Asia* (ISGT Asia), 2019.

[C2] **T. Huang**, N. M. Freris, P. R. Kumar, and L. Xie, "Localization of forced oscillations in the power grid under resonance conditions," *52nd Annual Conference on Information Sciences and Systems* (CISS), Princeton, NJ, 2018, pp. 1-5.

[C1] M. S. Modarresi, **T. Huang**, H. Ming, and L. Xie, "Robust Phase Detection in Distribution Systems," *2017 IEEE Texas Power and Energy Conference* (TPEC), College Station, TX, 2017, pp. 1-5.

PATENT DISCLOSURE

H. Sun, **T. Huang**, and K. Kim, "Methods and Systems for A Holistic Framework for Parameter Coordination of Interconnected Microgrid Systems against Disasters," *U.S. Patent No. 11,196,256*, Dec. 7, 2021.

PRESENTATIONS & INVITED TALKS

[P1] "Physical Anomaly Management in Massively Digitized Power Systems"
Laboratory of Information & Decision Systems EESG Seminar Series
Massachusetts Institute of Technology (MIT), Oct. 20, 2022

[P2] "A Neural Lyapunov Approach to Transient Stability Assessment in Interconnected Microgrid"
54-th Hawaii International Conference on System Sciences (HICSS 54), 2021, paper presentation

HICSS-54 Energy Systems Track Virtual Session, poster presentation

[P3] "Forced Oscillation Localization in ERCOT System through Synchrophasors"
The North American Synchrophasor Initiative (NASPI) Work Group Meeting, Nov. 3, 2020

[P4] "Tutorial of Forced Oscillation Localization Tool"
Electric Reliability Council of Texas (ERCOT), Aug. 12, 2020

[P5] "Detection of Cyber Attacks in Renewable-rich Microgrids Using Dynamic Watermarking"
IEEE Power & Energy Society (PES) General Meeting, Aug. 5, 2020

[P6] "A Holistic Framework for Parameter Coordination of Interconnected Microgrids against Disasters" *IEEE Power & Energy Society (PES) General Meeting*, Aug. 3, 2020

[P7] "Robust PCA over Dynamic Systems: A Case of Forced Oscillation Localization"
LIDS & Stats Tea Talk, Laboratory of Information & Decision Systems
Massachusetts Institute of Technology (MIT), Nov. 7, 2018

[P8] "PMU Prioritization and Forced Oscillation Localization in Power Systems"
ISO New England, Sep. 13, 2018

[P9] "An Online Defense Framework against Cyber Attacks on Automatic Generation Control"
ISO New England, Feb. 2018

[P10] "Prioritization of PMU Location and Signal Selection for Monitoring Critical Oscillations"
IEEE Power & Energy Society (PES) General Meeting, Aug. 4, 2020
Electric Reliability Council of Texas (ERCOT), Nov. 17, 2017
Shenzhen Research Institute of Big Data, The Chinese University of Hong Kong (Shenzhen), Aug. 17, 2017

RESEARCH PROJECT

DOE: Secure Monitoring and Control of Solar Power Distribution System Through Dynamic Watermarking *Jul. 2020 - now*

- Identified microgrid model and designed cyberattack detector via dynamic watermarking
- Wrote quarterly reports and made slides for quarterly review

Synchrophasor Analytics for ERCOT *Jun. 2019 - Jun. 2020*

- Determined critical oscillatory modes from both ambient and ringdown synchrophasor data
- Pinpointed forced oscillation sources in ERCOT events using robust PCA

PROFESSIONAL ACTIVITIES

- *Session Chair*, The 53rd North American Power Symposium (NAPS) 2021
- *Session Chair*, IEEE Power & Energy Society (PES) General Meeting 2020
- *Committee Member*, IEEE Texas Power and Energy Conference (TPEC) 2019
- *Webinar Coordinator*, MIT A+B 2020
- *Virtual Meeting Coordinator*, IEEE Power & Energy Society Women in Power (2020 - now)
- *Journal Reviewer*: IEEE Transactions on Power Systems, IEEE Transactions on Smart Grids, IEEE Transactions on Industry Applications, IEEE Internet of Things Journal, IEEE Industry

Applications Magazine, IEEE Power Engineering Letters, International Journal of Electrical Power & Energy Systems, Energy Systems, IEEE Open Access Journal of Power and Energy, IEEE Power and Energy Technology Systems Journal

- *Conference Reviewer*: IEEE PES General Meeting 2018-2021, Power System Computation Conference (PSCC 2018), Texas Power and Energy Conference (TPEC 2018), Annual Conference of the IEEE Industrial Electronics Society (IECON 2020)

PRESS COVERAGE

"HICSS-54 Best Paper Award Tong et al., 2021"
Texas A&M Engineering Experiment Station Smart Grid Center News, Jan. 2021
"Research team receives best paper award at flagship IEEE conference"
Texas A&M University Engineering News, Sept. 2020
"2020 IEEE PES Best Paper Award"
Texas A&M Engineering Experiment Station Smart Grid Center News, Aug. 2020
"Best conference paper of IEEE PES-GM 2020"
Mitsubishi Electric Research Laboratories (MERL) News & Event, Jun. 2020
"Cybersecurity and solar energy: How are they related?"
Texas A&M University Engineering News, Jan. 2020
"Researchers receive $4.4M Department of Energy grant to enhance solar technology"
Texas A&M Engineering Experiment Station News, Sep. 2019