Peng Zhang

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EDUCATION

University of Wisconsin-Madison (UW-Madison) Madison, US
PhD in Electrical and Computer Engineering Sep 2025 - Present

- **GPA:** 4.0/4.0, **Advisors:** Prof. Manish Singh and Prof. Line Roald
- **Research:** Informativity for voltage monitoring and new load integration in distribution systems
- **Awards:** Novotny Welcome Awards, 2025

University of Washington (UW) Seattle, US
MS in Electrical Engineering Sep 2023 - Jun 2025

- **GPA:** 3.95/4.0, **Advisor:** Prof. Baosen Zhang
- **Research:** Online optimal voltage control in power distribution networks
- **Awards:** NAPS Student Travel Award (Hartford CT), IEEE PES GM Student Program (Austin TX), 2025

North China Electric Power University (NCEPU) Beijing, China
BEng in Electrical Engineering and Its Automation Sep 2019 - Jun 2023

- **GPA:** 93.08/100 (3.95/4.0), **Ranking in 3 years:** 1/55, 1/399, 7/396
- **Thesis:** High-Resolution Spatiotemporal Assessment of Onshore and Offshore Wind Energy and Long-Term System Planning, advised by Prof. Nian Liu
- **Awards:** Outstanding Graduate in Beijing (4%), 2023; Extra-high Voltage (EHV) Scholarship (0.4%), 2022; First-class Schneider Electric Scholarship (1%), 2021; First-class Academic Scholarship (5%) 2020, 2021, 2022

INTERNSHIP

GE Vernova, Bothell, WA Jun 2024 - Aug 2024
Software Engineer Intern – Power Systems

- Supported and maintained automated CI/CD pipelines of GE Vernova's software *Platform and Habitat* delivered to system operators in the US, by configuring build scripts and validating test suites
- Developed an optimal scheduling framework for controllable reactive power resources, including automatic voltage regulators (AVRs) and shunt capacitor banks, to minimize losses of transmission systems; and encapsulated as a module for GE Vernova's Energy Management System (EMS) software
- Solved the cost-effective actions for operator-specific voltage requirements and formulated the risk-aware optimization for secure and economic system operations under large uncertainties from renewable energy resources

RESEARCH EXPERIENCE

Geometric and Algebraic Characterization of Informativity for Voltage Monitoring Madison, US
Research assistant with Prof. Manish Singh and Prof. Line Roald Sep 2025 - Present

- **Measurement selection:** Unveiled the complex geometry of the safety-guaranteed partial measurement set; formulated a bilevel problem to select the online measurements for network-wide voltage safety with proposed monotone metric; derived a single-level reformulation by strong duality, and designed scenario reduction methods with computable optimality gap; numerically validated computational efficiency and enhanced safety perception

  - Presented as a poster at PowerUp 2026 [Poster]
- **Geometric characterization:** Recast the optimization-based voltage safety assessment as a set-membership problem to reduce both the temporal and spatial complexity; analyzed the geometry of safeguarding and non-safeguarding measurement sets under the linearized power flow; proposed a dual solution-based algorithm to online construct the geometry through the supporting hyperplanes

  - Working paper: Online Voltage Safety Assessment via Geometric Characterization of Partial Measurement Set

Online Voltage Control in Distribution Systems under Model Inaccuracy Seattle, US
Research assistant with Prof. Baosen Zhang Jan 2024 - Aug 2025

- **Disturbance-action controller:** Developed an adaptive controller that exploits the temporal load correlations to

coordinate active and reactive power outputs of inverters for voltage regulation; analytically derived the stability conditions and bounds on performance degradation under model inaccuracies; numerically demonstrated the robustness to communication delays and fluctuating load profiles and solar generation

- Presented as a poster at PESGM 2025 [Poster]

- **Online exponential barrier** Proposed an exponential barrier-based algorithm with real-time grid feedback to balance the control cost and voltage constraint satisfaction under model inaccuracies; derived the analytical safety barrier weights, the sufficient conditions for voltage safety at convergence, and the local exponential rate with an appropriate step size

  - Presented at NAPS 2025 [Slides]

Spatiotemporal Modeling and Planning of Macro-Grid Systems Beijing, China
Research assistant with Prof. Nian Liu Sep 2022 - Jun 2023

- **Resources assessment:** Evaluated the physical potential of PV and wind energy by processing hyperscale high-resolution numerical weather and geospatial data from Seniverse, NREL, NASA, etc., based on PVLIB and a modified wind output model; assessed economic potential by calculating the Levelized Cost of Electricity (LCOE)
- **Macro-grids planning:** Formulated the large-scale linear/quadratic programming for the optimal system expansion and operation scheme for provincial grids with integration of utility-scale PV, wind, energy storage, etc.
- **Risk-aware adequacy for extreme weather:** Characterized the nonlinear response of loads to the outdoor temperature; served as the team member to comprehensively evaluate the nationwide adequacy and flexibility of renewable energy during diverse extreme weather events, e.g., hot and cold waves. [Project Paper]

Interdisciplinary Research on Machine Learning and Nonlinear Dynamics Beijing, China
Research assistant with Prof. Lei Wang May 2020 - Jun 2023

- **Analytical methods:** Applied Linear Stability Analysis (LSA), Darboux Transformation (DT) to explore the evolution of solution dynamics for governing high-order and high-dimensional nonlinear PDEs
- **Data-driven methods:** Leveraged Physics-Informed Neural Network (PINN) to both discover the mechanism of control equations (backwards) and infer the solutions (forwards) under corresponding conditions; extended PINN to (2+1)-d in the context of DS I equation that describes the wave dynamics in shallow water; predicted the evolution of rogue waves and explored the transition conditions among three families of lump waves

PUBLICATIONS

[1] **P. Zhang**, L. Roald and M. Singh. "Optimal Measurement Selection for Certifiable Voltage Monitoring in Power Distribution Systems," *arXiv preprint arXiv:2609.28785,* 2026. (Accepted to HICSS-60)

[2] **P. Zhang** and B. Zhang, "Optimal voltage control using online exponential barrier method," in *Proc. 57th North American Power Symposium (NAPS)*, 2025.

[3] **P. Zhang** and B. Zhang, "Online voltage regulation of distribution systems with disturbance-action controllers," *arXiv preprint arXiv:2412.00629*, 2024.

[4] Y. Zhang, L. Wang, **P. Zhang**, H. Luo, W. Shi, and X. Wang, "The nonlinear wave solutions and parameters discovery of the Lakshmanan-Porsezian-Daniel based on deep learning," *Chaos, Solitons & Fractals*, vol. 159, Art. no. 112155, 2022.

SKILLS

Programming: Python, MATLAB, Mathematica, C, Julia
Tools: (*Optimization*) Gurobi/Mosek/CPLEX, CVX; (*Power Systems*) MATPOWER/Pandapower/PyPSA, Multisim, PVLIB, PowerWorld, OpenDSS; (*Machine Learning*) PyTorch and TensorFlow

EXTRACURRICULAR ACTIVITIES

Volunteer for Discovery Day 2025, UW May 2024

- Guided 4th–8th grade students and their parents in hands-on science exhibition activities and promoted engagement within the interdisciplinary engineering community.

Captain of Soccer Team, Department of Mathematics and Physics at NCEPU Sep 2020 - Jun 2021

- Took charge of the annual recruitment, weekly training, match deployment, etc.