Xinyi Zhao

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EDUCATION BACKGROUND

University of Washington — **Seattle, US**
Ph.D. in Industrial Engineering, Department of Industrial & Systems Engineering — *Sept. 2021-Present*
Completed Courses: Machine Learning; Stochastic Processes; Integer Programming
Research Interests: Smart Grid; Operations Research; Reinforcement Learning; Advised by: Prof. Chaoyue Zhao

Tsinghua University — **Shenzhen, China**
M.S. in Electrical Engineering, Tsinghua-Berkeley Shenzhen Institute — *Sept. 2018-Jun. 2021*
Thesis: *Active Distribution System Planning Considering Energy Storage Systems Participating in Multiple Ancillary Services*
GPA: 3.98/4.00 (Rank 1/128); Co-advised by: Prof. Hongbin Sun and Prof. Xinwei Shen

Wuhan University — **Wuhan, China**
B.Eng. in Electrical Engineering, Department of Electrical Engineering and Automation — *Sept. 2014-Jun. 2018*
GPA: 3.87/4.00 (Rank 4/340)

RESEARCH TOPICS

I am working on the planning and operation of power distribution networks, including several topics like:
- Two-stage stochastic/robust integer programming for integrated power systems under uncertainty.
- Distributionally robust optimization framework for quantifying and analyzing system flexibility.
- Fleet electrification considering operations of coupled transportation and power systems.
- Modified progressive hedging algorithm which is faster than Benders decomposition.
- Deep reinforcement learning approach for optimal power flow of distribution networks.

PUBLICATIONS

♢ **Journals:**
- **Xinyi Zhao**, Xinwei Shen, Qinglai Guo, Hongbin Sun and Shmuel S. Oren. *A Stochastic Distribution System Planning Method Considering Regulation Services and Energy Storage Degradation.* **Applied Energy**, 2020, 277:115520. [PDF]
- Haizhou Liu, Xinwei Shen, Qinglai Guo, Hongbin Sun, Mohammad Shahidehpour, Wenzhi Zhao, **Xinyi Zhao**. *Application of Modified Progressive Hedging for Stochastic Unit Commitment in Electricity-Gas Coupled Systems.* **CSEE Journal of Power and Energy Systems**, 2020, 7(4): 840-849. [PDF]

♢ **Conferences:**
- **Xinyi Zhao**, Xinwei Shen, Hongkun Chen, *et al. A Two-Stage Multi-Objective Planning Strategy for Electric Vehicle Charging Stations Considering Power-loss Sensitivity in Distribution System.* **2nd IEEE Conference on Energy Internet and Energy System Integration**, 2018. [PDF]
- **Xinyi Zhao**, Xinwei Shen, Tian Xia, *et al. Optimal Distribution System Planning Considering Regulation Services and Degradation of ESSs.* **11th International Conference on Applied Energy**, 2019. [PDF]
- Yuquan Liu, **Xinyi Zhao**, Xinwei Shen, *et al. A Distribution System Expansion Planning Method Considering Integrated Energy Service Providers' Revenue on Energy Storage Investment.* **25th International Conference on Electricity Distribution**, 2019. [PDF]

♢ **Patent:**
- **Xinyi Zhao**, Linxin Yin, Shinan Song, Huiyi Hu, Zhi Zhang and Yu Zheng. *Human Body Knee Jerk Intelligent Diagnosis and Treatment Percussion Hammer based on Six-axis Acceleration Transducer.* **(No: 201710279460.6, Invention Granted)**, 2017. [Abstract]

RESEARCH EXPERIENCE

National Renewable Energy Laboratory (NREL) — **Golden, Colorado**
Hydrogen Systems for Performance-based Value Stacking — *Jun. 2022-Sept. 2022*

♢ **Simulated the daily hydrogen load based on the data of a hydrogen fueling station**
- Modeled the fueling process of the hydrogen-fueled trucks based on the queueing theory, which can be separated into two events: their arrivals and departures from the hydrogen station.

♢ **Developed a planning model for the integrated hydrogen energy system**
- Implemented the stochastic planning model with Python and solved with Google OR-Tools. The long-term profitability of the integrated system under both current and future conditions was compared in the planning results.

Smart Grid and Renewable Energy Laboratory **Shenzhen, China**
Distribution System Planning Considering Regulation Services and ESS Degradation *Sept. 2018-Jun. 2021*

♢ **Considered degradation model of storage units in distribution system planning**
- Added a linear degradation penalty term in the objective to avoid excessive charge/discharge of ESSs;
- Compared degradation curves of ESSs in different cases, and identified that the storage lifetime was prolonged for one year when considering degradation penalty.

♢ **Developed Gaussian mixture model to generate stochastic scenarios**
- Adopted GMM to model distributions of load demand, LMP, regulation signals and prices accurately to generate diverse stochastic scenarios.

♢ **Modified progressive hedging algorithm**
- Proved that a rational average solution is superior to the traditional mathematical expectation ($\sum_{s\in S}\theta_s \cdot X_s$) on stable convergence when implementing *non-anticipativity* constraints;
- Found that with parallel computing and gap-dependent penalty factors, the modified progressive hedging outperformed Gurobi and the L-shaped method.

AWARDS

Graduate Career:
- UW College of Engineering Dean's Fellowship *Sept. 2021*
- Tsinghua Comprehensive Scholarship *Sept. 2019*

Undergraduate Career:
- First Prize in the 10th National University Students Electrical Math Modeling Competition *Aug. 2017*
- First Power Exploration Scholarship of Wuhan University (3/340) *Sept. 2016*
- China National Scholarship (Top 0.2% of all undergraduate students in China) *Nov. 2015*
- First-class Student Scholarship & Merit Student Scholarship of Wuhan University *Nov. 2015*
- Merit Freshmen Scholarship of Wuhan University (Top 5% of students enrolled at WHU) *Dec. 2014*

TEACHING

- TA, Reinforcement Learning for Energy Systems (16 hrs), Prof. Scott Moura *Summer, 2020*
- TA, Introduction of Smart Grid (32 hrs), Prof. Ye Guo and Prof. Yinliang Xu *Spring, 2020*
- TA, Energy-Environment and Data-Information 100 level (16 hrs), Prof. Xuan Zhang *Fall, 2019*

INVITED PRESENTATION

- Conference oral presentation: *Optimal Distribution System Planning Considering Regulation Services and Degradation of Energy Storage Systems.* **ICAE 2019**, Västerås, Sweden, selected for further considerations in **Applied Energy** (Top 5%). [PPT]

SKILLS & CERTIFICATE & OTHERS

- Skills: Python, Matlab, R, Julia, C, LaTex, Microsoft Office Suite.
- Certificate: China National Computer Rank Examination Level 2 (C Language Programming: 90+ /100), Chinese Calligraphy and Painting Tests Level 9.
- Volunteering: Worked as a volunteer in ACM SenSys 2018 and ICAE 2019, and participated in volunteer activities at Perkins School for the Blind.