Ruiting WANG

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Education

University of California, Berkeley (UC Berkeley). *Advisor: Scott Moura*	**California, USA**
<u>*Energy, Control, & Application Lab.*</u> *Systems Engineering. Ph.D. Candidate.*	*2020-2025*
Tsinghua University	**Beijing, China**
Building Environment and Energy Engineering, B.S.	*2016-2020*

Research Interests

My research centers on the challenges posed to energy and transportation systems by vehicle electrification. I develop learning, optimization, and optimal control methods to enhance system control and support smart decision-making in areas such as infrastructure design and operational strategies. I focus on the development of these methods to better understand, optimize, and control the interconnected and large-scale networks in energy and transportation systems for practical implications.

Publications

[1] **Wang, R.**, Machala, M., Kwon, H., Jordan, K., Moura, S., Boloor, M. Empowering Equity through Optimal Workplace Electric Vehicle Charging Infrastructure Design. *Transportation Research Part D* (In preparation)

[2] **Wang, R.**, Martinez, A., Allybokus, Z., Zeng, W., Obrecht, N., Moura, S. (2024) Electrifying Heavy-Duty Trucks: Battery-Swapping vs Fast Charging. *IEEE Transactions on Smart Grid* (Submitted)

[3] **Wang, R.**, Wu, J., Paparella, F., Moura., S., Gonzalez, M. (2024) Sink Proximity: a Novel Approach for Online Vehicle Dispatch in Ride-hailing. *IEEE Transactions on Intelligent Vehicles* (In review)

[4] **Wang, R.**, Feng, W., Nordman, B., Gerber, D., Li, Y., Kang, J., Hao, B., Brown, R. (2024) Technology Standards for DC Microgrids in Buildings: A Review. *Renewable and Sustainable Energy Reviews* (In review)

[5] **Wang, R.**, Keyantuo, P., Zeng, T., Sandoval, J., Vishwanath, A., Borhan, H., Moura, S. (2024) Optimal Routing of a Mixed Fleet of Heavy-Duty Trucks with Pickup and Delivery. *Applied Energy, 368(1), 123407*.

[6] **Wang, R.**, Feng, W., Xue, H., Gerber, D., Li, Y., Hao, B., Wang, Y. (2021). Simulation and power quality analysis of a Loose-Coupled bipolar DC microgrid in an office building. *Applied Energy, 303(1), 117606*.

[7] **Wang, R.**, Chen, Q., Zhao, B. (2020). Control of fine particulate pollution inside entrance booths. *Building and Environment, 169, 106576*.

[8] A. Goshtasbi, A., Zhao, R., **Wang, R.**, Han, S., Ma, W., Neubauer, J. (2024) Enhanced equivalent circuit model for high current discharge of lithium-ion batteries with application to electric vertical takeoff and landing aircraft. *Journal of Power Sources, 620, 235188*.

[9] **(Best Paper) Wang, R.**, Ju, Y., Allybokus, Z., Zeng, W., Obrecht, N., Moura, S., (2024) Optimal sizing, operation, and efficiency evaluation of battery swapping stations for electric heavy-duty trucks. *2024 American Control Conference*.

[10] Keyantuo, P., **Wang, R.**, Zeng, T., Vishwanath, A., Borhan, H., Moura, S. (2023) Distributionally Robust and Data-Driven Solutions to Commercial Vehicle Routing Problems. *IFAC-PapersOnLine, 56 (2)*.

[11] **Wang, R.**, Zeng, T., Keyantuo, P., Sandoval, J., Vishwanath, A., Borhan, H., Moura, S. (2023) Optimal Dispatch & Routing of Electrified Heavy-Duty Truck Fleets: A Sensitivity Analysis with Fleet Data. *2023 American Control Conference*.

Honors and Awards

- 2025 Christine Mirzayan Science and Technology Policy Graduate Fellowship Finalist (Top 9%)
- ASME Energy Systems **Best Paper** in American Control Conference 2024 (Toronto, Canada)
- Top 0.2% in 27th National College Academic Competition of Building Environment in China, 2019
- Lin Zhiqun's scholarship for diligence (1 among 26), Tsinghua University, 2018, 2019
- Scholarship for excellent academic performance, Tsinghua University, 2017

Research and Experience

PhD Research Projects at UC Berkeley, *Graduate Student Researcher*

Assessment of Battery-Swapping vs Fast-Charging for Sustainable Freight   *09/2023-11/2024*

- ASME Energy Systems Technical Committee **Best Paper** in American Control Conference 2024 [9].
- Developed an optimization framework that enhances battery swapping station **system planning and operation**, incorporating **techno-economic analysis**, carbon-aware objectives, and a grid services strategy.
- Analyzed charging system efficiencies of battery-swapping and fast-charging using **real logistics data** from California, informing state-level freight electrification and charging infrastructure design.

Optimal Dispatch and Routing of Electrified Heavy-Duty Truck Fleets   *06/2021-04/2023*

- Developed a **stochastic** model for fleet scheduling and routing with detailed vehicle longitudinal dynamics.
- Expertise in using Gurobi for large-scale combinatorial optimization problems. Experience in using online model-free **deep reinforcement learning (PyTorch)** to solve traveling salesman problems and other combinatorial optimization problems.
- The research paper [6] maintained a spot on **SSRN's Top Ten download list** for the Automotive Engineering eJournal in February and March 2024.
- Manage collaboration with partners from both **industries and academia**, while providing deliverables and quarterly reports for 18 months. Give presentations to both professional and non-technical audiences.

Toyota Research Institute, *Carbon Neutral Strategy Intern*   *05/2024-08/2024*

Empowering Equity through Optimal Workplace Electric Vehicle Charging Infrastructure Design

- Developed a **modularized toolkit** for evaluation of EV charging accessibility disparities among populations.
- Quantified EV charging access across various communities to improve equitable access to charging facilities.

Joby Aviation, *Powertrain Modeling and Algorithms Intern*   *05/2023-08/2023*

Large-scale non-linear programming for battery model parameter identification.

- Developed a high-fidelity **parameter identification** model for a reduced-order lithium battery model and solved large-scale optimal control problems efficiently with **automatic differentiation** methods.
- Greatly improved model stability, computational efficiency, and scalability to higher dimensional datasets.

Lawrence Berkeley National Laboratory, *Research Assistant*   *Summer 2019, 12/2020-6/2021*

Direct Current (DC) building microgrids and distributed energy storage system.

- Simulated DC building microgrids in **Simulink**. Use **Bode and step analysis** for robustness evaluation.
- Independently managed the project, demonstrating strong project management skills. Post-internship efforts led to publications in *Applied Energy* [7] and *Renewable and Sustainable Energy Reviews* [4].

ByteDance, *Data Analyst Intern*   *10/2020-01/2021*

- Incorporate data and market analysis using SQL and Python to inform advertisement product strategies.
- Collaborate with teams from various departments throughout the **whole lifecycle of software development**.

Teaching Experience

- (Spring 2025) **Teaching Assistant** of <u>CE 291D Data-driven Control Methods for Civil Engineering</u> at UC Berkeley. <u>Core course</u> for Systems Engineering graduate students.
- (Spring 2024) **Teaching Assistant** of <u>CE 295 Data Science for Energy</u> at UC Berkeley (80+ students). Hosted office hours and delivered lectures on control, optimization, machine learning, and optimal control. <u>Core course</u> for Systems Engineering graduate students.
- (Spring 2019) **Teaching assistant** for the course Outline of Modern Chinese History at Tsinghua University. Engaged with over 40 students and hosted two reading workshops. Prepared multiple discussion materials.
- (Summer 2017) **Volunteer teacher** in Xuwen Middle School, Xuwen County, Zhanjiang, Guangdong, China. Designed and taught scientific methods lessons and English lessons for 150 middle school students in six classes in a rural area with limited educational resources.

Services

Session Chair of an invited session at 2024 Informs Annual Meeting (Seattle, USA). "Innovative and Sustainable Strategies in Freight and Logistics". Freight Transportation and Logistics special group. Organize and facilitate the session and create an active discussion with 20+ participants.

Student Liaison of American Society of Mechanical Engineers Energy Systems Technical Committee.

- Organize and host student career-advancing special session in MECC 2024 (Chicago, USA). The session features 10 speakers on a roundtable panel and more than 60 student attendees.

Speakers Co-Director at Beyond Academia (BA), a non-profit organization run by UC Berkeley graduate students to empower PhDs and postdocs to expand their career options.

- Implement strategies for promoting and organizing a virtual conference with over 1300 attendees.
- Hosted and moderated the "Research in Industry" panel at the 2024 BA conference with 80+ participants and overwhelmingly positive feedback.
- Organized multiple events, e.g. "What I Wish I'd Done in Grad School", "Professional Profile Clinic", etc.

Graduate Mentor at UC Berkeley Educational Opportunity Program STEM.

Serve on **Graduate Student and Postdoctoral Scholar Professional Development Committee** at UC Berkeley.

Invited Talks

- **Wang, R.**, Management of Electrified Mobility. Cal Unmanned Aviation Lab, UC Berkeley. May, 2023.
- **Wang, R.**, Zeng, T., Keyantuo, P., Sandoval, J., Vishwanath, A., Borhan, H., Moura, S., Optimal Dispatch and Routing of Electrified Heavy-Duty Truck Fleets: A Case Study with Fleet Data. 2023 American Control Conference. June, 2023.
- **Wang, R.**, Keyantuo, P., Moura, S., Data-Driven Distributionally Robust Vehicle Routing for Heterogeneous Heavy-Duty Trucks. 2023 INFORMS Annual Meeting. October, 2023.
- **Wang, R.**, Ju, Y., Allybokus, Z., Zeng, W., Obrecht, N., Moura, S., Optimal sizing, operation, and efficiency evaluation of battery swapping stations for electric heavy-duty trucks. 2024 American Control Conference. June, 2024.
- **Wang, R.** Innovative and Sustainable Strategies in Freight and Logistics. 2024 Modeling, Estimation, and Control Conference. October, 2024.

Relevant Skills

Programming and simulations: Python, Gurobi, SQL, C, MATLAB/Simulink, Linux; COMSOL, SPSS, etc.

Skillset: Strong proficiency in <u>Python, data science, and optimization</u>. Expertise in linear/nonlinear control, machine learning, convex/combinatorial optimization, stochastic optimization, and reinforcement learning.