Eli **Brock**

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Education

University of California, Berkeley — *USA*
PhD Candidate, Electrical Engineering — *2022 - Present*

- Advisors: Javad Lavaei and Somayeh Sojoudi
- Teaching: Optimization Models in Engineering, Fall 2025 (Head TA)

University of Pittsburgh — *USA*
Bachelor of Science in Electrical Engineering, Summa Cum Laude — *2018 - 2022*

- Minors: Mathematics, Economics

Professional Experience

Lawrence Berkeley National Laboratory — *Berkeley, CA*
Graduate Student Research Assistant, Grid Integration Group — *2024 - Present*

- Conducts research on mixed-integer optimization methods for distribution grid planning.
- Develops and maintains distribution grid planning codebase used across LBL projects and in partnership with industry.

Pacific Northwest National Laboratory — *Portland, Oregon*
Undergraduate Research Intern, Building Simulation & Design Group — *2020-2022*

- Developed a parallel computing infrastructure and cosimulation framework for urban-scale building energy simulation.

Selected Research Projects

Strategic Arbitrage in Wholesale Electricity Markets — *2025-Present*
UC Berkeley

- How can grid-scale storage operators and load aggregators exercise market power?
- Developed dynamic game model for wholesale electricity market.
- Derived conditions under which standard equilibrium-seeking algorithms succeed.
- Trained equilibria on benchmark network.

Game Theory | Reinforcement Learning | Jax

Nodal Pricing in Electric Distribution Systems — *2024-2025*
UC Berkeley

- Can locational pricing on distribution nodes better coordinate customer-owned flexible devices?
- Proposed a practical marginal-cost-based dynamic pricing rule.
- Established new sufficient conditions under which stochastic games admit locally-attracting equilibria.
- Demonstrated near-socially-optimal performance on benchmark network.

Game Theory | Reinforcement Learning | PyTorch

Least-Cost Optimal Distribution Grid Expansion (LODGE) — *2024-Present*
Lawrence Berkeley National Laboratory

- Objective: Serve growing future load with least expensive portfolio of distribution grid upgrades.
- Developed specialized cutting-plane algorithm that finds good solutions without linearization.
- Built high-fidelity nonlinear optimization model for unbalanced three-phase distribution grids.

Optimization | Pyomo

Chance-Constrained Optimal Power Flow — *2022-2024*
UC Berkeley

- Objective: find generator dispatch that is robust to variable renewable energy forecast uncertainty.
- Achieved generalization guarantees using distributionally robust optimization theory.
- Validated performance against state-of-the-art methods on several benchmarks.

Optimization | JuMP

Certificates & Awards

2025 **Outstanding Graduate Student Instructor**, UC Berkeley EECS

2022 **Graduate Research Fellow**, National Science Foundation
2021 **John W. Estey Outstanding Scholar**, IEEE Power and Energy Society

Publications

[1] E. Brock, J. Li, J. Lavaei, and S. Sojoudi, "Coordinating Distributed Energy Resources with Nodal Pricing in Distribution Networks: a Game-Theoretic Approach," in *2025 IEEE 64th Conference on Decision and Control (CDC)*, 2025, pp. 4029–4036.

[2] E. Brock, H. Zhang, J. Lavaei, and S. Sojoudi, "Distributionally robust joint chance-constrained optimal power flow using relative entropy," *IEEE Transactions on Power Systems*, vol. 40, no. 4, pp. 2902–2914, 2025.

[3] E. Brock, C. Gulian, M. Heleno, J. Lavaei, and S. Sojoudi, "Distribution System Expansion Planning with Nonlinear Power Flow Models," in *2025 IEEE Power & Energy Society General Meeting (PESGM)*, 2025, pp. 1–5.

[4] E. Adachi, E. Brock, and R. Kravis, "Understanding price formation in grids transitioning to zero marginal cost generation," in *2024 IEEE Power and Energy Conference at Illinois (PECI)*, 2024, pp. 1–6.

[5] E. Brock, L. Bruckstein, P. Connor, S. Nguyen, R. Kerestes, and M. Abdelhakim, "An application of reinforcement learning to residential energy storage under real-time pricing," in *2021 IEEE PES Innovative Smart Grid Technologies-Asia (ISGT Asia)*, 2021, pp. 1–5.

[6] E. Brock, H. Zhang, J. M. Kemp, J. Lavaei, and S. Sojoudi, "Distributionally robust optimization for nonconvex QCQPs with stochastic constraints," in *2023 62nd IEEE Conference on Decision and Control (CDC)*, 2023, pp. 4320–4326.

[7] Z. T. Taylor, D. Maddox, and E. Brock, "pnnl/gparm," technical report, 2023.

[8] Y. Ye, C. A. Faulkner, W. Jung, J. Zhang, and E. Brock, "A new database of building-space-specific internal loads and load schedules for performance based code compliance modeling of commercial buildings," in *Building Simulation*, 2024, pp. 877–892.

[9] N. J. Waltz, C. A. Faulkner, Y. Ye, X. Lei, and E. T. Brock, "Building-to-grid modeling framework with a case study of battery systems," in *Building Simulation 2023*, 2023, pp. 2484–2490.

[10] Y. Ye, X. Lei, J. Lerond, J. Zhang, and E. T. Brock, "A Case Study about Energy and Cost Impacts for Different Community Scenarios Using a Community-Scale Building Energy Modeling Tool," *Buildings*, vol. 12, no. 10, p. 1549, 2022.

[11] S. Nguyen, E. Brock, P. Connor, E. Cook, M. Abdelhakim, and R. Kerestes, "Integrating distributed devices onto rural circuits," in *2022 IEEE Rural Electric Power Conference (REPC)*, 2022, pp. 18–24.

[12] J. Zhang, E. T. Brock, and Y. Ye, "A Parallel Computing Infrastructure for Building Energy Simulation," technical report, 2020.

Skills

Programming	Python | Julia
Tech Stack	Docker | Git
Frameworks & Libraries	NumPy | Jax | JuMP | CVXPY | Pyomo | Pandas
Personal Interests	Hiking | Swimming | Reading | Basketball