Joel Mathias

joel.mathias@asu.edu | +1 (352) 277-9561 | Philadelphia, PA | joel-mathias.github.io | joel-mathias |

joel-mathias-90367b63 | orcid.org/0000-0002-9711-4607 | scholar.google.com/citations?user=gBZFKz0AAAAJ&hl=en

Education

University of Florida Gainesville, FL
Ph.D., Electrical & Computer Engineering *2017 — 2022*
- Dissertation: *Balancing the Power Grid with Distributed Control of Flexible Loads*
- Advisor: Dr. Sean Meyn

University of Florida Gainesville, FL
M.S., Electrical & Computer Engineering

University of Mumbai Mumbai, India
Bachelor of Engineering, Electronics & Communications Engineering

Grid-Specific Work Experience

Senior Market Design Specialist June 2025 — Present
PJM Interconnection *Philadelphia, PA*

- Broad focus on energy and ancillary service market reforms to align price formation and dispatch with the flexibility and reliability needs of the system
- Part of Reserve Certainty Senior Task Force supporting comprehensive changes to the reserve markets, including introduction of new reserve products to address challenges associated with netload uncertainty and ramping as well as nodal pricing of reserves
- Computation of proposed demand curves informed by stochastic analysis for the new and updated reserve services
- Market reforms for energy storage resources including new rules to allow opportunity costs as part of market offers, state of charge accounting and optimization, as well as changes to energy must offer rules for capacity storage resources

Engineer III — Market Design May 2024 — June 2025
Midcontinent Independent System Operator (MISO) *Indianapolis, IN*

- Design of capacity markets with reliability-based demand curves (including mathematical formulation, software implementation, testing, and stakeholder interactions)

Postdoctoral Research Scholar July 2022 — May 2024
Arizona State University *Tempe, AZ*

- Focus on design of robust model predictive control and reinforcement learning techniques for automatic dispatch of distributed energy resources in power grid

Research Intern 2019 & 2021
Electric Power Engineers (EPE) *Austin, TX*

- Implemented a distribution-level short-term load forecasting tool in Python using a deep learning architecture based on LSTM

Graduate Research Assistant 2017 — 2022
University of Florida *Gainesville, FL*

- Formulation of distributed stochastic control architecture to extract virtual energy storage (VES) from residential electric loads for ancillary services: ensures minimal load-to-grid communication, consumer privacy, and load-level QoS
- Design of simulation testbed to evaluate performance of control architectures

Skills

Languages ■ Python, MATLAB, General Algebraic Modeling System (GAMS)
Mathematics ■ Real Analysis, Stochastic & Optimal Control, Convex Optimization
Misc. ■ Git, Azure Databricks, Jupyter/pySpark Notebooks

Research Publications

Journal Articles

J1 H. Ballouz, **J. Mathias**, S. Meyn, R. Moye, and J. Warrington, "Control engineer roles in the next power market transition," *Annual Review of Control, Robotics, and Autonomous Systems*, vol. 8, Jan. 2025.

J2 **J. Mathias**, R. Moye, S. Meyn, and J. Warrington, "State space collapse in resource allocation for demand dispatch and its implications for distributed control design," *IEEE Transactions on Automatic Control*, 2023. DOI: 10.1109/TAC.2023.3293617.

J3 **J. Mathias**, A. Bušić, and S. Meyn, "Load-level control design for demand dispatch with heterogeneous flexible loads," *IEEE Transactions on Control Systems Technology*, vol. 31, no. 4, pp. 1830–1843, 2023. DOI: 10.1109/TCST.2023.3245287.

Conference Proceedings

C1 **J. Mathias**, R. Anguluri, O. Kosut, and L. Sankar, "Model predictive control for joint ramping and regulation-type service from distributed energy resource aggregations," in *IEEE Power & Energy Society General Meeting*, 2024.

C2 F. Lu, **J. Mathias**, S. Meyn, and K. Kalsi, "Convex Q-learning in continuous time with application to dispatch of distributed energy resources," in *IEEE Conf. on Decision and Control*, Dec. 2023.

C3 S. Meyn, F. Lu, and **J. Mathias**, "Balancing the power grid with cheap data," in *IEEE Conf. on Decision and Control*, Dec. 2023.

C4 **J. Mathias**, S. Meyn, H. Ballouz, and M. Ansari, "A distributed control architecture for optimal allocation of grid-responsive load aggregations," in *IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT)*, 2022, pp. 1–5. DOI: 10.1109/ISGT50606.2022.9817327.

C5 **J. Mathias**, R. Moye, S. Meyn, and J. Warrington, "State space collapse in resource allocation for demand dispatch," in *IEEE Conf. on Decision and Control*, Dec. 2019, pp. 626–688. DOI: 10.1109/CDC40024.2019.9029384.

C6 N. Cammardella, **J. Mathias**, M. Kiener, A. Bušić, and S. Meyn, "Balancing California's grid without batteries," in *IEEE Conf. on Decision and Control*, Dec. 2018, pp. 7314–7321. DOI: 10.1109/CDC.2018.8618975.

C7 **J. Mathias**, A. Bušić, and S. Meyn, "Demand dispatch with heterogeneous intelligent loads," in *50th Annual Hawaii International Conference on System Sciences (HICSS)*, Jan. 2017, pp. 3126–3147. DOI: 10.24251/HICSS.2017.380.

C8 **J. Mathias**, R. Kaddah, A. Bušić, and S. Meyn, "Smart fridge / dumb grid? Demand dispatch for the power grid of 2020," in *49th Annual Hawaii International Conference on System Sciences (HICSS)*, Jan. 2016, pp. 2498–2507. DOI: 10.1109/HICSS.2016.312.

Books and Chapters

B1 Y. Chen, M. U. Hashmi, **J. Mathias**, A. Bušić, and S. Meyn, "Distributed control design for balancing the grid using flexible loads," in *Energy Markets and Responsive Grids: Modeling, Control, and Optimization*, S. Meyn, T. Samad, I. Hiskens, and J. Stoustrup, Eds., New York, NY: Springer, 2018, pp. 383–411. DOI: 10.1007/978-1-4939-7822-9_16.

News Media

N1 H. Ballouz, **J. Mathias**, S. Meyn, R. Moye, and J. Warrington, *Addressing misconceptions on the performance of the energy market in Texas*, Utility Dive, Apr. 2021.

References

Dr. Sean Meyn
Professor, Electrical and Computer Engineering,
University of Florida, Gainesville, FL, USA.
International Chair, INRIA, Paris, France.
meyn@ece.ufl.edu

Dr. Joseph Warrington
Principal Optimisation Engineer,
AstraZeneca,
Cambridge, UK.
joe.warrington@gmail.com