Anna Stuhlmacher

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Education

University of Michigan — **Ann Arbor, MI**
Ph.D. - Electrical Engineering — *2023*
Advisor: Johanna L. Mathieu

University of Michigan — **Ann Arbor, MI**
M.S. - Electrical Engineering — *2019*

Boston University — **Boston, MA**
B.S. - Electrical Engineering — *2017*
Summa Cum Laude

Positions

Michigan Technological University — **Houghton, MI**
Assistant Professor, Electrical and Computer Engineering — *2023-Present*

University of Michigan — **Ann Arbor, MI**
Graduate Student Research Assistant — *2017-2023*
Graduate Student Instructor — *Fall 2021*
Undergraduate Researcher, Summer Research Opportunity Program — *Summer 2016*

National Renewable Energy Laboratory — **Golden, CO**
Power Systems Control and Optimization Intern — *Summer 2021*

Boston University — **Boston, MA**
Undergraduate Research Assistant in Joshua Semeter's Lab — *2014-2017*

Publications and Presentations

** indicates presenter, underline indicates students mentored*

Journal Papers

[J6] **A. Stuhlmacher**, A. Kody, and M. Wu, "Optimizing Biogas Use in Wastewater Treatment Plants For Demand Flexibility", In: (Review)

[J5] **A. Stuhlmacher**, S. Guikema, and J. L. Mathieu, "Assessing Power and Water Network Resilience When Water Pumps Provide Frequency Regulation", In: (Review).

[J4] **A. Stuhlmacher**, C. Ten, L. Dilworth, and Y. Tang, "Operational Planning for Emerging Distribution Systems: A Unique Perspective on Grid Expansion", In: Foundations and Trends in Electric Energy Systems, vol. 7, no. 2, pp. 63-164, 2023. DOI: 10.1561/3100000033.

[J3] **A. Stuhlmacher*** and J. L. Mathieu, "Flexible Drinking Water Pumping to Provide Multiple Grid Services", In: Electric Power Systems Research - Special Issue for the 2022 Power Systems Computation Conference (PSCC), vol. 212, p. 108491. Porto, Portugal, June 2022. DOI: 10.1016/j.epsr.2022.108491.

[J2] **A. Stuhlmacher** and J. L. Mathieu, "Chance-Constrained Water Pumping to Manage Water and Power Demand Uncertainty in Distribution Networks," In: Proceedings of the IEEE, vol. 108, no. 9, pp. 1640-1655. 2020. DOI: 10.1109/JPROC.2020.2997520.

[J1] **A. Stuhlmacher*** and J. L. Mathieu, "Water Distribution Networks as Flexible Loads: A Chance-constrained Programming Approach", In: Electric Power Systems Research - Special Issue for the 2020 Power Systems Computation Conference (PSCC), vol. 188, p. 106570. (virtual), June 2020. DOI: 10.1016/j.epsr.2020.106570. *Presentation Link.*

Conference Proceedings

[C6] A. N. Sakib and **A. Stuhlmacher**, "Leveraging Drinking Water Pumps as Flexible Loads Using Input Convex Neural Networks", In: (Review).

[C5] **A. Stuhlmacher*** and J. L. Mathieu, "Demand Response Potential of Drinking Water Distribution Networks", In: Proceedings of the 58th Hawaii International Conference on System Sciences (HICSS). Waikoloa Village, Hawaii, January 2025. DOI: 10125/109192.

[C4] **A. Stuhlmacher***, J. L. Mathieu, and P. Seiler, "Optimizing Dual-Axis Solar Panel Operation in an Agrivoltaic System and Implications for Power Systems", In: Proceedings of the 57th Hawaii International Conference on System Sciences (HICSS). Waikiki, Hawaii, January 2024. DOI: 10125/106735.

[C3] **A. Stuhlmacher*** and J. L. Mathieu, "Uncertainty-Aware Methods for Leveraging Water Pumping Flexibility for Power Networks", In: Proceedings of the IREP Symposium on Bulk Power System Dynamics and Control. Banff, Canada, August 2022. DOI: 10.48550/arXiv.2207.04943.

[C2] **A. Stuhlmacher***, L. A. Roald, and J. L. Mathieu, "Tractable Robust Drinking Water Pumping to Provide Power Network Voltage Support", In: Proceedings of the Conference on Decision and Control (CDC). (virtual), pp. 4206-4213, December 2021. DOI: 10.1109/CDC45484.2021.9683419.

[C1] **A. Stuhlmacher*** and J. L. Mathieu, "Chance-Constrained Water Pumping Managing Power Distribution Network Constraints", In: Proceedings of the North American Power Symposium (NAPS). Wichita, KS, October 2019. DOI: 10.1109/naps46351.2019.9000282.

Dissertation

A. Stuhlmacher, "Optimal Scheduling and Control of Uncertain Coupled Power-Water Distribution Networks". PhD Thesis. University of Michigan. May 2023. DOI: 10.7302/7426.

Technical Reports

[T1] R. O'Neil, K. Oikonomou, M. Parvania, V. Tidwell, A. T. Al-Awami, M. Panteli, S. Conrad, T. Brekken, E. Goharian, N. Voisin, "Integrated Water and Power Systems: Current State and Research Roadmap," IEEE PES Task Force on Water-Power Systems, Technical Report No. PES-TR114, September 2023. **Contributor to the 'Integrated Operation of Water and Power Systems' Topic Area*

Abstracts with Oral Presentations

[A3] **A. Stuhlmacher***, S. Guikema, and J. L. Mathieu, "Assessing the Resilience of an Optimal Water Pumping Control Strategy to Provide Frequency Regulation", INFORMS Annual Meeting. Phoenix, AZ, October 2023.

[A2] **A. Stuhlmacher*** and J. L. Mathieu, "Stochastic Optimization of Water Distribution Network Operation to Provide Power Grid Flexibility", SIAM Conference on Optimization Annual Meeting. Seattle, WA, May 2023.

[A1] **A. Stuhlmacher***, L. A. Roald, and J. L. Mathieu, "An Adjustable Robust Optimization Model for Drinking Water Pumping as a Flexible Load", INFORMS Annual Meeting. (virtual), October 2021.

Posters

[P12] A. N. Sakib* and **A. Stuhlmacher**, "Flexible Operation of Drinking Water Pumps using Input Convex Neural Network Approximations", Institute of Computing and Cybersystem's Computing Showcase. Houghton, MI, October 2024. (2^{nd} place within Graduate Student Category)

[P11] M. Wu* and **A. Stuhlmacher**, "Investigating the Impacts of Agrivoltaic Design Choices on Inter-Row Shading and Electricity Production", Institute of Computing and Cybersystem's Computing Showcase. Houghton, MI, October 2024. (2^{nd} place within Undergraduate Student Category, selected for publication in the College of Computing's undergraduate journal, *Infinite Loop*)

[P10] **A. Stuhlmacher*** and J. L. Mathieu, "Assessing the Resilience of an Optimal Water Pumping Strategy to Provide Frequency Regulation", IEEE Power and Energy Society General Meeting. Orlando, FL, July 2023.

[P9] **A. Stuhlmacher***, J. L. Mathieu, and P. Seiler, "Optimizing Dual-Axis Solar Panel Operation in an Agrivoltaic System under Uncertainty", AgriVoltaics2023 Conference and Exhibition, (virtual), April 2023. *Presentation Link.*

[P8] **A. Stuhlmacher*** and J. L. Mathieu, "Computationally Tractable Uncertainty-Aware Framework for Optimal Water Pumping in Coupled Power-Water Systems", Fifth Workshop on Autonomous Energy Systems, National Renewable Energy Laboratory (NREL). Golden, CO, July 2022.

[P7] D. Li*, **A. Stuhlmacher**, and J. L. Mathieu, "Estimating the Demand Response Potential of Drinking Water Distribution Networks in Arizona", University of Michigan Undergraduate Research Symposium. Ann Arbor, MI, April 2022.

[P6] C. Bertcher*, **A. Stuhlmacher**, and J. L. Mathieu, "Comparison of Linearized Three-Phase Unbalanced Power Flow Models", IEEE Power and Energy Society General Meeting. (virtual), July 2021. *Presentation Link.*

[P5] C. Bertcher*, **A. Stuhlmacher**, and J. L. Mathieu, "UM Bus Electrification: Challenges and Solutions", University of Michigan Undergraduate Research Symposium. Ann Arbor, MI, April 2019.

[P4] **A. Stuhlmacher*** and J. L. Mathieu, "Stochastic Water Distribution Network Operation Considering Power Distribution Network Constraints", Engineering Graduate Symposium, University of Michigan. Ann Arbor, MI, October 2018.

[P3] **A. Stuhlmacher***, J. L. Mathieu, and V. Gupta, "Water-Power Distribution Network Coupling for Optimal Pumping to Reduce Energy Costs and Promote Resilience", Engineering Graduate Symposium, University of Michigan. Ann Arbor, MI, November 2017.

[P2] **A. Stuhlmacher***, S. Crocker, and J. L. Mathieu, "Effects of Aggregate Load Control on the Physical Constraints of Distribution Networks", Rackham Summer Research Opportunity Program Symposium, University of Michigan. Ann Arbor, MI, July 2016.

[P1] S. Crocker*, **A. Stuhlmacher**, and J. L. Mathieu, "Effects of Aggregate Load Control on the Physical Components of Distribution Networks", IEEE PES General Meeting. Boston, MA, July 2016.

Honors and Awards

- Best paper award for the Electric Energy Systems Track, Hawaii International Conference on System Sciences, January 2025
- Societal Impact Award, Senior Design Capstone Project, College of Engineering, Boston University, Spring 2017
- Entrepreneurial Award, Senior Design Capstone Project, Department of Electrical and Computer Engineering, Boston University, Spring 2017

Funding

Course Innovation Grant **$1,500**
IDEAhub, Michigan Technological University
June 2024-August 2024

Rapid Seedling Award **$9,445**
GLRC-ICC Joint Institute, Michigan Technological University
May 2024-August 2024

Rackham Predoctoral Fellowship **$44,214**
Rackham Graduate School, University of Michigan
May 2022-April 2023

Graduate Research Fellowship Program (GRFP) **$138,000**
National Science Foundation
2017-2020

Invited Talks

- (Upcoming) Texas A&M, March 28th, 2024.
- (Upcoming) IEEE Northeastern Wisconsin Section, February 6th, 2025.
- Purdue University, Herrick Energy Seminar, "Coordination of the Water Supply System and the Power Grid to Support System Performance", April 26th, 2024.
- IEEE Northeastern Wisconsin Section, "Agrivoltaics - Placing Solar Photovoltaic Panels Over Cropland", February 15th, 2024.
- Polytechnique Montréal, Group for Research in Decision Analysis (GERAD), "Optimizing Dynamic Solar Panel Operation in an Agrivoltaic System and Implications for Power Systems" (virtual), January 24th, 2024.
- Michigan Technological University, Alternative Energy Enterprise, "Agrivoltaics - Placing Solar Photovoltaic Panels Over Cropland", November 28th, 2023.
- Stanford University, Water and Energy Efficiency for the Environment Lab (WE3Lab), "Optimizing Flexible Drinking Water Networks to Support Power System Performance" (virtual), July 14th, 2023.
- Cornell University, "Optimizing Flexible Drinking Water Networks to Support Power System Performance", March 13th, 2023.
- Oregon State University, "Optimizing Flexible Drinking Water Networks to Support Power System Performance", February 22nd, 2023.

- Michigan Technological University, "Optimizing Flexible Drinking Water Networks to Support Power System Performance", February 6th, 2023.
- Portland State University, "Optimizing Flexible Resources to Support Power System Resiliency", January 11th, 2023.
- Hope College, "Drinking Water Networks as Flexible Loads in the Power Grid", November 12th, 2021.

Teaching

MTU EE 5232: Power System Optimization — **Houghton, MI**
Instructor — *Spring '24*

MTU EE 3120: Electrical Energy Systems — **Houghton, MI**
Instructor — *Fall '23, '24, Spring '25*

UM EECS 460: Control Systems Analysis and Design — **Ann Arbor, MI**
Graduate Student Instructor — *Fall '21*

BU EC 402: Introduction to Control Systems — **Boston, MA**
Undergraduate Teaching Fellow — *Spring '17*

Guest Lecture

- UM EECS 534: Analysis of Electric Power Distribution Grids and Loads, "Power Flow Relaxations and Approximations for Unbalanced Networks", October 12th, 2022.

Graduate Teacher Certificate — **Ann Arbor, MI**
University of Michigan, Center for Research on Learning and Teaching (CRLT) — *Spring '22*

UM EECS 598: Markets and Optimization — **Ann Arbor, MI**
Grader — *Fall '19, Spring '22*

Service

Society Memberships

** intermittently*

Institute of Electrical and Electronics Engineers (IEEE), Institute for Operations Research and the Management Sciences (INFORMS)*, Graduate Society of Women Engineers, Tau Beta Pi Engineering Honors Society, IEEE HKN Boston University Chapter, Order of the Engineer

Technical Committees

- IEEE PES Task Force on Water-Power Systems

Conferences, Workshops, and Panels

- Panelist for "Tenure-Track Faculty Positions", University of Michigan ENGR 580 (Teaching Engineering), Dec. 2, 2024
- Session organizer and chair of the Distributed, Renewable and Mobile Resources minitrack, Hawaii International Conference on System Sciences (HICSS), 2025 and 2026

Reviewer

Journals

IEEE Transactions on Power Systems, IEEE Transactions on Control of Networked Systems, IEEE Transactions on Smart Grids, Electric Power Systems Research, IEEE Power Engineering Letters, IEEE Control Systems Letters (L-CSS)

Conferences

Power Systems Computation Conference (PSCC), IEEE Conference on Decision and Control (CDC), Conference on Probabilistic Methods Applied to Power Systems (PMAPS), American Control Conference (ACC), Hawaii International Conference on System Sciences (HICSS)

Proposals

National Science Foundation

In The News

- "Holiday Lights Survey: When Do Americans Start Decorating?" This Old House, October 29, 2024.