Michael W. Fisher

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Appointments

2022 – present **Assistant Professor**
University of Waterloo
Department of Electrical and Computer Engineering
Dynamics, Optimization, and Control of Complex Systems (DOCS) Group

2020 – 2022 **Postdoctoral Researcher**
ETH Zürich
Automatic Control Laboratory
Power Systems Laboratory
Department of Information Technology and Electrical Engineering
Professor Florian Dörfler and Professor Gabriela Hug

2013, 2014 **Summer Research Internships**
Los Alamos National Laboratory
Center for Nonlinear Studies
Dr. Misha Chertkov and Dr. Scott Backhaus

2012 **Summer Research Internship**
Lawrence Berkeley National Laboratory
BELLA Center (Formerly: LOASIS)
Dr. Cameron Geddes and Dr. Jean-Luc Vay

Education

Sep 2014 – Jan 2020 **University of Michigan - Ann Arbor**
Ph.D. Electrical Engineering: Systems
M.S. Mathematics (2017)
Advisor: Professor Ian Hiskens
GPA: 4.0/4.0
Thesis: Stability of Nonlinear Systems with Parameter Uncertainty

Sep 2010 – May 2014 **Swarthmore College**
B.A. Mathematics, Physics
GPA: 3.8/4.0

Awards

2019 Outstanding Student Paper Award, IEEE Conference on Decision and Control

2019 One of Three Students Selected by the ECE Department for Nomination for the University of Michigan Rackham Predoctoral Fellowship

2018 Selected as the University of Michigan Representative to 2018 Seminar for the Next Generation of Researchers in Power Systems

2017 Top Four Finalist for Best Student Paper Award, IEEE Conference on Decision and Control

2016 National Science Foundation 2016 Graduate Research Fellowship Program Honorable Mention

2015 Best Poster Award, Engineering Graduate Symposium, University of Michigan, Ann Arbor

2015 National Science Foundation 2015 Graduate Research Fellowship Program Honorable Mention

2012 Barry M. Goldwater Scholarships Honorable Mention

2011 CRC Press Chemistry Achievement Award, Taylor and Francis Group, LLC

Preprints

M. W. Fisher, G. Hug, and F. Dörfler. Approximation by Simple Poles – Part I: Density and Geometric Convergence Rate in Hardy Space.
Submitted to *IEEE Transactions on Automatic Control*, 2022.

M. W. Fisher, G. Hug, and F. Dörfler. Approximation by Simple Poles – Part II: System Level Synthesis Beyond Finite Impulse Response.
Submitted to *IEEE Transactions on Automatic Control*, 2022.

Journal Publications

M. W. Fisher and I. A. Hiskens. Hausdorff Continuity of Region of Attraction Boundary Under Parameter Variation with Application to Disturbance Recovery. *SIAM Journal of Applied Dynamical Systems*, 21(1): 327-365, 2022.

V. Häberle, M. W. Fisher, E. Prieto-Araujo, and F. Dörfler. Control Design of Dynamic Virtual Power Plants - An Adaptive Divide-and-Conquer Approach. *IEEE Transactions on Power Systems*, To appear.

M. W. Fisher and I. A. Hiskens. Comments on "Stability Regions of Nonlinear Autonomous Dynamical Systems." *IEEE Transactions on Automatic Control*, 66(12): 6194-6196, 2021.

S. Misra, M. W. Fisher, S. Backhaus, R. Bent, M. Chertkov, F. Pan. Optimal Compression in Natural Gas Networks: A Geometric Programming Approach. *IEEE Transactions on Control of Network Systems*, 2(1):47-56, 2014.

Conference Publications

P. D. Grontas, M. W. Fisher, and F. Dörfler. Distributed and Constrained $\mathcal{H}_2$ Control Design via System Level Synthesis and Dual Consensus ADMM. *IEEE Conference on Decision and Control*, 2022, Accepted.

M. W. Fisher and I. A. Hiskens. Numerical Computation of Critical System Recovery Parameter Values by Trajectory Sensitivity Maximization. In *IEEE Conference on Decision and Control*, p. 8000-8006, 2019.

M. W. Fisher and I. A. Hiskens. Parametric Dependence of Large Disturbance Response for Vector Fields with Event-Selected Discontinuities. In *European Control Conference*, p. 166-173, 2019

M. W. Fisher and I. A. Hiskens. Numerical Computation of Critical Parameter Values for Fault Recovery in Power Systems. In *Power Systems Computation Conference*, p. 1-6, 2018

M. W. Fisher and I. A. Hiskens. Parametric Dependence of Large Disturbance Response and Relationship to Stability Boundary. In *IEEE Conference on Decision and Control*, p. 1821-1827, 2017.

M. W. Fisher and I. A. Hiskens. Numerical Computation of Parameter-Space Stability/Instability Partitions for Induction Motor Stalling. In *IFAC Workshop on Control of Transmission and Distribution Smart Grids*, p. 250-255, 2016.

M. W. Fisher and I. A. Hiskens. Phase Boundary Computation for Fault Induced Delayed Voltage Recovery. In *IEEE Conference on Decision and Control*, p. 3278-3284, 2015.

M. Chertkov, M. W. Fisher, S. Backhaus, R. Bent, S. Misra. Pressure Fluctuations in Natural Gas Networks caused by Gas-Electric Coupling. In *Hawaii International Conference on System Sciences*, p. 2738-2747, 2014

Student Supervision

2020-2022 PhD Student Supervision

- *Verena Häberle (co-advised with Florian Dörfler)*
  Institution: ETH Zürich
  Project: Decentralized control of heterogeneous power generation sources in a dynamic virtual power plant. More details available here.

2021-2022 Master Student Supervision

- *Panagiotis Grontas*
  Institution: ETH Zürich
  Project: Distributed and Constrained $\mathcal{H}_2$ Control Design via System Level Synthesis and Dual Consensus ADMM.

2021-2022 Master Thesis Supervision

- *Francisco Canales Pérez*
  Institution: ETH Zürich
  Thesis: Heterogeneous Ensemble Control with State and Input Constraints for Dynamic Virtual Power Plants.
- *Moritz Danninger (co-advised with Johanna Vorwerk)*
  Institution: ETH Zürich
  Thesis: Optimization-based nonlinear control of inverter-interfaced thermal loads.

2020-2022 Semester Project Supervision

- *Simon Schnellmann (co-advised with Johanna Vorwerk)*
  Institution: ETH Zürich
  Project: Assessing nonlinear stability of inverter-interfaced demand response.
- *Gianluca Mancini (co-advised with Verena Häberle and Eduardo Prieto)*
  Institution: ETH Zürich
  Project: Control of Dynamic Virtual Power Plants with Geographically Distributed Energy Sources.
- *Panagiotis Grontas*
  Institution: ETH Zürich
  Project: Dynamic tracking for distributed and adaptive control of dynamic virtual power plants.
- *Jules Authier (co-advised with Verena Häberle and Eduardo Prieto)*
  Institution: ETH Zürich
  Project: Control of Dynamic Virtual Power Plants with Geographically Distributed Energy Sources.

Teaching Experience

2022 Course Instructor

- *Digital Control Applications (ECE 484)*
  Undergraduate course at University of Waterloo

2021 Guest Lecturer

- *Power System Dynamics, Control, and Operation*
  Graduate course at ETH Zürich

2018 Guest Lecturer

- *Nonlinear Dynamics and Control*
  Graduate course at University of Michigan - Ann Arbor

2021 Teaching Assistant

- *Power System Dynamics, Control, and Operation*
  Graduate course at ETH Zürich

2020 Teaching Assistant

- *Control Systems 1*
  Undergraduate course at ETH Zürich

2018 Graduate Student Instructor

- *Nonlinear Dynamics and Control*
  Graduate course at University of Michigan - Ann Arbor

Conference Presentations

2019 IEEE Conference on Decision and Control, Nice, France

2019 European Control Conference, Naples, Italy

2018 Power Systems Computation Conference, Dublin, Ireland

2017 IEEE Conference on Decision and Control, Melbourne, Australia

2016 IFAC Workshop on Control of Transmission and Distribution Smart Grids, Prague, Czech Republic

2015 IEEE Conference on Decision and Control, Osaka, Japan

Invited Workshops and Seminars

2020 Workshop on Emerging Challenges in Stability, Control, and Optimization of Power Systems - Stability Assessment and Closed-Loop Control, European Control Conference, Virtual

2018 Seminar for the Next Generation of Researchers in Power Systems, Banff, Canada

2014 Grid Science Student Seminar Series, Los Alamos National Laboratory, Los Alamos, New Mexico

2013 Center for Nonlinear Studies Seminar Series, Los Alamos National Laboratory, Los Alamos, New Mexico

2012 LOASIS Group, Lawrence Berkeley National Laboratory, Berkeley, California

Professional Services and Affiliations

Member of the Institute for Electrical and Electronics Engineers (IEEE)

- *IEEE Societies: Control Systems Society, Power and Energy Society*

Member of the Society for Industrial and Applied Mathematics (SIAM)

Reviewer for:

- *IEEE Transactions on Automatic Control*
- *IEEE Transactions on Power Systems*
- *IEEE Transactions on Smart Grid*