Matthew O'Shaughnessy

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Education

Ph.D. Electrical & Computer Engineering, GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA *Expected Nov. 2021*
GT Machine Learning Center. Thesis: Causal methods for understanding complex systems.

M.S. Mathematics, GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA *2019*

B.S. Electrical Engineering, GEORGIA INSTITUTE OF TECHNOLOGY, ATLANTA, GA *2016*

Selected honors

2017–21 **National Defense Science & Engineering Graduate Fellowship**
Selective national fellowship providing four years of full support (total value >$250,000)

2021 **Selected Fellow, Science ATL Communication Fellowship**

2021 **Winner, GT International Affairs Paper Competition**
Topic: security implications of AI-enabled disinformation

2020 **Nominee, Cleaver Award for Outstanding Ph.D. Dissertation Proposal**

2019 **Selected Fellow, GT Sam Nunn Security Program**
Year-long research fellowship focused on science policy and international security

Research experience

Graduate research fellow *2016 – Present*
- Developed theory providing insight into widely-used machine learning techniques for inferring causal structure between time series.
- Created causality-inspired framework for explaining black-box machine learning systems.
- Derived novel Bayesian algorithm for exploiting low-dimensional and temporal structure in inference.
- Conducted survey research characterizing roles of cultural values, technical experience, and application context in public opinion on AI governance.
- Served as machine learning and causality expert in collaborations with neuroscience, circuit design, and policy researchers.

Undergraduate research mentor *2019 – Present*
- Provided technical and career mentoring for four undergraduate students.
- Resulted in one paper in preparation and two GT President's Undergraduate Research Awards.

Industry experience *2014 – 2016*
- Georgia Tech Research Institute Electro-Optical Systems Lab (Research co-op, 3 full-time semesters 2014 – 2016)
- Boeing Satellite Systems, DSP Algorithms Group (Intern, Summer 2015)
- MIT Lincoln Laboratory, Embedded & Open Systems Lab (Research intern, Summer 2016)

Policy experience

IEEE-USA AI Policy Committee *2020 – Present*
- Coordinated recommendations on algorithmic bias, government access to AI expertise, and promoting public understanding of AI.
- As co-chair of subcommittee on Democratic Use of AI, led 12-person team of lawyers, researchers, and engineers in developing position statement on international AI standards, AI-enabled disinformation, and democratic governance of AI.
- Advocated for priorities to congressional staff as part of IEEE congressional visit day.

AI policy working group involvement *2020 – Present*
- Member, IEEE Committee on Concentration of Power from AI systems.
- Member, Mechanism Design for Social Good (MD4SG) working group on Algorithms, Policy & Law.

Chair, GT Graduate Student Senate *2020 – 2021*
- Presided over meetings of 24-member graduate student legislature.
- Drafted resolutions in support of international students and changes to student health insurance, and built coalitions to pass.

Selected publications

Primary publications — technical

- M. O'Shaughnessy, M. Davenport, and C. Rozell, "Guarantees for causal inference in dynamical systems using the stable Takens' theorem," In preparation.
- M. O'Shaughnessy, G. Canal, M. Connor, M. Davenport, and C. Rozell, "Generative Causal Explanations of Black-Box Classifiers," *Proc. Advances in Neural Information Processing Systems (NeurIPS)*, December 2020.
- M. O'Shaughnessy, M. Davenport, and C. Rozell, "Sparse Bayesian Learning with Dynamic Filtering for Inference of Time-Varying Sparse Signals," *IEEE Transactions on Signal Processing*, December 2019.

Primary publications — AI policy

- M. O'Shaughnessy, D. Schiff, L. Varshney, M. Davenport, and C. Rozell, "What governs public opinion on AI use and governance?," In preparation, pre-analysis plan available.
- M. O'Shaughnessy, "Security implications of machine-learning enabled Disinformation," to appear in *M. Kosal, ed., Innovate for Future Threats: Disruptive Innovation Efforts and Uses of the Technology Environment by State and Non-state Actors*, 2021.

Other publications

- A. Willats, M. O'Shaughnessy, K. Johnson, and C. Rozell, "When are Open- and Closed-Loop Control Needed for Causal Inference in Neural Circuits?," in *Proc. NeuroMatch 3.0*, Online, October 2020.
- P. Brown, M. O'Shaughnessy, C. Rozell, J. Romberg, and M. Flynn, "A 17.8 MS/s Compressed Sensing Radar Accelerator Using a Spiking Neural Network," *IEEE Journal of Solid State Circuits*, September 2020.
- G. Canal, M. Connor, J. Jin, N. Nadagouda, M. O'Shaughnessy, C. Rozell, and M. Davenport, "The PICASSO Algorithm for Bayesian Localization via Paired Comparisons in a Union of Subspaces Model," in *Proc. IEEE Int. Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Barcelona, Spain, May 2020.
- P. Brown, M. O'Shaughnessy, C. Rozell, J. Romberg, and M. Flynn, "A 17.8MS/s Neural-Network Compressed Sensing Radar Processor in 16nm FinFET CMOS," in *Proc. IEEE Custom Integrated Circuits Conf. (CICC)*, Boston, MA, March 2020.
- M. O'Shaughnessy, M. Davenport, and C. Rozell, "Dynamical System Implementations of Sparse Bayesian Learning," in *Proc. IEEE Int. Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Guadeloupe, West Indies, December 2019.
- G. Canal*, M. O'Shaughnessy* (equal contribution), C. Rozell, and M. Davenport, "Joint Estimation of Trajectory and Dynamics from Paired Comparisons," in *Proc. IEEE Int. Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Guadeloupe, West Indies, December 2019.
- M. O'Shaughnessy, M. Davenport, and C. Rozell, "Robust Incorporation of Signal Predictions into the Sparse Bayesian Learning Framework," In *Proc. IEEE Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Toulouse, France, July 2019.
- M. O'Shaughnessy and M. Davenport, "Localizing Users and Items from Paired Comparisons," In *Proc. IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP)*, Vietri sul Mare, Salerno, Italy, September 2016.
- R. Ortman, D. Carr, R. James, D. Long, M. O'Shaughnessy, C. Valenta, and G. Tuell, "Real-time, Mixed-mode Computing Architecture for Waveform-resolved Lidar Systems with Total Propagated Uncertainty," in *Proc. SPIE Defense and Commercial Sensing*, Baltimore, Maryland, April 2016.

Patents

- M. O'Shaughnessy, G. Canal, M. Connor, M. Davenport, and C. Rozell, "Generative Causal Explanations of Black-Box Classifiers." International Patent Application No. PCT/US2021/038884.

Editorials and commentary

- M. O'Shaughnessy, "Will Machine Learning Supercharge Disinformation?" *The Cipher Brief*, September 2, 2020.
- M. O'Shaughnessy, "Opinion: Deporting International Students if Classes Go Online Hurts U.S. Colleges and Economy," *The Atlanta Journal-Constitution*, July 9, 2020.