Matthew R. O'Shaughnessy

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https://matthewoshaughnessy.github.io/

RESEARCH INTERESTS	Machine learning, causal inference, low-dimensional structure. Societal implications of technology, AI policy.

EDUCATION

Ph.D. Electrical & Computer Engineering August 2016 – Present
Georgia Institute of Technology, Atlanta, GA
Supported by NDSEG Fellowship, 2017 – 2021
Co-Advisors: Prof. Mark Davenport, Prof. Christopher Rozell
Thesis: "Causal methods for understanding complex systems"

M.S. Mathematics December 2019
Georgia Institute of Technology, Atlanta, GA

B.S. Electrical Engineering May 2016
Georgia Institute of Technology, Atlanta, GA
Designations: Highest Honors, Research Option, Co-op Option

PROFESSIONAL EXPERIENCE

MIT Lincoln Laboratory Summer 2016
Open and Embedded Systems Group (102)

Georgia Tech Research Institute Summer 2014, Spring 2015, Fall 2015
Electro-Optical Systems Lab *(full time, three semesters)*

Boeing Satellite Systems Summer 2015
DSP Algorithms Group

JOURNAL PUBLICATIONS

[J2] 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.

[J1] **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.

CONFERENCE PUBLICATIONS

[C9] **M. O'Shaughnessy**, G. Canal, M. Connor, M. Davenport, and C. Rozell, "Generative Causal Explanations of Black-Box Classifiers," to appear in *Proc. Advances in Neural Information Processing Systems (NeurIPS)*, Vancouver, BC, Canada, December 2020 (Acceptance rate 20.1%).

[C8] 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.

[C7] 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.

[C6] 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.

[C5] **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.

[C4] 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.

[C3] **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.

[C2] **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.

[C1] 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.

OTHER PUBLICATIONS

[O5] **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*, 2020.

[O4] **M. O'Shaughnessy**, "Localizing Embeddings for Recommendation Systems using Binary Paired Comparisons," *Undergraduate Thesis*, Georgia Institute of Technology, May 2016.

[O3] G. Tuell, D. Carr, N. Guida, **M. O'Shaughnessy**, "Strategies for Mitigating Sea Surface Effects in the Workflow of Deployed Topo-Bathy Lidar Systems," *Technical Report to NOAA*, September 2015.

[O2] G. Tuell, D. Carr, N. Guida, **M. O'Shaughnessy**, "On the Relationship between Resolution of Sea Surface DEMs and Accuracy of Refracted Angle based on Analysis of Empirical Data," *Technical Report to NOAA*, July 2015.

[O1] G. Tuell, D. Carr, N. Guida, **M. O'Shaughnessy**, "Procedures and Algorithms for Raytracing Lidar Measurements Through an Irregular Sea Surface," *Technical Report to NOAA*, May 2015.

PATENTS

[P1] **M. O'Shaughnessy**, G. Canal, M. Connor, M. Davenport, and C. Rozell, "Methods for Generating and Providing Causal Explanations of Artificial Intelligence Models and Devices Thereof." International Patent Application No. PCT/US2021/038884.

Filed June 2021.

EDITORIALS/ COMMENTARY [E2] **M. O'Shaughnessy**, "Will Machine Learning Supercharge Disinformation?" *The Cipher Brief*, September 2, 2020.

[E1] **M. O'Shaughnessy**, "Opinion: Deporting International Students if Classes Go Online Hurts U.S. Colleges and Economy," *The Atlanta Journal-Constitution*, July 9, 2020.

IN PREPARATION [I2] **M. O'Shaughnessy**, M. Davenport, and C. Rozell, "Guarantees for causal inference in coupled dynamical systems using the stable Takens' theorem," *In Preparation.*

[I1] **M. O'Shaughnessy**, D. Schiff, L. Varshney, C. Rozell, and M. Davenport, "What Governs Public Opinion on AI Use and Governance?," *Pre-Analysis Plan Available.*

TEACHING EXPERIENCE

Undergraduate Student Supervision

Alec Helbling	2020 – Present
Miguel Garcia[†*]	2019 – Present
Mark Faingold[†]	2019 – 2020
Jason Palmer[†]	2019 – 2020

[†]Opportunity Research Scholars (ORS) program
[*]Awarded Georgia Tech President's Undergraduate Research Award (PURA)

Undergraduate Teaching Assistant   August 2013 – May 2016
Recitation instructor, CS 1371 (Computing for Engineers)   (*6 semesters*)
Senior TA and Tech Team lead, 2015–2016

AWARDS
Selected Fellow, Science ATL Communication Fellowship, 2021
Nominated for Cleaver Outstanding Ph.D. Dissertation Proposal Award, 2021
Winner, Georgia Tech International Affairs Paper Competition, 2021
National Defense Science & Engineering Graduate (NDSEG) Fellowship, 2017 – 2021
Selected Fellow, Sam Nunn Security Program, 2019 – 2020
Georgia Tech President's Undergraduate Research Award, 2015
3rd Place, Opportunity Research Scholars Poster Contest, 2014
2nd Place, Opportunity Research Scholars Poster Contest, 2013
Principal Violist, Georgia Tech Symphony Orchestra, 2014
Kelley Family Music Scholarship, 2013
Georgia Tech Dean's List; Faculty Honors; Zell Miller Scholarship, 2012 – 2016
National Merit Scholarship, 2012 – 2016

REVIEWER SERVICE
IEEE Transactions on Signal Processing, 2018, 2019, 2020, 2021
IEEE Wireless Communication Letters, 2020
SIAM Journal of Applied Dynamical Systems, 2020
Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS), 2019
Georgia Tech President's Undergraduate Research Award, 2016 – 2020

SERVICE AT GA TECH
Chair, Graduate Student Senate, GT Student Government Association, 2021
Graduate Student Senator, GT Student Government Association, 2020
Committee Member, GT SGA Strategic Assessment and Navigation Cmte., 2020
Committee Member, GT Technology Fee Advisory Committee, 2020 – 2021

Organizer, Children of the Norm Group Meeting, 2019 – Present
Mentor, School of ECE Graduate Student Organization, 2019
Website Developer, GT Center for Signal & Information Processing, 2018
Member, Center for Signal & Information Processing Student Activities Committee
ECE Section Editor, The Tower Undergraduate Research Journal, 2015 – 2016

OTHER ACTIVITY **Voting Member**, IEEE-USA AI Policy Committee, 2020 – Present
Co-chair, IEEE-USA AI Policy Subcmte. on Anti-Democratic Practices, 2021 – Present
Member, MD4SG Working Group on Algorithms, Policy, and Law, 2021 – Present
Member, IEEE Cmte. on Concentration of Power from AI Systems, 2021 – Present
Participant, IEEE-USA Congressional Visit Day, 2021
Guest Lecturer, *Machine learning in 90 minutes*, Georgia Tech MBA Class, 2020
Fellow, Sam Nunn Security Program (GT School of International Affairs), 2019 – 2020