Adam J. Eisen

eisenaj@mit.edu ◇ adamjeisen.github.io ◇ LinkedIn

Professional Summary

Machine learning researcher, data scientist, and MIT PhD in Computational Neuroscience. Leveraging mathematical rigour to understand complex biological data. Eager to build impactful solutions to challenging problems in neuroscience, psychiatry and biotech.

Education

Massachusetts Institute of Technology, Cambridge, MA — Sep 2020 - Present
PhD in Computational Neuroscience
Research Focus: Neural dynamics and consciousness
GPA: 5.0/5.0
Advisors: Prof. Earl K. Miller & Ila R. Fiete

Queen's University, Kingston, ON, Canada — Sep 2014 - Apr 2018
Bachelor of Applied Science in Mathematics & Engineering, Computing and Communications Option
GPA: 4.12/4.3
Dean's Scholar Designation: 2015, 2016, 2017, 2018

Publications

Eisen, A.J., Bardon, A.G., Ballesteros, J.J., Bastos, A.M., Donoghue, J.A., Mahnke, M.K., Brincat, S.L., Roy, J.E., Ishizawa, Y., Brown, E.N., Fiete, I.R., and Miller, E.K. "Similar destabilization of neural dynamics under different general anesthetics" *bioRxiv* (2025). [Link] (In Review)

Eisen, A.J., Ostrow, M., Chandra, S., Kozachkov, L., Miller, E.K., and Fiete, I.R. "Characterizing control between interacting subsystems with deep Jacobian estimation" *arXiv* (2025). [Link] (In Review)

Eisen, A.J.*, Kozachkov, L.*, Bastos, A.M., Donoghue, J.A., Mahnke, M.K., Brincat, S.L., Chandra, S., Tauber, J., Brown, E.N., Fiete, I.R., and Miller, E.K. "Propofol anesthesia destabilizes neural dynamics across cortex" ***Neuron*** (2024). [Link]

Ostrow, M., **Eisen, A.J.**, and Fiete, I.R. "Delay Embedding Theory of Neural Sequence Models" ***ICML Workshop on Next Generation Sequence Models*** (2024). [Link]

Ostrow, M., **Eisen, A.J.**, Kozachkov, L., and Fiete, I.R. "Beyond Geometry: Comparing the Temporal Structure of Computation in Neural Circuits with Dynamical Similarity Analysis" ***Neural Information Processing Systems*** (2023). [Link]

Das, S., **Eisen, A.J.**, Lin, Y.H., Chan, H.S. "A lattice model of charge-pattern-dependent polyampholyte phase separation" *The Journal of Physical Chemistry B* (2018). [Link]

Experience

Massachusetts Institute of Technology, Dept. of Brain and Cognitive Sciences — Apr 2021 - Present
Graduate Researcher | Advisors: Prof. Earl K. Miller & Ila R. Fiete — *Cambridge, MA*

- Designed and implemented a machine learning framework for learning the Jacobians of arbitrary dynamical systems and applied it to data-driven optimal control of high-dimensional nonlinear systems, achieving nearly double the accuracy of baseline methods
- Leveraged advanced dynamical systems theory to characterize depth of unconsciousness via neural dynamic stability; demonstrated that propofol, ketamine, and dexmedetomidine destabilize the brain
- Developed an innovative mathematical framework for quantifying dynamical similarity between systems, revealing fundamental differences underlying machine learning algorithms

Heliolytics — Sep 2018 - Aug 2020
Developer — *Toronto, ON, Canada*

- Engineered and optimized machine learning and computer-vision algorithms for pixel-level aerial image matching, achieving a 25% accuracy improvement to 99.9% success rate

· Architected and deployed a distributed computing network to process high-volume image data, enabling scalable automated processing of aerial imagery

Queen's University, Dept. of Mathematics & Engineering Sep 2017 - Apr 2018
Senior Thesis Student | Advisor: Prof. Abdol-Reza Mansouri *Kingston, ON, Canada*

· Thesis: "Image restoration algorithms for musical style transfer"; applied computer vision algorithms to music transformation, adapting stochastic image models and Markov chain Monte Carlo methods to achieve cross-domain style transfer between audio samples

The Hospital for Sick Children, Dept. of Genetics & Genome Biology May 2017 - Aug 2017
Machine Learning Researcher | Advisor: Prof. Lisa Strug *Toronto, ON, Canada*

· Developed and evaluated multiple machine learning approaches to predict patient comorbidity risk from genetic markers in cystic fibrosis, enabling data-driven clinical risk assessment

University of Toronto, Dept. of Biochemistry May 2016 - Aug 2016
Research Assistant | Advisors: Prof. Hue Sun Chan & Lewis Kay *Toronto, ON, Canada*

· Developed and optimized high-performance C++ simulations using Monte Carlo methods to model charged polymer interactions and phase separation, validating theoretical predictions of polymer conformational properties

Selected Honors & Awards

Singleton Ph.D. Fellowship, MIT 2020,2021

Annie Bentley Lillie Prize in Mathematics, Queen's University 2018
- awarded to the graduating Mathematics & Engineering student with the **highest average in mathematics courses**

Nellie and Ralph Jeffrey Award in Mathematics, Queen's University 2017
- awarded to the student in Mathematics & Engineering having the **highest standing in the mathematics courses of the first three years** and an overall first-class average

H. Janzen Memorial Scholarship, Queen's University 2015
- awarded to the student with the **highest standing in the first-year physics courses** in Applied Science

R. L. Dorrance Memorial Scholarship, Queen's University 2015
- awarded to the student with the **highest standing in the first-year chemistry courses** in Applied Science

Selected Talks

The MIND (Mediano) Lab, Imperial College London, UK Oct 2024
Invited talk: "Propofol anesthesia destabilizes neural dynamics across cortex"

The Science of Consciousness Conference, Taormina, Italy May 2023
Oral presentation: "Propofol anesthesia destabilizes neural dynamics across cortex"

Selected Teaching Experience

Instructor: MIT 6.S094 Computational Psychology and Psychiatry Jan 2025
- Lecturer for special course on computational methods in psychiatry, lecture titled "How math can help you understand yourself", designed introductory lectures on computational modelling in psychiatry

Teaching Assistant: MIT 9.07, Statistics for Brain and Cognitive Sciences Sep 2021 - Dec 2021
- Led recitations, office hours, and filled in as primary lecturer when the instructor was unavailable
- Awarded an overall rating of 6.5/7 in student feedback surveys, the highest of all instructors for the course in 2021; student feedback praised going "above and beyond" with high energy and approachable teaching style

Technical Strengths

Tools Python, PyTorch, PyTorch Lightning, Hydra, Git, Slurm, LaTeX
Selected coursework & topics Nonlinear Dynamics & Control, Computational Neuroscience, Computational Psychiatry, Stochastic Processes, Information Theory

Additional Information

Musical composition and performance
- Co-writer, musician and performer with Erez Zobary (Jul 2019 - Present); released an EP under moniker Kodachrome (Nov 2016)

Athletic interests: running, yoga, hiking, cycling, resistance training; completed half marathon (Nov 2024)