

# Adam J. Eisen

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## PROFILE FOR AI SCIENTIST AT NOVARTIS

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Machine learning researcher, data scientist, and MIT PhD in Computational Neuroscience. Combining deep learning and mathematical rigour to model and interpret complex biological data. Eager to collaboratively build impactful solutions to challenging problems in neuroscience, psychiatry and biotech.

## EDUCATION

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**Massachusetts Institute of Technology**, Cambridge, MA Sep 2020 - Present  
PhD in Computational Neuroscience (GPA: 5.0/5.0)

**Queen's University**, Kingston, ON, Canada Sep 2014 - Apr 2018  
Bachelor of Applied Science in Applied Mathematics & Computer Engineering  
GPA: 4.12/4.3, Dean's Scholar: 2015, 2016, 2017, 2018

## PUBLICATIONS

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**Eisen, A.J.**, ..., Miller, E.K., and Fiete, I.R. "Characterizing control between interacting subsystems with deep Jacobian estimation" *NeurIPS* (2025) (Spotlight) [\[Link\]](#)

**Eisen, A.J.**, ..., Brown, E.N., Fiete, I.R., and Miller, E.K. "Similar destabilization of neural dynamics under different general anesthetics" *bioRxiv* (2025). [\[Link\]](#) (Under Revision)

**Eisen, A.J.\***, Kozachkov, L.\* ..., 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" *NeurIPS* (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). [\[Link\]](#)

## RESEARCH, DATA SCIENCE, & ML EXPERIENCE

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

### Deep Learning of Nonlinear Control Interactions in Complex Systems | Spotlight at NeurIPS (2025)

- Designed and engineered JacobianODE, a modular deep learning framework in PyTorch to estimate Jacobians of unknown nonlinear dynamical systems directly from time-series data
- Achieved improved Jacobian estimation performance over NeuralODEs on noisy, high-dimensional chaotic systems
- Applied JacobianODE models for data-driven optimal control (ILQR) of multi-area recurrent neural networks, enabling precise and interpretable manipulation of system dynamics
- Scaled parallelized training and hyperparameter optimization with distributed computing (GPU clusters)

### Dynamic Stability as a Biomarker of Consciousness in Neural Dynamics | Neuron (2024)

- Developed DeLASE, a scalable signal-processing pipeline grounded in dynamical systems theory to quantify dynamic stability in partially observed neural activity (LFPs)
- Validated DeLASE on large-scale intracortical datasets, proving its ability to robustly detect convergent patterns of neural destabilization across diverse anesthetics
- Advanced dynamic stability as a general, real-time biomarker for tracking complex neural states, with direct applications in neural decoding and brain-computer interfaces

### Mechanistic Interpretability of Neural and Artificial Systems

- Co-developed Dynamical Similarity Analysis (DSA) to identify when systems share dynamic computations beyond geometric similarity (NeurIPS, 2023)

- Analyzed Transformers and State-Space Models through delay embedding theory, revealing how architectural inductive biases shape performance on time-series prediction tasks (ICML Workshop on Next Generation Sequence Models, 2024)

## Heliolytics

Developer

Sep 2018 - Aug 2020

Toronto, ON, Canada

- Engineered and optimized machine learning and computer vision algorithms for pixel-level aerial image matching, improving accuracy by 25% to reach 99.9% success rate
- Designed and deployed a distributed computing pipeline to process large-scale aerial imagery datasets

## 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 deep learning models to predict patient comorbidity risk from large-scale genomic data in cystic fibrosis, achieving near-clinical-grade performance for potential use in precision medicine

## 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 modeling 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 · Weights & Biases · Hydra · Slurm · L<sup>A</sup>T<sub>E</sub>X

### Skills

Deep Learning · Machine Learning · Neural Data Science · Biological Data Analysis · Dynamical Systems  
Computational Modeling · Signal Processing · Distributed Computing · Parallel Computing

## ADDITIONAL INFORMATION

### Musical composition and performance

- Songwriter & musician with [Erez Zobary](#) (Jul 2019 - Present); released [EP](#) under moniker Kodachrome (Nov 2016)

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