# Adam J. Eisen

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**CURRENT AFFILIATION**

*Doctoral Candidate*                                       Sep 2020 – Present
Department of Brain and Cognitive Sciences
MIT, Cambridge, MA
Advisors: Earl K. Miller & Ila R. Fiete

**EDUCATION**

*Bachelor of Applied Science in Engineering*            Sep 2014 – Apr 2018
Mathematics and Engineering, Computing and Communications Option
Queen's University, Kingston, ON, Canada
Advisor: Abdol-Reza Mansouri
- ○ GPA: 4.12/4.3
- ○ Dean's Scholar Designation: 2015, 2016, 2017, 2018

**PAPERS**
**(\*co-first author)**

**Eisen, A.J.\***, Kozachkov, L.\*, Bastos, A.M., Donoghue, J.A., Mahnke, M.K., Brincat, S.L., Chandra, S., Brown, E.N., Fiete, I.R., and Miller, E.K. "Propofol anesthesia destabilizes neural dynamics across cortex"
*bioRxiv* (2023). [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]

**RESEARCH & WORK EXPERIENCE**

*MIT, Department of Brain and Cognitive Sciences*        Sep 2020 – Present
Cambridge, MA
Graduate Student
Research Advisors: Prof. Earl K. Miller & Ila R. Fiete
- ○ Developed a novel approach to analyzing the stabiltiy of neural dynamics, leveraging tools from dynamical systems theory
- ○ Demonstrated that propofol anesthesia destabilizes neural dynamics through comprehensive large-scale data processing, analysis, and visualization
- ○ Constructed a novel metric for comparing the dynamics between systems, and applied it to disentangle machine learning rules

*Heliolytics*                                            Sep 2018 – Aug 2020
Toronto, ON, Canada
Research and Development
- ○ Developed and integrated machine learning and computer-vision algorithms for pixel-level aerial image matching, improving accuracy from about 75% to 99.9%
- ○ Designed and constructed a distributed network of computing and monitoring systems to implement high volume image processing and analysis pipelines
- ○ Constructed a framework using quantitative metrics and statistics to assess algorithm performance and improvement

*Queen's University, Department of
Mathematics and Engineering*                              Sep 2017 – Apr 2018
Kingston, ON, Canada
Senior Thesis Student
Research Advisor: Prof. Abdol-Reza Mansouri
  o Thesis: "Image restoration algorithms for musical style transfer"
  o Applied machine learning and computer vision to learn a musical style, and
    adapted a stochastic image model and Markov chain Monte Carlo methods to
    transform audio samples into the learned style

*The Hospital for Sick Children, Department of
Genetics & Genome Biology*                                May 2017 – Aug 2017
Toronto, ON, Canada
Machine Learning Researcher
Research Advisor: Prof. Lisa Strug
  o Built and tested deep learning models for predicting the likelihood of comor-
    bidities in patients with cystic fibrosis based on genetic data
  o Analyzed and compared the predictive power of additional models including
    random forests and penalized regressions

*University of Toronto, Department of Biochemistry*        May 2016 – Aug 2016
Toronto, ON, Canada
Research Assistant
Research Advisor: Prof. Hue Sun Chan and Lewis Kay
  o Optimized and expanded a C++ model to carry out Monte Carlo simulations
    of interactions among charged polymers leading to polymer phase separation
  o Validated an analytic theory regarding polymer radius of gyration

TALKS          May 24, 2023: **The Science of Consciousness Conference**, Taormina, Italy
                 o *Title*: "Propofol anesthesia destabilizes neural dynamics across cortex"

               January 26, 2022: **The MetaConscious (Yang) Lab**, MIT, Cambridge, MA
                 o *Title*: "Propofol anesthesia destabilizes neural dynamics across cortex"

WRITING        **Eisen, A.J.** "Mapping the Mountains and Valleys of the Mind"
               *MIND OCEAN SPACE* (2024). [Link]

HONORS &       Singleton Fellowship                                          2020,2021
AWARDS
               Annie Bentley Lillie Prize in Mathematics                          2018
                 o awarded to the graduating student in Mathematics and Engineering who has
                   the highest average on courses in mathematics in the final year

               Keyser Prize                                                       2018
                 o awarded to the two best Mathematics and Engineering theses

               Dean's List                                             2015,2016,2017,2018

               Nellie and Ralph Jeffrey Award in Mathematics                     2017
                 o awarded to the student entering the fourth year of the Mathematics and Engi-
                   neering program, or of an honours program with a Mathematics major, having
                   the highest standing in the mathematics courses of the first three years and an
                   overall first-class average

Nellie and Ralph Jeffrey Award in Mathematics                                    2016

Susan Near Scholarship                                                          2016
  ◦ for standing on year's work

H. Janzen Memorial Scholarship                                                  2015
  ◦ awarded annually to the student who attained the highest standing in the first-
    year physics courses in Applied Science

R. L. Dorrance Memorial Scholarship                                            2015
  ◦ given by the Engineering Society for highest standing in the first-year chemistry
    courses in Applied Science

Annie Bentley Lillie Prize in First Year Calculus                             2015

Carl Reinhardt Entrance Scholarship in Physics                           2014,2015

Principal's Entrance Scholarship                                          2014,2015
  ◦ for obtaining grade 12 average of 98%

Valedictorian of the high school graduating class                            2014
  ◦ selected by peers and faculty

CONFERENCES    Ostrow, M., **Eisen, A.J.**, et al. "Beyond Geometry: Comparing the Temporal Struc-
ture of Neural Computation with Dynamical Similarity Analysis" (Oral Presentation)
Computational and Systems Neuroscience, 2024, Lisbon, Portugal

Ostrow, M., **Eisen, A.J.**, et al. "Beyond Geometry: Comparing the Temporal
Structure of Computation in Neural Circuits with Dynamical Similarity Analysis "
Neural Information Processing Systems, 2023, New Orleans, LA

Ostrow, M., **Eisen, A.J.**, et al. ""Beyond Geometry: Comparing the Temporal
Structure of Computation in Neural Circuits with Dynamic Mode Representational
Similarity Analysis" (Oral Presentation)
Computational Cognitive Neuroscience, 2023, Oxford, United Kingdom

**Eisen, A.J.**, et al. "Propofol anesthesia destabilizes neural dynamics across cortex"
(Oral Presentation)
The Science of Consciousness Conference, 2023, Taormina, Italy

**Eisen, A.J.**, et al. "Propofol anesthesia destabilizes neural dynamics across cortex"
Computational and Systems Neuroscience, 2023, Montreal, QC, Canada

**Eisen, A.J.**, et al. "Propofol anesthesia destabilizes neural dynamics across cortex"
Society for Neuroscience 2022, San Diego, CA

**Eisen, A.J.**, et al. "Propofol anesthesia changes dynamic stability in cortex" (Vir-
tual)
Society for Neuroscience 2021, Chicago, IL

TEACHING &      *Mentor*                                     Septmber 2023 – December 2023
MENTORING       *Mentee:* Nicole Wong, Undergraduate Researcher at MIT
EXPERIENCE        ◦ Provided instruction on dynamical systems theory concepts and practice

*Teaching Assistant*                                          Jan 2023 – Apr 2023
MIT 9.40
Introduction to Neural Computation
- ○ Led recitations, conducted review sessions, and held office hours
- ○ Awarded an overall rating of 6.4/7 in student feedback surveys, the highest of all instructors for the course in 2023

*Teaching Assistant*                                          Sep 2021 – Dec 2021
MIT 9.07
Statistics for Brain and Cognitive Sciences
- ○ Led recitations, conducted review sessions and 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 said "He went above and beyond for the people in the class which I really appreciated. He was always full of energy and answered questions with a smile."

*Tutor & Workshop Leader*                                     Sep 2016 – Apr 2018
EngLinks Tutoring at Queen's University
- ○ Prepared materials and conducted in-depth exam workshops for courses such as Differential Equations, Real Analysis and Electricity and Magnetism
- ○ Led workshops of 60-100 students

*Private Tutor*                                               May 2015 – Jul 2015
Self-employed, Toronto, ON, Canada
- ○ - Delivered tutoring services in math, science and jazz history to 10 high school and university-level students, with successful academic outcomes

**TECHNICAL SKILLS**

**Languages**: Python, MATLAB, R

**Packages**: PyTorch, PyTorch Lightning, scikit-learn, SciPy, LaTeX

**Developer Tools**: Git, Slurm

**Mathematics (Selected Topics)**: Dynamical Systems Theory, Linear Algebra, Calculus, Probability Theory, Information Theory, Operator 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)
- ○ Vocal and piano performer and teacher (Sep 2010 – Apr 2018)

*Athletics*: yoga, hiking, running, cycling, resistance training
- ○ Completed sprint triathlon (Aug 2018)