

# Mitchell Ostrow

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## EDUCATION

**Massachusetts Institute of Technology**, Cambridge, MA August 2022-Present  
Ph.D. in Computational Neuroscience and Machine Learning  
**Yale University, New Haven, CT**  
B.S. in Neuroscience, B.S. in Statistics and Data Science August 2017 - December 2021  
GPA: 3.95/4.00, *Magna Cum Laude*, *Distinction in both majors*  
Statistics and Data Science Thesis: *Neural Mechanisms of Theory of Mind in Deep Reinforcement Learning*  
Neuroscience Thesis: *Oscillations in Prefrontal Cortex Block Uncertain Evidence in Perceptual Decision-Making*

## AWARDS

*UCL Analytical Connectionism Travel Grant (\$1200)* 2023  
*SFI Complexity-GAIN Travel Grant (\$3000)* 2023  
*CCN Conference Contributed Talk (24/530 Abstracts Chosen)* 2023  
*Praecis Presidential Fellowship* (Ph.D. Funding for 1 year) 2022  
*Computationally-Enabled Integrative Neuroscience Fellowship* (Ph.D. Fellowship) 2022  
*Mellon Fellowship* (\$500 awarded for senior thesis research) 2021  
*Yale Nominee for the Marshall and Mitchell Scholarships* 2021  
*2<sup>nd</sup> Place Poster, Yale Undergraduate Research Symposium* 2019  
*Kavli Neuroscience Fellowship* (\$5000 grant for summer undergraduate neuroscience research) 2019  
*Richter Fellowship* (\$1500 awarded for summer undergraduate research) 2019

## PUBLICATIONS

**Ostrow, M.B.**, Eisen, A.J., Kozachkov, L., Fiete, I.R. (2023). *Beyond Geometry: Comparing the Temporal Structure of Computation in Neural Circuits with Dynamic Similarity Analysis*. *Neural Information Processing Systems*, In Submission. <https://arxiv.org/abs/2306.10168>  
**Ostrow, M.B.**, Yang, G.R., Seo, H. (2022). *Representational Geometry of Social Inference and Generalization in a Competitive Game*. *Robotics Science and Systems Conference, Workshop on Social Intelligence and Human Robotics*. [https://social-intelligence-human-ai.github.io/docs/camready\\_8.pdf](https://social-intelligence-human-ai.github.io/docs/camready_8.pdf)  
**Ostrow, M.B.** (2021). *Examining the Viability of Computational Psychiatry: Approaches into the Future*. *Yale Undergraduate Research Journal*, Spring 2021. <https://elischolar.library.yale.edu/cgi/viewcontent.cgi?article=1079&context=yurj>

## POSTERS

**Ostrow, M.B.**, Eisen, A.J., Kozachkov, L., Fiete, I.R. (2023). *Beyond Geometry: Comparing the Temporal Structure of Computation in Neural Circuits with Dynamic Mode Representational Similarity Analysis*. *Conference on Computational Cognitive Neuroscience*. Top 5% in both Clarity and Impact Ratings, selected as a talk (24/530).  
Sung, H., **Ostrow, M.B.** *Predictive Models are not Enough for Explanation-Seeking Curiosity: A Case Study*. *Curiosity, Creativity and Complexity Conference 2023*.  
**Ostrow, M.B.\***, Chen, T.\*, Zhang, C.\*, Sung, H.K.\* *Do Deep Neural Networks Have Concepts?* *Philosophy of Deep Learning Conference, 2023*. (Selected as a talk).  
Naim, M., Gibson, D., Papageorgiou, D., Xie, Y., **Ostrow, M.**, Graybiel, A., and Yang, G.R. *Network Dimensions Alter Reversal Learning Strategies*. *COSYNE 2023*.  
**Ostrow, M.B.**, Yang, G.R., Seo, H. (2022). *Neural Representations of Opponent Strategy Support the Adaptive Behavior of Recurrent Actor-Critics in a Competitive Game*. *COSYNE 2022 Conference*.  
**Ostrow, M.B.**, Yang, G.R., Seo, H. (2021). *A Deep Neural Network Model Adapts Flexibly to Different Opponent Strategies in a Competitive Game*. *Society for Neuroscience Conference Proceedings*.  
**Ostrow, M.B.**, Emmons, E., Pittenger, C. (2019). *Exploring Mouse Models for Tic Pathophysiology with Relevance to Tourette Syndrome*. *Yale Undergraduate Research Symposium, September 2019*.

## TALKS

*Beyond Geometry: Comparing the Temporal Structure of Computation in Neural Circuits with Dynamical Similarity Analysis*,  
Contributed Talk, *Conference on Computational Cognitive Neuroscience*, August 2023.  
*Investigating the Interplay of Anatomical, Biophysical, and Functional Modularity in Task-Optimized RNNs*,  
*International Brain Laboratory*, February 2023, June 2023

*How Neuroscience and AI Drive Each Other Forwards*,  
 Instructor Spotlight, Inspirit AI Summer School, 2022

*Representational Geometry of Social Inference and Generalization in a Competitive Game*,  
 Spotlight Talk, Robotics Science and Systems Workshop on Social Intelligence and Human Robotics, June 2022  
 Yale Department of Neuroscience Research in Progress Talk, April 2022

*Deep Meta-Learning in a Generalized Context Produces Semantic Neural Representations*,  
 Yale Neuroscience Undergraduate Research Organization (YNEURO), February 2021

*Low-D Sensory Processing Neural Activity Best Explains Mouse Behavior in a Visual Discrimination Task*,  
 Neuromatch Academy Virtual Conference, July 2020

## RESEARCH EXPERIENCE

**Massachusetts Institute of Technology**, Cambridge, MA Jan 2022-  
*Graduate Researcher, Fiete Lab*

- Designing novel methods from dynamical systems theory to empirically assess artificial neural networks' similarity to themselves and neural data.
- Investigating the role that modularity in neural networks plays in meta-learning, and devising new methods for modularity to emerge through learning.

**Massachusetts Institute of Technology**, Cambridge, MA Sep 2022-Nov 2022  
*Graduate Researcher, Jazayeri Lab*

- PI: **Dr. Merhdad Jazayeri**
- Performed high dimensional neural data analysis to identify the neural mechanisms of mental simulation.
  - Designed RNNs and Neural ODES with geometric priors to learn multidimensional continuous attractors.

**Yale Department of Neuroscience**, New Haven, CT Jan 2022-June 2022  
*Postgraduate Research Associate*

**Yale Department of Neuroscience**, New Haven, CT Aug 2019-Dec 2021  
*Undergraduate Researcher*

- PI: **Dr. Hyojung Seo**, additionally advised by **Dr. Guangyu Robert Yang** and **Dr. Daniel Ehrlich**.
- Independently developed deep reinforcement learning and deep learning algorithms as a model for macaque prefrontal cortex in two independent research projects (Python, Tensorflow).
  - Implemented unsupervised dimensionality reduction methods on population recordings and simulated data.
  - Identified latent dynamics and representations in the neural populations that support decision-making.

**Lockheed Martin**, *Brain-Inspired AI Research Engineer Intern*, Shelton, CT June 2021-December 2021

- Developed a novel hierarchical deep reinforcement learning algorithm that unified variational autoencoders, Transformer self-attention, and motor primitives via Modern Hopfield Networks, reducing error rate by half.
- Designed a generative algorithm that learns motor primitives to navigate a gridworld in an explainable manner.

**Yale Department of Psychiatry**, *Undergraduate Research Fellow*, New Haven, CT Jan 2019-Aug 2019  
 PI: **Dr. Chris Pittenger**

- Completed an independent research project analyzing the effects of striatal histamine depletion on rodent repetitive behavior stereotypy, resulting in a paper and presentation.

## TEACHING AND SCIENCE OUTREACH

**MIT Graduate Member**, Resources for Easing Friction and Stress (REFS) 2023  
 -Provides low-barrier services to graduate peers through coaching, listening, escalation, and informal mentoring and mediation

**Research Mentor**, Lumiere Education 2023  
 -Mentors 2 high school students on computational neuroscience research, each completing an independent research project

**Conference Peer Reviewer**  
 -NeurIPS Workshop on Symmetry & Geometry in Neural Representations 2022  
 -Cognitive Computational Neuroscience Conference (CCN) 2023

**Mentor**, MIT BCS Application Assistant Program Fall 2022  
 -Individually mentored eight students on their application to PhD programs.

**Summer School Tutor**, Inspirit AI Summer School Summer 2022, 2023  
 -Taught introductory machine learning and supervised capstone research projects,

**Volunteer**, Neuromatch Academy April-May 2022  
 -Peer-reviewed over 100 applications to NMA Computational Neuroscience and Deep Learning summer schools.

**Co-Founder and Co-Organizer**, Applied Philosophy in Neuroscience Journal Club June 2021-Dec 2021  
 -Created and organized a weekly reading group to study philosophy of neuroscience.

**Student Advisory Committee**, Yale Department of Neuroscience Sept 2021-Dec 2021

<b>Linear Models Teaching Assistant</b> , Yale Department of Statistics and Data Science	Aug 2020-Dec 2020
<b>Computer Science Tutor</b> , The Coding School	April 2020-Nov 2020
-Individually tutored two middle school and high school students in introductory and intermediate Python.	
<b>Volunteer Teacher</b> , Yale Brain Bee	March 2021
<b>Mentorship and Research Chair</b> , Yale Neuroscience Undergraduate Research Organization	Aug 2020-May 2021
<b>NSF GRFP Peer Editor</b> , Yale University Graduate Writing Lab	June 2020-July 2020
<b>Emergency Medical Technician</b> , Seymour EMS, Seymour, CT	Sept 2019-Dec 2019

#### **SKILLS AND INTERESTS**

Programming: Python, MATLAB, Julia, Bash

Tools: Adobe Illustrator, Git, LaTeX, Docker, Pandas, NumPy, PyTorch, TensorFlow, Scikit-Learn, Matplotlib, Scipy

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