

# Mikail Khona

## Personal Info

email: mikail@mit.edu

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Address: 76A Pleasant Street, Cambridge, MA 02139

## Education

2018 - 2024 **Massachusetts Institute of Technology, MA**

(expected) *PhD candidate in Physics*

Advisor: Ila Fiete, Mehran Kardar

Graduate research in theoretical and computational systems neuroscience.

Summer 2021 **Methods in Computational Neuroscience (MCN) Summer School, MA**

2014 - 2018 **Indian Institute of Technology (IIT), Bombay, India**

*Bachelor of Technology in Engineering*

Major: Engineering Physics (honour)

minor: Mathematics

High School **The Bombay Scottish School, Mahim, India**

## Publications

- [Khona, Mikail, Fiete, Ila.](#) **Attractor and Integrator Networks in Neuroscience.** Nature Reviews Neuroscience (in press). [\[link\]](#)
- Schaeffer, Rylan, [Khona, Mikail](#), Meshulam, Leenoy, Fiete, Ila. **No Free Lunch from Deep Learning in Neuroscience: A Case Study through Models of the Entorhinal-Hippocampal Circuit.** NeurIPS. 2022. [\[link\]](#)
- Schaeffer, Rylan, [Khona, Mikail](#), Fiete, Ila. **Reverse-engineering recurrent neural network solutions to a hierarchical inference task for mice.** NeurIPS. 2020. [\[link\]](#)
- [Khona, Mikail\\*](#), Chandra, Sarthak\*, Fiete, Ila. **Spontaneous emergence of topologically robust grid cell modules: A multiscale instability theory.** Submitted. [\[link\]](#)
- [Khona, Mikail\\*](#), Chandra, Sarthak\*, Ma, Joy, Fiete, Ila. **Winning the lottery with neurobiology: faster learning on many cognitive tasks with fixed sparse RNNs.** Submitted. [\[link\]](#)
- G. Madirolas, A. Al-Asmar, L. Gaouar, L. Marie-Louise, A. Garza-Enriquez, [M. Khona](#), C. Ratzke, J. Gore, A. Pérez-Escudero. **A taste for numbers: *Caenorhabditis elegans*. foraging follows a low-dimensional rule of thumb.** Submitted. [\[link\]](#)
- Schaeffer, Rylan\*, Bordelon Blake\*, [Khona, Mikail\\*](#), Pan, Weiwei, Fiete, Ila. **Efficient Online Inference for Nonparametric Latent Variable Time Series.** UAI. 2021. [\[link\]](#)

## Awards / Achievements

2022 - 2023 K. Lisa Yang ICoN Graduate Student Fellow (\$100k)

2021 - 2022 MathWorks Science Fellowship (one of 20 across the School of Science at MIT) (\$100k)

2018 - 2019 Seigel Fellowship, Department of Physics (\$100k)

2016 - 2018 Institute Academic Award for the highest GPA among undergraduates in the Physics department at IIT Bombay (9.95/10)

2016 - 2017 DAAD-WISE scholarship for an undergraduate project in Germany in 2017 [declined].

2014 An All India Rank of 562/1.4M (Percentile 99.96) in the **IIT - JEE** 2014.

## Conference Abstracts / Posters

- Khona, Mikail, Chandra, Sarthak, Konkle, Talia and Fiete, Ila. **Modelling the formation of the human visual cortical hierarchy with bottom-up growth**. Cosyne Abstracts 2022.
- **Khona, Mikail**, Chandra, Sarthak, Acosta, Francisco, Fiete, Ila **The emergence of discrete grid cell modules from smooth gradients in the brain**. Cosyne Abstracts 2021.
- Khona, Mikail, Xu, Qianli and Fiete, Ila. **A model of oscillatory gating of information flow between neural circuits as a function of local recurrence**. Cosyne Abstracts 2020.
- Schaeffer, Rylan, Khona, Mikail, Fiete, Ila. **No Free Lunch from Deep Learning in Neuroscience: A Case Study through Models of the Entorhinal-Hippocampal Circuit**, ICML AI4Science Workshop. 2022.

## Invited Talks

September 2022 brAln seminar: Carnegie Mellon University

August 2022 Harvard Vision lab

## Academic Services

2022 Reviewer for NeurReps: Symmetry and Geometry in Neural Representations, Workshop, NeurIPS 2022.

## Teaching and Mentoring

Fall 2019 8.01L: Physics I

Spring 2021 8.592: Introduction to Biological Physics

Fall 2021 Physics Mentorship program, Physics Department, MIT

## Technical Skills

- Deep learning with Python: Pytorch
- Scientific computing with Python (NumPy, SciPy) and MATLAB.
- Scientific illustration with Adobe Illustrator.