

Leo Kozachkov

Pronounced ‘Cause-Itch-Cove’
leokoz8@gmail.com, mit.edu

CURRENT AFFILIATION *Postdoctoral Fellow* Dec 2022 – Present
K. Lisa Yang Integrative Computational Neuroscience (ICoN) Center
MIT, Cambridge, MA
Advisor: Ila Fiete

EDUCATION *Doctor of Philosophy, Brain and Cognitive Sciences* Sept 2017 – Nov 2022
MIT, Cambridge, MA
Advisors: Earl K. Miller & Jean-Jacques Slotine

Bachelor of Science, Physics Sept 2012 – May 2016
Rutgers University, New Brunswick, NJ
◦ Minor in Mathematics

PAPERS **Kozachkov, L.***, Tauber, J*, Brincat, S ., Slotine, J-J ., Miller, E.K (2022) “Robust and Brain-Like Working Memory through Short-Term Synaptic Plasticity” *PLoS Computational Biology* [\[Link\]](#)

Kozachkov, L.*, Slotine, J-J. (2022) “A Note on Matrix Measure Flows, With Applications to the Contraction Analysis of Plastic Neural Networks”, *arXiv*, 2022 [\[Link\]](#)

Kozachkov, L.*, Kastanenko, K.V, Krotov, D. (2022) “Building Transformers from Neurons and Astrocytes”, *bioRxiv*, 2022 [\[Link\]](#)

Kozachkov, L.*, Ennis, M*, Slotine, J-J. (2022) “RNNs of RNNs: Recursive Construction of Stable Assemblies of Recurrent Neural Networks”, *Neural Information Processing Systems*, 2022 [\[Link\]](#)

Kozachkov, L.*, Wensing, P, Slotine, J-J. (2022) “Generalization in Supervised Learning Through Riemannian Contraction” *arXiv* [\[Link\]](#)

Kozachkov, L.*, Lundqvist, M*, Slotine, J-J. & Miller, E.K. (2020) “Achieving stable dynamics in neural circuits” *PLoS Computational Biology* [\[Link\]](#)

Kozachkov, L., Michmizos, K. (2020) “Sequence learning in Associative Neuronal-Astrocytic Networks” *13th International Conference on Brain Informatics* [\[Link\]](#)

Kozachkov, L., Michmizos, K. (2017) “The causal role of astrocytes in slow-wave rhythmogenesis: A computational modelling study” *arXiv* [\[Link\]](#)

INVITED TALKS October 26 2022: NeuroAI Lab, Stanford University, CA

October 20 2022: Francesco Bullo Group, University of Santa Barbara, CA

September 01 2022: Center for Computational Neuroscience, Flatiron Institute, New

York

HONORS & AWARDS

NeurIPS Scholar Award	2022
Singleton Fellowship	2021-2022
Best Paper Award, 1st Runner Up, 13th International Conference on Brain Informatics	2020
Paul Robeson Scholar, School of Arts and Sciences	2016
Dean's List	2013 – 2014 – 2015 – 2016
Bronze Medal, University Physics Competition	2014
Research Assistant Award, Aresty Research Center ◦ 29% acceptance rate.	2013 – 2014
Writers Foundation Award ◦ For “excellence in creative writing.”	2012

CONFERENCES

Kozachkov, L., et al. “Robust and Brain-Like Working Memory Through Short-Term Synaptic Plasticity” Gordon Conference on Neurobiology, 2022, ME.

Kozachkov, L., et al. “Dynamic stability underlies cortical computations during working memory” Society for Neuroscience 2021, Chicago, IL.

Eisen, A., **Kozachkov, L.**, et al. “Propofol anesthesia changes dynamic stability in cortex” Society for Neuroscience 2021, Chicago, IL.

Kozachkov, L., Michmizos, K. “Sequence learning in Associative Neuronal-Astrocytic Network” 13th International Conference on Brain Informatics, 2020.

Kozachkov, L., et al. “Achieving and using stability in neural circuits” Society for Neuroscience 2019, Chicago, IL.

Kozachkov, L., et al. “Combination and Stability Properties of Echo-State Networks” Society for Neuroscience 2018, San Diego, CA.

Kozachkov, L., Michmizos, K. “A Biomimetic Neural-Astrocytic Network: Adding a Slow Layer for Fast Information Processing” NICE 2017, Dayton, Ohio.

Shinbrot T, **Kozachkov, L.**, Siu T. “A nonlinear feedback model for granular and surface charging.” Applied Physics Society Meeting, 2015, San Antonio, TX.

TECHNICAL SKILLS

Languages: Python, MATLAB

Packages: PyTorch, PyTorch Lightning, scikit-learn, NumPy, SciPy, L^AT_EX

Developer Tools: Git, Windows Subsystem for Linux (WSL)

Mathematics (Selected Topics): Nonlinear Control Theory, Dynamical Systems Theory, Linear Algebra, Calculus, ODEs, PDEs, Mathematical Theory of Statistics

& Probability, Statistical Learning Theory

**TEACHING
EXPERIENCE**

Teaching Assistant
MIT 9.53

Spring 2019, 2020

Emergent Computations in Distributed Neural Circuits

Part-Time Lecturer
Rutgers Physics 206
General Physics Lab

Sept 2015 – Dec 2015

**RESEARCH
EXPERIENCE**

Miller Lab + Nonlinear Systems Lab
Department of Brain and Cognitive Sciences
Graduate Student

Sept 2018 – Present

Research Advisor(s): Prof. Earl K. Miller & Jean-Jacques Slotine

- Developing theoretical framework using tools from control theory to understand the role of dynamic stability in neural computations.
- Helping conduct/analyze electrophysiological experiments with non-human primates to understand the role of stability in cortical computations underlying working memory.

Laboratory for Computational Brain
Department of Computer Science
Research Assistant

April 2016 – August 2017

Research Advisor: Prof. Konstantinos Michmizos

- Designed simulations to elucidate the role of low-frequency glial calcium waves in modulating large neural populations.
- Developed minimal, neurophysiologically plausible models of glia-neuron and glia-synapse interactions.

Sengupta Lab
Department of Physics and Astronomy
Senior Honors Thesis Student
Thesis Advisor: Prof. Anirvan Sengupta

Sept 2015 – May 2016

- Modeled and analyzed the effects of epigenetic chromatin silencing on *Neurospora Crassa* circadian rhythm.

Computational Vision and Psychophysics Lab
Department of Psychology, Center for Cognitive Science
Research Assistant

Sept 2015 – Feb 2016

Research Advisor: Prof. Melchi Michel

- Studied the effects of intrinsic position uncertainty on search times in object identification tasks for natural, cluttered images.

Shinbrot Lab
Department of Biomedical Engineering
Research Assistant
Research Advisor: Prof. Troy Shinbrot

Summer 2014

- Developed an Ising-like model to simulate spontaneous tribocharging of similar materials. Research was presented at American Physical Society, 2015.

Laboratory of Vision Research
Rutgers Center for Cognitive Science

Sept 2013 – May 2014

Aresty Research Assistant

Research Advisor: Prof. Thomas V. Papathomas

- Studied the 3-D perception of faces and scenes. Research presented at the Aresty Undergraduate Research Symposium. [Poster](#).

**EXTRA-
CURRICULAR
ACTIVITIES**

Research Intern

2022 – 2022

MIT-IBM Watson AI Lab

IBM Research

Lifeguard

2012 – 2013 – 2014 – 2015

Candlewood Management Service Inc

Custodian

Jan 2011 – June 2011

Raritan Valley YMCA East Brunswick, NJ

Staff Writer

2013 – 2015

Applied Sentience

Rutgers University

- Published monthly [articles](#) on science, philosophy, mathematics, and literature.

Lifeguard

2012 – 2013 – 2014 – 2015

Candlewood Management Service Inc

Custodian

Jan 2011 – June 2011

Raritan Valley YMCA East Brunswick, NJ