Emily Mackevicius

Curriculum Vitae

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Education

2011–2018	**PhD, Neuroscience**, *Massachusetts Institute of Technology, Cambridge MA.*
2012	**Methods in Computational Neuroscience Course**, *Marine Biological Laboratory, Woods Hole, MA.*
2007–2011	**BS, Mathematics**, *University of Chicago, Chicago IL.*
2003–2007	**High School**, *Belmont High School, Belmont, MA.*

Research Affiliations

2024-present	**Senior Research Scientist**, Basis Research Institute.
2022-present	**Co-founder and Director**, Basis Research Institute.
2018-2024	**Associate Research Scientist**, Aronov Lab and Center for Theoretical Neuroscience, Zuckerman Institute, Columbia University.
2011-2018	**PhD Student**, Fee Lab, McGovern Institute, Department of Brain and Cognitive Sciences, MIT.
2010-2011	**Undergraduate Researcher**, Bensmaia Lab, Department of Organismal Biology and Anatomy, University of Chicago.
2009	**VIGRE Summer REU**, Mathematics Department, University of Chicago.

Publications

Urbaniak*, R., Xie*, M., and **Mackevicius, E. L.**. (2024). Bridging cognitive, statistical, and neural descriptions of multi-agent bird foraging behavior. *Nature Scientific Reports* **14**, 21770. `https://www.nature.com/articles/s41598-024-71931-0`

Chettih*, S.N., **Mackevicius*, E. L.**, Hale, S., and Aronov, D. (2024). Barcoding of episodic memories in the hippocampus of a food-caching bird. *Cell,* Volume 187, Issue 8, 1922 - 1935.e20. `https://doi.org/10.1016/j.cell.2024.02.032`

Mackevicius, E. L., Gu, S., Denisenko, N. I., and Fee, M. S. (2023). Self organization of songbird neural sequences during social isolation; *eLife* `https://elifesciences.org/articles/77262`

Applegate, M.C., Gutnichenko, K.S. **Mackevicius, E. L.**, Aronov, D. (2023). An entorhinal-like region in food-caching birds; *Current Biology* `https://www.sciencedirect.com/science/article/pii/S0960982223006619?via%3Dihub`

Fang, C., Aronov, D. A., Abbott, L. F., and **Mackevicius, E. L.** (2023). Neural learning rules for generating flexible predictions and computing the successor representation; *eLife* 12:e80680. `https://doi.org/10.7554/eLife.80680`

Mackevicius, E. L., Happ, M. T. L., and Fee, M. S. (2020). An avian cortical circuit for chunking tutor song syllables into simple vocal-motor units. *Nature Communications* 11:5029. `https://doi.org/10.1038/s41467-020-18732-x`

Mackevicius, E. L., Bahle, A. H., Williams, A. H., Gu, S., Denisenko, N. I., Goldman, M. S., and Fee, M. S. (2019). Unsupervised discovery of temporal sequences in high-dimensional datasets, with applications to neuroscience. *eLife* 8:e38471. `https://doi.org/10.7554/eLife.38471`

Mackevicius, E. L., and Fee, M.S. (2018). Building a state space for song learning. *Current Opinion in Neurobiology.* 49:59-68. `https://doi.org/10.1016/j.conb.2017.12.001`

Deny, S., **Mackevicius, E. L.**, Okubo, T. S., Berman, G., Shaevitz, J., and Fee, M. S. (2016). Learning stable representations in a changing world with on-line tSNE: proof of concept in the songbird. *International Conference on Learning Representations (ICLR), 2016.* `https://openreview.net/forum?id=oVgo1jRRDsrlgPMRsBzY`

Okubo, T. S., **Mackevicius, E. L.**, Payne, H. L., Lynch, G. F., and Fee, M. S. (2015). Growth and splitting of neural sequences in songbird vocal development. *Nature*, 528(7582), 352-7. `https://doi.org/10.1038/nature15741`

Okubo, T. S., **Mackevicius, E. L.**, and Fee, M.S. (2014). In Vivo Recording of Single-Unit Activity during Singing in Zebra Finches. *Cold Spring Harb Protoc*; (12):1273-83. `https://www.doi.org/10.1101/pdb.prot084624`

Mackevicius, E. L., Best, M. D., Saal, H. P., and Bensmaia, S. J. (2012). Millisecond precision spike timing shapes tactile perception. *The Journal of neuroscience: the official journal of the Society for Neuroscience*, 32(44), 15309-17. `https://doi.org/10.1523/JNEUROSCI.2161-12.2012`

Papers in progress and preprints

Aitsahalia, I., Botch, T.L., Gu, S., O'Connell, T., Siegel, R., Peterson, R. E., Batenkov, D., **Mackevicius, E.L.** (2025). Inferring cognitive strategies from groups of animals in natural environments. *Accepted talk, NeurIPS Data on Brain and Mind Workshop 2025.*

Peterson, R. E., Batenkov, D., El-Hady, A., **Mackevicius, E.L.** (2025). Computational Urban Ecology of New York City Rats. *preprint:* `https://www.biorxiv.org/content/10.1101/2025.07.21.665423v1` *Accepted NeurIPS AI for Non-Human Animal Communication Workshop 2025.*

Mineault, P., Zanichelli, N., Peng, J.Z., Arkhipov, A., Bingham, E., Jara-Ettinger, J., **Mackevicius, E.L.**, Marblestone, A., Mattar, M., Payne, A., Sanborn, S., Schroeder, K., Tavares, Z., Tolias, A., and Zador, A. (2025). NeuroAI for AI Safety. *preprint:* `https://arxiv.org/abs/2411.18526`

Gu, S., **Mackevicius, E. L.**, Fee, M.S., and Zhou, P. Spatial Tracking Across Time (STAT): Tracking Neurons Across In-Vivo Imaging Sessions through Optimizing Local Neighborhood Motion Consistency. *preprint:* `https://www.biorxiv.org/content/10.1101/2023.05.13.540658v2`

Invited and Selected Talks

2025 **COSYNE workshop on agent-based models in neuroscience**, *`https://www.youtube.com/watch?v=8cesfqNqY9U&list=PLAJi-27DFo6SeJEzV7e_de8NIHUap06iJ`*.

2024	**UW/Allen Shanahan NeuroAI meeting talk.**
2024	**COSYNE workshop on comparative approaches to advance neural circuits and computation.**
2024	**Knowledge Distillation podcast**, *https://open.spotify.com/show/0X6mLCGkkxI5CDTPkBJRcT?si=75cd99c4191741a8*.
2023	**Stavros Niarchos Foundation Brain Insight Lecture, discussion moderator for "Can Machines Learn Like People?"**, *https://www.youtube.com/watch?v=dCodVXdqHEQ*.
2023	**Janelia invited talk.**
2023	**COSYNE workshop on neurodevelopment and evolution: the formation of innate circuit priors and behaviors.**
2023	**COSYNE workshop on neural mechanisms of sequence learning and execution.**
2022	**Johns Hopkins Kavli NDI-X Speaker Series.**
2022	**Simons Society of Fellows Retreat Talk.**
2021	**Lamont-Doherty Earth Observatory XR Glaciology Group.**
2021	**Zuckerman Institute Postdoctoral Seminar (ZIPS).**
2020	**Motor Club, Zuckerman Institute.**
2019	**Brain Against the Machine Workshop, Bernstein Conference.**
2019	**NeuroNex Junior Scientist Workshop on Advanced Neural Data Analysis.**
2018	**Janelia Junior Scientist Workshop on Mechanistic Cognitive Neuroscience.**
2018	**Songbird Data Science Workshop, SfN pre-meeting.**
2018	**Quantitative Approaches to Naturalistic Behaviors at Banbury (Cold Spring Harbor).**
2018	**Computational Neuroscience Tutorial, MIT Brain and Cognitive Sciences Department**, https://www.youtube.com/playlist?list=PLyGKBDfnk-iAU7N6dYVy7HhK2aLjLSPKM.
2018	**COSYNE (Computational and Systems Neuroscience) conference**, *https://youtu.be/XyWtCtZ_m-8?list=PL9YzmV9joj3FNsAV2S_cKxY8Ik_-YlQfu*.
2017	**Janelia J-Theory seminar.**
2017	**Stanford Neuroscience Invited Graduate Student Talk Series.**
2017	**MIT Brain and Cognitive Sciences Department Retreat.**
2016 & 2017	**Quantitative Methods Workshop, MIT Biology Department and Center for Minds Brains and Machines.**
2016 & 2017	**MIT Brain and Cognitive Sciences Department Interview Day Talk.**
2015	**Integrative Neuronal Systems Conference, MIT Brain and Cognitive Sciences Department.**
2014	**Center for Minds Brains and Machines Summer School at Woods Hole**, http://cbmm.mit.edu/video/emily-mackevicius-learning-computational-neuroscience-perspective.

Fellowships and Awards

2023-present	**Pathway to Independence Award (K99/R00, 1K99NS131256-01)**, National Institutes of Health (NIH) grant funding up to two years of postdoctoral training, then three years of research as a faculty (or equivalent).
2020-2023	**Simons Society of Fellows**, Three year postdoctoral fellowship, covering salary, research allowance, and weekly dinners with other New York City fellows.
2019	**Helen Hay Whitney Fellowship**, Competitive three year postdoctoral fellowship, got selected but could not activate both Whitney and Simons..
2018	**COSYNE Presenters Travel Grant**, Selected to give a talk and awarded a travel grant based on the high reviewer ranking of my abstract.
2015-2018	**Computational Neuroscience Tutorial Series, awarded department funding for filming and admin support**, `https://stellar.mit.edu/S/project/bcs-comp-tut/index.html`.
2013-2016	**National Defense Science and Engineering Graduate Fellowship (NDSEG)**, Three year graduate fellowship from the Department of Defense covering tuition and stipend for three years.
2015	**Angus MacDonald Award for Excellence in Undergraduate Teaching**, Awarded by MIT Brain and Cognitive Sciences Deparment for my work TAing a new undergraduate course in Computational Neuroscience.
2015	**MIT Graduate Women of Excellence Award**, One of roughly 50 awardees of more than 200 nominees. Award is meant to "honor graduate women who exemplify leadership and outstanding accomplishment".
2012	**Scholarship for Methods in Computational Neuroscience course**, *Marine Biology Lab*, Woods Hole, MA.
2011-2012	**Henry E. Singleton (1940) Presidential Fellowship**, MIT fellowship for first year graduate students.
2010	**Computational Neuroscience Summer Researcher**, NIH-sponsored summer research experience for undergraduates.
2009	**Math Summer Undergraduate Research Fellowship**, *University of Chicago*.
2007-2011	**University Scholarship**, Merit scholarship for entering University of Chicago students.

Teaching, Mentorship, Broader Collaborations

2023	**Djali, Basis + GKZ**, Venice Biennale Architettura 2023, Laboratory of the Future. • Co-produced an installation using AI and Afrofuturist storytelling traditions
2021-2023	**Organize several scientific events**, Zuckerman Institute and Center for Theoretical Neuroscience. • Serve on Seminar Committee, co-organize journal club on Network Flow
2022	**Co-organizer, Beyond Bayes Workshop**, International Conference for Machine Learning (ICML). • Recruited speakers and presenters, moderated panel discussion
2022	**Volunteer, Saturday Science**, Zuckerman Institute Public Programs. • Taught kids of a variety of ages about the brain
2021	**Course Leader, The Brains Behind Bird Behavior**, Math For America (MfA). • Led a workshop for K12 teachers about the neuroscience behind bird behaviors, and how to incorporate this material into the classroom

2020   **Speaker, Rhythm and Reason**, Arts & Minds, the National Jazz Museum in Harlem and Columbia University's Zuckerman Institute.
• Collaborated with Jazz Artist in Residence Helen Sung to produce a program for patients with dementia and their caregivers, and the general public

2019   **Instructor, Discover Science Program**, Zuckerman Institute, Columbia University.
• Designed and implemented an after school outreach program for local middle school students

2014-2018   **Member, Education Committee**, MIT Brain and Cognitive Sciences Department.
• Advised committee on graduate and undergraduate curriculum

2013-2017   **Founder, Computational Neuroscience Tutorial Series**, MIT Brain and Cognitive Sciences and Center for Minds Brains and Machines.
• Chose topics, invited speakers, created course website with problem sets, references, slides, and videos: https://stellar.mit.edu/S/project/bcs-comp-tut/index.html

2013-2017   **Teaching Assistant, Methods in Computational Neuroscience**, Woods Hole Marine Biology Laboratory.
• Made tutorials and problem sets, answered student questions, proposed novel projects, and advised students on projects

2016-2017   **Instructor, Quantitative Methods Workshop**, MIT Biology Department and Center for Minds Brains and Machines.
• Designed and taught tutorials at intensive quantitative workshop for undergrads from underrepresented backgrounds

2013-2017   **Mentor and PAL, MIT Summer Research Program**, MIT Brain and Cognitive Sciences and Center for Minds Brains and Machines.
• Mentored summer student and served as informal PAL to several students in research program for undergrads from underrepresented backgrounds

2014-2015   **Teaching Assistant**, MIT Brain and Cognitive Sciences Department.
• 9.40 (Introduction to Computational Neuroscience) TA: designed problem set questions, helped plan lectures and course curriculum, held office hours, answered student questions.

2014   **Teaching Assistant, Brains, Minds and Machines Summer Course**, Woods Hole Marine Biology Laboratory.
• Made MATLAB for neuroscience tutorial, gave neuroscience lecture, answered student questions, advised students on projects.

2014   **Conference organizer**, Graduate Women at MIT (GWAMIT).
• Organized a mentorship event for the 2014 Spring Empowerment Conference, co-chair of the 2014 Fall Leadership Conference

2011-2014   **Video Maker**, MIT+K12 Videos.
• Made outreach videos on science topics for the MIT+K12 Videos project, and Khan Academy. Designated as a 'high quality veteran video maker'.
• `http://k12videos.mit.edu/squid-skin-with-a-mind-of-its-own/`
• `http://www.khanacademy.org/science/mit-k12/v/bread-mold-kills-bacteria`

2012   **Teaching Assistant**, MIT Brain and Cognitive Sciences Department.
• 8.261/9.29 (Introduction to Computational Neuroscience) TA: held office hours and review sessions, and graded assignments

2011   **Teaching Assistant**, University of Chicago Biology Department.
• BIOS 20244 (Biophysics and Chemical Biology) TA: advised and assessed student presentations

2009-2010   **YSP Group Leader**, University of Chicago Mathematics Department.
• Led a discussion group of gifted $5^{th} - 9^{th}$ graders covering topics related to the mathematics of encryption

2008-2010	**VIGRE Course Assistant**, University of Chicago Mathematics Department.
	• MATH 151,2,300 (Calculus) TA: held office hours, graded papers, assisted problem sessions
2009	**VIGRE REU**, University of Chicago Mathematics Department.
	• Led a discussion group of 11th and 12th graders in Knot Theory and Applied Probability
2007-2008	**Gearup Classroom Support**, University of Chicago Neighborhood Schools Program.
	• Assisted 8th grade Chicago Public Schools classroom

Skills and hobbies

Computer	MATLAB, Python, Slurm, LaTex, Mac OS X, Microsoft Office, CAD, Eagle, DeepLabCut	Fabrication	precision lathe, precision milling machine, band saw, drill press, 3D printers, laser cutters, computer-controlled machining, electronics, etc.
Cello	MIT Chamber Music Society and Gilbert and Sullivan Pit Orchestra, University of Chicago Symphony Orchestra, Early Music Ensemble, Classical Improvisation Group	Other	pottery, hiking, slackline, climbing, weaving, birding

References

References available upon request