

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 Experience

- 2024-present **Senior Research Scientist**, Basis Research Institute.
- 2022-present **Co-founder and Director**, Basis Research Institute.
- 2018-present **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

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

2024 **UW/Allen Shanahan NeuroAI meeting talk.**

2024 **Knowledge Distillation podcast,** <https://open.spotify.com/show/0X6mLcGkxI5CDTPkBJRcT?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 Department 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 5th – 9th 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.
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Cello MIT Chamber Music Society and
Gilbert and Sullivan Pit Orchestra,
University of Chicago Symphony Or-
chestra, Early Music Ensemble, Clas-
sical Improvisation Group

Other pottery, hiking, slackline, climbing,
weaving, birding

References

References available upon request