

Elizabeth (Liz) A. O’Gorman

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Technical Skills

Languages: Python; PyTorch; R; MATLAB; Keras and TensorFlow

Environments & Tools: ØMQ; bash/zsh; Git; High-Performance Computing (Apptainer/Singularity, Docker); JIT-compiling; Jupyter; LabVIEW; LaTeX; Linux/UNIX; MATLAB, MySQL and SQL

Machine and Deep Learning: supervised and unsupervised ML; CNNs, LSTMs/RNNs, VAEs

Data Analysis: dimensionality reduction; multi-channel and single-channel signal processing (audio, image, neural, video); spectral analysis; time-series and Markovian analysis; closed-loop real-time pipeline development for streaming data; profiling and time complexity analysis

Education

Duke University

2018-2025

PhD in Neurobiology

Dissertation: “[Flexible, Real-Time Shaping of Zebra Finch Vocal Learning](#)” 

Committee: John Pearson, PhD (advisor); Richard (Rich) Mooney, PhD (chair); R. Alison Adcock, MD, PhD (minor area representative); Jenna McHenry, PhD

Advised by John Pearson, PhD (2022-2025)

Advised by David Carlson, PhD and Kafui Dzirasa, MD, PhD (2018-2022)

Concurrent MS in Electrical & Computer Engineering (Data Analytics & Machine Learning)

Emory University

2014-2018

BS with Highest Honors in Neuroscience & Behavioral Biology — Ethics Minor

Honors Thesis: “[Low-Dimensional Mapping of Corticostriatal Circuitry Dynamics Underlying Pair Bonding](#)” 

Committee: Gordon Berman, PhD (advisor); Robert Liu, PhD; Joseph Manns, PhD; Samuel (Sam) Sober, PhD

Advised by Gordon Berman, PhD (2018)

Advised by Donald (Tig) Rainnie, PhD (2015-2018)




Honors and Awards: Alpha Epsilon Upsilon (General Academic) Honor Society; Nu Rho Sci (Neuroscience) Honor Society; Phi Sigma Tau (Philosophy) Honor Society; William Harrison Hightower, Jr. Scholarship; Dean’s List Fall 2017; Merit List Fall 2014 - Spring 2016

Oxford College of Emory University

2014-2016

AA in Arts & Sciences

Awards and Honors

- [Gordon Research Conference and Gordon Research Seminar on the Neural Mechanisms of Acoustic Communication \(NMAC GRC and GRS\)](#)  Travel Award, 2024
- [Flatiron Institute’s Center for Computational Neuroscience 2022 Workshop on Calcium & Voltage Imaging Analysis](#)  Travel Award from the Simons Foundation, 2022
- [National Science Foundation Graduate Research Fellowship \(NSF GRFP\): NSF GRFP DGE 16-44868](#) , 2018-2023
- Highest Honors in Neuroscience & Behavioral Biology at Emory University, 2018

Research Experience

**PhD Graduate Research Assistant advised by John Pearson,
PhD at Duke University**

2022-2025

Flexible, real-time shaping of zebra finch vocal learning

- Developed flexible pipelines for real-time analysis and reinforcement of streaming zebra finch vocalizations using custom LabVIEW and Python software, deep learning (variational autoencoders and convolutional neural networks), machine learning (K-nearest neighbors, random forest, support vector machine classifiers), and spectral and time series analysis
- Analyzed high-dimensional and spectral changes of zebra finch song in response to real-time behavioral reinforcement
- Conducted experiments to negatively reinforce zebra finch vocalizations by delivering an auditory error signal and negative reinforcer (white noise) contingent upon production of target song features

**PhD Graduate Research Assistant advised by David Carlson,
PhD and Kafui Dzirasa, MD, PhD at Duke University**

2018-2022

Behavior and neural dynamics of mouse models of neuro-developmental and psychiatric disorders

- Developed pipelines for fine-grained analysis of adaptive behaviors exhibited during various behavioral assays and multimodal incorporation of population-level local field potentials of distributed brain regions using deep learning and machine learning, statistical modeling (topic models), spectral and time series analysis, and image and video processing
- Analyzed and modeled behavioral and neural responses to non-social and social stimuli exhibited by a genetic mouse model of autism spectrum disorder determining statistically significant difference in object approach and social approach and response postural and trajectory dynamics
- Analyzed and modeled changes and trajectories of adaptive behaviors, exploration of an open field and open- and closed-arms of an elevated plus maze, exhibited by mice in response to chronic mild unpredictable stress

**Honors Undergraduate Research Assistant advised by Gordon
Berman, PhD at Emory University**

2018

Low-dimensional mapping of corticostriatal circuitry dynamics underlying pair bonding

- Analyzed population-level corticostriatal dynamics and neural states associated with affiliative and non-affiliative social behaviors exhibited by prairie voles during a cohabitation period using dimensionality reduction, Gaussian mixture models, and divergence metrics
- Quantified inter- and intra-animal variability, Jensen-Shannon divergence, of subjects' recordings from mPFC and NAcc (hit subjects), and mPFC and within or bordering the BNST (non-hit subjects) determining statistically significant differences
- Identified 36 stereotyped brain-states (i.e., specific pairings of peak oscillatory frequencies) to be used for neural decoding

Honors Undergraduate Research Assistant advised by Donald (Tig) Rainnie, PhD, Chia-Chun (Jeffrey) Hsu, PhD and Teresa Madsen, PhD at Emory University

2015-2018

Funded by the Scholarly Inquiry and Research at Emory (SIRE) Research Partners Program, 2016-2017

Behavior and neural dynamics of rat models of neuro-development and psychiatric disorders

- Quantified expression of fear learning, recall, and extinction exhibited by rats using a differential fear paradigm determining statistically significantly increased frequency and duration of freezing during and after training
- Developed pipelines to automate analysis of non-social and social behaviors exhibited by wild-type rats and a pharmacologically-induced (valproic acid-induced) rat model of autism spectrum disorder during a three-chamber social preference test to significantly streamline analysis, reduce human bias and error, and significantly decrease costs and time of analysis determining statistically significant differences in responses to food and social reward
- Conducted experiments assessing the role of metabolism influencing non-social and social behaviors exhibited by rats by pharmacologically manipulating cyclic AMP via intracerebroventricular infusion determining significant increases of anxiety-like behaviors, specifically frequency and latency of acoustic startle responses

Summer Undergraduate Research Assistant advised by Craig Forest, PhD, Christine Payne, PhD, and Scott Thourson, PhD at Georgia Institute of Technology

2017-2018

Funded by the Summer Undergraduate Research in Engineering and Sciences Program, 2017

Poly (3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) microwires for selective stimulation of single cells

- Using ex vivo electrophysiology, polymer science, microwire fabrication, electrochemistry, and COMSOL computational modeling.
- Recorded membrane potential responses of HEK293 cells while applying 100 Hz stimulation from polymer microwires at various distances and geometries using ex vivo electrophysiological techniques (whole-cell patch-clamping)
- Determined PEDOT:PSS-coated gold microwires deliver high, localized (spatially specific) electric fields as PEDOT:PSS coating decreased surface impedance, allowing for maximal delivery of charge and minimal microwire dimensions to enhance biocompatibility
- Measured surface impedance and generated local electric field of polymer microwires in solution and with impedance spectroscopy
- Simulated polymer microwire stimulation with COMSOL, physics simulation software to determine experimental observations conferred with simulations
- Conducted di-electrophoresis for polymerization of PEDOT:PSS microwires

Publications

Hsu C-C, Madsen TE, **O’Gorman E**, Rainnie DG, and Gourley SL. Reward-related dynamical coupling between basolateral amygdala and nucleus accumbens. *Brain Structure and Function*. 2020 Jul;225(6):1873-1888. PMID: 32556583; PMCID: PMC7405940. [↗](#)

Poster Presentations

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking vocal learning with deep learning: flexible real-time perturbation of zebra finch song. Computational and Systems Neuroscience (CoSyNe); 2025 March 27-30; Montreal, Canada.

O’Gorman EA, Schreiner DC, Mooney RD, Pearson, JM. Hacking vocal learning with deep learning: flexible real-time perturbation of zebra finch song. *Science Communications Worldwide*. doi:10.57736/f758-9516 [↗](#)

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking neural learning with deep learning: real-time perturbation of high-dimensional song features in the zebra finch. Gordon Research Conference and Gordon Research Seminar on the Neural Mechanisms of Acoustic Communication (NMAC GRC and GRS); 2024 May 18-24; Newry, ME.

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking song learning with deep learning: real-time perturbation of zebra finch song. Duke University Department of Neurobiology Annual Retreat; 2024 September 25-27; Wrightsville Beach, NC.

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking neural learning with deep learning. Duke University Department of Neurobiology Annual Retreat; 2023 September 26-28; Wrightsville Beach, NC.

O’Gorman EA, Draelos AW, Pearson JM. Integration of deep learning models for real-time analysis. Duke University Department of Neurobiology Annual Retreat; 2022 September 28-30; Wrightsville Beach, NC.

O’Gorman EA, Gallagher NM, Fink AJ, Mague SD, Carlson DE, Dzirasa K. A computational ethology approach to identifying stress biomarkers. Duke University Department of Neurobiology Annual Retreat; 2019 September 25-27; Wrightsville Beach, NC.

Hsu C-C, Madsen TE, **O’Gorman E**, Habib R, Rainnie DG. Neuronal oscillations in the nucleus accumbens and basolateral amygdala during social preference test and food conditioning. 47th Annual Society for Neuroscience Meeting; 2017 November 11-15; Washington, DC. [↗](#)

Oral Presentations

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking Neural Learning with Deep Learning: Real-Time Perturbation of High-Dimensional Song Features in the Zebra Finch. Gordon Research Conference on the Neural Mechanisms of Acoustic Communication (NMAC GRC and GRS); 2024 May 22; Newry, ME.

O’Gorman EA, Schreiner DC, Mooney RD, Pearson JM. Hacking Neural Learning with Deep Learning. Duke University, School of Medicine, Department of Neurobiology’s Student Seminar Series; 2023 April 5; Duke University, Durham, NC.

O’Gorman EA. See Something, Learn Something: A Cortico-amygdala Circuit’s Role in Observational Learning. Duke University, School of Medicine, Department of Neurobiology’s Student Seminar Series; 2019 October 16; Duke University, Durham, NC.

Undergraduate Poster Presentations

O’Gorman EA, Amadei EA, Liu RC, Berman GJ. Low-dimensional mapping of corticostriatal circuitry dynamics underlying pair bonding. Emory College Spring Undergraduate Research Symposium – Neuroscience and Behavioral Biology Department; 2018 April 23; Emory University, Atlanta, GA.

O’Gorman EA, Thourson SB, Landry CR, Payne CK, Forest CR. Mapping local electric fields generated by polymer microwires for single neuron stimulation. Georgia Institute of Technology Summer Undergraduate Research in Engineering and Science Program Research Symposium; 2017 July 27; Georgia Institute of Technology, Atlanta, GA.

O’Gorman EA, Hsu C-C, Madsen TE, Rainnie DG. Comparison of behavioral outcomes between a social and nonsocial rewarding task in a rat model of autism spectrum disorder. Emory College Spring Undergraduate Research Symposium; 2017 April 17-21; Emory University, Atlanta, GA.

Habib R, Madsen TE, Hsu C-C, **O’Gorman EA**, Rainnie DG. Neural and behavioral changes during fear learning, recall, and extinction. Emory College Spring Undergraduate Research Symposium – Biology Department; 2017 April 17-21; Emory University, Atlanta, GA.





Undergraduate Oral Presentations

O’Gorman EA, Thourson SB, Landry CR, Payne CK, Forest CR. Mapping local electric fields generated by polymer microwires for single neuron stimulation. Georgia Institute of Technology Summer Undergraduate Research in Engineering and Science Program Research Symposium; 2017 July 27; Georgia Institute of Technology, Atlanta, GA.

Mentoring

- Direct mentor of an undergraduate research assistant, Hannah Hortman, 2024-2025
- Co-Founder of the Creative Computing Program at CC Spaulding Elementary School in Durham, NC, 2019-2024
- Invited Guest Speaker for the “Engineers Who Think Differently — DiffEQ” club at FAMU-FSU College of Engineering, 2022 and 2023
- Direct supervisor of an Undergraduate Computer Science Independent Study: Machine Learning for Quantitative Behavioral Analysis, 2019-2020
- Duke Neurobiology Social Integration of New students and Academic Peer Support Environment (SINAPSE) Mentor, 2019-2020, 2022-2023
- Duke F1RSTS, First-Generation Student Mentor, 2018-2020

Professional Activities and Outreach

- Sylvan Learning Center Instructor, 2025-Present
- Duke University Department of Neurobiology Seminar Speaker Selection Committee, 2022-2023
- [FEMMES+](#)  Capstone Volunteer, 2021
- Teaching Assistant for [Duke University Department of Neurobiology Quantitative Neurobiology Course taught by John Pearson, PhD](#) , 2020
- [Triangle Women in STEM](#)  Volunteer, 2019
- [Duke Institute for Brain Sciences \(DIBS\) Discovery Day](#)  Volunteer, 2019

Workshops

- [Calcium & Voltage Imaging Analysis Workshop](#), June, 2022, at the Flatiron Institute's Center for Computational Neuroscience in New York City, NY
- DeepLabCut (DLC) Workshop, Jan, 2019, at the Rowland Institute at Harvard University in Cambridge, MA