Eric Kenji Lee

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EricKenjiLee | EricKenjiLee

Education

Boston University – Boston, MA — 2019 – Present
M.A./Ph.D. in Psychological and Brain Sciences

University of Washington – Seattle, WA — 2016 - 2019
M.S. in Applied Mathematics

University of Puget Sound – Tacoma, WA — 2011 - 2015
B.S. in Biochemistry and Mathematics
Minor in Neuroscience

Awards & Honors

NIH NINDS F31 NRSA ($75,000 over two years; 8th percentile)
Computational Properties of Prefrontal Cortex (CPPC) Conference Travel Award ($360)
ETC Outstanding Tutor
Puget Sound Research Travel Grant ($500)
University of Puget Sound Summer Research Grant ($4,000)
University of Puget Sound Trustee Scholarship ($60,000 over four years)
University of Hawaii REU Research Fellowship

Research Experiences

Boston University – Boston, MA — Sep. 2019 – Present
Ph.D. Student in the Dept. of Psychological and Brain Sciences
Advisor: Chandramouli Chandrasekaran Ph.D.

- Trained rhesus macaques (*Macaca mulatta*) on perceptual decision-making tasks.
- Conducted *in vivo* extracellular electrophysiological recordings of dorsolateral prefrontal cortex with Neuropixels probes.
- Published two first-author publications on analyzing spike waveform properties with nonlinear dimensionality reduction.
- Developed a multimodal graph method for identifying cell types via electrophysiology.

The Allen Institute for Brain Science – Seattle, WA — Oct. 2015 to Present
Research Associate I/II in the Department of Neural Coding
Advisor: Jérôme Lecoq Ph.D.

- Conducted experiments and analysis characterizing the visual cortex of the mouse using 2-photon functional calcium imaging and infrared imaging.

The University of Washington – Seattle, WA — May 2015 to Sep. 2015
Research Technologist I in the Department of Psychology
Advisor: Joseph Sisneros Ph.D.

- Conducted field-work and behavioral assays assessing the changes in auditory processing of the midshipman fish during mating.

The University of Puget Sound – Tacoma, WA — Sep. 2012 to May 2015
Research Assistant in the Departments of Biology/Physics
Advisors: Siddharth Ramakrishnan Ph.D. and Rachel Pepper Ph.D.

- Researched the influence of xenoestrogens on mating behaviors of the zebrafish. Conducted treatment, imaging, and analysis of fluorescence data in MATLAB.

The University of California – Berkeley, CA May 2014 to Aug. 2014

Summer Research Intern in the Department of Biophysics

Advisors: Rachel Pepper Ph.D.

- Investigated the fluid dynamics of navigatory behavior in the oceanic larvae. MATLAB, Python, and particle image velocimetry for fluid analysis.

The University of Hawai'i – Honolulu, HI May 2013 to Sep. 2013

Summer Research Intern and Research Assistant

Advisor: Linda Chang M.D.

- Used independent component analysis and statistical parametric mapping in MATLAB/SPM8 to investigate diagnostic criterion in the default-mode network.

Publications

Carr, N., Zhu, S., **Lee, E.K.**, et al. Towards understanding the microcircuit in primate visual cortex in-vivo. *In preparation*. Conceptualization and devised methods.

Wang, T. **Lee, E.K.***, Carr, N.*, Chandrasekaran, C. Distinct Roles of Prefrontal and Premotor Cortex in Decision-making. *In preparation*. Conducted data collection and formal analysis.

Lee, E.K., Gül, A., Heller, G., Lakunina, A., Jaramillo, S., Chandrasekaran, C. Building a look-up table for cell types using multi-modal analysis of electrophysiology. *In submission*. Conducted data collection, formal analysis, validation, data visualization, and manuscript writing.

Gillon C.J., Lecoq J.A. *et al.* (**10th** of 23 authors, alphabetical). Responses of pyramidal cell somata and apical dendrites in mouse visual cortex over multiple days. *Scientific Data* (2023). Conducted data collection.

Kleinman, M., Wang, T., Xiao, D., Feghhi E., **Lee, E.K.**, et al. A cortical information bottleneck during decision-making. *Peer reviewed at eLife* (2023). Conducted data collection.

Lee, E.K., Carr, N., Perliss, A., and Chandrasekaran C. WaveMAP for identifying putative cell types from extracellular electrophysiology. *STAR Protocols* (2023). Conducted data collection, formal analysis, validation, data visualization, and manuscript writing.

Yao S., Wang Q., Hirokawa K.E., *et al.* (**24th** of 51 authors, alphabetical). A whole-brain monosynaptic input connectome to neuron classes in mouse visual cortex. *Nat. Neuro.* (2022). Conducted data collection.

Mayner W.J.P., Marshall W., Billeh Y.N., *et al.* (**10th** of 23 authors, alphabetical). Measuring stimulus-evoked neurophysiological differentiation in distinct populations of neurons in mouse visual cortex. *eNeuro* (2022). Conducted data collection and experimental piloting.

Ramadan M., **Lee E.K.**, *et al.* A standardized behavioral event equally impacts the activity of cortical visual areas and layers. *eNeuro* (2022). Conducted data collection/annotation. Collected eye tracking data. Analyzed neural responses in response to "fidget" events. Manuscript writing.

Lee E.K., Balasubramanian H., *et al.* Delineation of cell type diversity by nonlinear dimensionality reduction of waveforms. *eLife (2021)*. Analyzed data, devised methods, and wrote manuscript.

Orlova N.*, Najafi, F.*, *et al.* (**20th** of 29 authors, alphabetical). Multiplane mesoscope reveals distinct cortical interactions following expectation violations. *bioRxiv*. Conducted data collection.

Gillon C.J., Pina J.E., Lecoq J.A., *et al.* Learning from unexpected events in the neocortical microcircuit. *JNeuro* (2024). Conducted data collection and annotation.

Millman D., Ocker G., Caldejon S., Kato I., **Lee E.K.** *et al*. VIP interneurons selectively enhance weak but behaviorally-relevant stimuli. *eLife* (2020). Conducted data collection and analysis to characterize data set used.

de Vries S.*, Lecoq J.*, Buice M.A.* *et al*. (**44th** of 72 authors, alphabetical). A large-scale standardized physiological survey reveals functional organization of the mouse visual cortex. *Nat. Neuro.* (2019). Data collection over multiple modalities. Created automated data analysis and QC

for infrared imaging. Aided software development and hardware iteration; led implementation of a new eye tracking set-up system and software.

Waters J., **Lee E.K.**, *et al.* Biological variation in the sizes, shapes, and arrangement of the aged brain. *PLOS One*. Conducted data collection and analysis to characterize data set used. Piloted and reviewed additional analyses.

Miller J. *et al.* (**44th** author of 72, alphabetical). Neuropathological and transcriptomic characteristics of the aged brain. *eLife* (2017). Conducted data collection and image analysis/QC of brightfield-imaging IHC slides.

Steinmetz N. *et al*. (**17th** author of 34, alphabetical). Aberrant cortical activity in multiple GCaMP6-expressing transgenic mouse lines. *eNeuro* (2017). Data collection and characterization of epileptiform activity in 2-photon fluorescence and epifluorescence imaging.

Inagaki T., Smith N. **Lee E.K.**, Ramakrishnan S. Low dose exposure to Bisphenol A alters development of gonadotropin-releasing hormone 3 neurons and locomotor behavior in Japanese Medaka. *Neurotoxicology* (2016). Conducted rearing and treatment of animals, dissection, imaging, image analysis, and manuscript preparation.

Workshop/ Conference Talks

Biophysics and Quantitative Biology in the AI Era (contributed) Jan 2023
NSF AI Planning Institute, Carnegie Mellon University. Pittsburgh, PA.
Multi-modal composition of physiological signals to delineate neuronal cell types in-vivo

CCN Junior Theoretical Neuroscientist's Workshop (contributed) Jun 2023
Center for Computational Neuroscience, Flatiron Institute. New York, NY.
Multi-modal composition of physiological signals to delineate neuronal cell types in-vivo

Presentations

Laboratory of Karel Svoboda (virtual, invited) Sep 2021
Janelia Farm, Ashburn, VA
Revealing cell types in vivo via dimensionality reduction and graph clustering of spike waveforms

Laboratory of Taufik Valiante (virtual, invited) Jul 2021
University of Toronto, Toronta, CA
Revealing cell types in vivo via dimensionality reduction and graph clustering of spike waveforms

AIBS – Mindscope (virtual, invited) Jun 2021
Allen Institute for Brain Science, Seattle, WA
Revealing cell types in vivo via dimensionality reduction and graph clustering of spike waveforms

Laboratory of Reza Shadmehr (virtual, invited) Mar 2021
Johns Hopkins University, Baltimore, MD
Revealing cell types in vivo via dimensionality reduction and graph clustering of spike waveforms

Selected Conference Posters

Chandrasekaran, C., Lakunina, A., Jaramillo, S., and **Lee, E.K.** Identifying cell types in vivo with multi-modal analysis of electrophysiological data. COSYNE Poster Session (2023).

Wang, T., Carr, N*., **Lee, E.K.***, et al. Distinct Roles of Prefrontal and Premotor Cortex in Decision-making. COSYNE Poster Session (2023).

Lee, E.K., Carr, N.*, Wang, T.*, Medalla, M., Luebke, J., and Chandrasekaran, C. Dorsolateral prefrontal cortex is a key cortical locus for perceptual decisions. COSYNE Poster Session (2023)

Wang T.* and **Lee E.K.*** *et al.* Distinct neural population dynamics in prefrontal and premotor cortex during decision-making. *Gordon Research Conference/Symposium* (2022).

Lee E.K.* and Wang T.* *et al.* Stimulus encoding, working memory, and action selection in dorsolateral prefrontal cortex during perceptual decision making. *Gordon Research Conference/Symposium* (2022).

Lee E.K., *et al.* Revealing cell types in vivo via dimensionality reduction and graph clustering of spike waveforms. *COSYNE* (2021).

Lee E.K., *et al.* The incorporation and uses of eye tracking in a large-scale pipeline for the Allen Institute's Brain Observatory. *Society for Neuroscience Poster Session* (2017).

Teaching

Boston University – Boston, MA

Teaching Fellow – PS/NE 337: Memory Systems (Dr. Steve Ramirez) Fall 2022
- Led discussion sections.

Teaching Fellow – PS 231: Physiological Psychology (Dr. Ben Wormwood) Fall 2019
- Led discussion sections and taught certain lecture sessions.

University of Puget Sound – Tacoma, WA

Course Assistant – NRSC 201: Intro. to Neuroscience (Dr. Siddharth Ramakrishnan) Fall 2014
- Prepared labs introducing undergraduates to neuroscience benchwork.

Service

Career Advising

- **Boston University Graduate Mentors –** Boston, MA — Fall 2019 – Present
- **UPS Alumni Mentor –** Tacoma, WA — Fall 2019 – Fall 2020
- **UPS Career Committee Member –** Tacoma, WA — Fall 2015 – Fall 2019
- **Take a Logger to Work Day Host –** Tacoma, WA — Fall 2015 – Fall 2019

Inclusivity of Underprivileged Groups

- **Científico Latino GSMI Mentor –** National Program — Fall 2023 – Present
- **Wash. State Opportunity Scholarship Mentor –** Seattle, WA — Fall 2016 – Fall 2019

Student/Employee Advocacy

- **Grad. Student Union Rep. (SEIU Local 509) –** Boston University — Fall 2022 – Present
- **AI RADS Organizing Committee –** Allen Institute — Fall 2018 – Spring 2019
- **UPS Senior Curriculum Committee –** University of Puget Sound — Spring 2018

Mentored Students

Malaika Mahmood – Científico Latino Mentee, Rutgers University — Fall 2023

Asım Gül – Boston University Exchange Program, Boğaziçi University — Spring - Fall 2023

Yuke Li – Biomedical Engineering Undergraduate, Boston University — Spring 2022

Stephanie Anakwe – Neuroscience Undergraduate, Boston University — Spring - Summer 2021
Currently a Research Assistant in the lab of Laura Lewis at MIT

Nancy Ou – Psychology Undergraduate, University of Washington — Fall – Spring 2018
Currently a Google UX Researcher

Zakariya Hussain – Neuroscience Undergraduate, University of Washington — Fall – Spring 2017

Anna Hoge – Allen Institute for Brain Science Intern, Allen Institute — Summer 2017
Currently an MD Student at the Mayo Clinic in Arizona

Mahdi Ramadan – Allen Institute for Brain Science Intern, Allen Institute — Summer 2016
Currently a PhD Student in Neuroscience at MIT BCS

Societies

Society for Neuroscience (SfN) Member — 2014 - Present
Neural Control of Movement (NCM) Member — 2021

Skillset

Programming Languages: Python, SQL, MATLAB, Java, R, C/C++, HTML/CSS, CUDA
Lab Skills: Mouse/macaque handling & behavior, 2-photon calcium imaging, infrared imaging, fluorescence imaging, teleost fish rearing and care, RT-qPCR, Western blotting
Data Skills: Fiji, dimensionality reduction, Keras/TensorFlow, machine learning, GUI/PyQT, Git
Select Coursework: numerical linear algebra, dynamical systems, molecular biology, biochemistry, complex analysis, numerical methods, dimensionality reduction, partial differential equations, convex optimization, high-performance computing, scientific computing, data science.