

## 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; 8<sup>th</sup> percentile)**

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.

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 preparation*. [Conducted data collection, formal analysis, validation, data visualization, and manuscript writing](#).

Gillon C.J., Lecoq J.A. *et al.* (**10<sup>th</sup>** 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., Fegghi 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.* (**24<sup>th</sup>** 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.* (**10<sup>th</sup>** 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.* (**20<sup>th</sup>** 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. *Accepted at JNeuro* (2023). [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.* (**44<sup>th</sup>** 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.* (44<sup>th</sup> 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.* (17<sup>th</sup> 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, Toronto, 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

- o Led discussion sections.

Teaching Fellow – PS 231: Physiological Psychology (Dr. Ben Wormwood) Fall 2019

- o 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

- o Prepared labs introducing undergraduates to neuroscience benchwork.

## Service **Career Advising**

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

## **Inclusivity of Underprivileged Groups**

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

## **Student/Employee Advocacy**

- o Grad. Student Union Rep. (SEIU Local 509) – Boston University Fall 2022 – Present
- o AI RADS Organizing Committee – Allen Institute Fall 2018 – Spring 2019
- o 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  
**Hobbies:** boxing, Brazilian jiu-jitsu, cycling, outrigger canoe paddling, rock climbing