

Keven J. Laboy-Juárez, PhD.
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Education

Postdoctoral Fellow

Center for Brain Science, Harvard University

March 2019 – February 2023

Doctor of Philosophy in Neuroscience

Helen Wills Neuroscience Institute, University of California, Berkeley

Awarded: December 2018

Bachelor of Science in Molecular Cell Biology and Theoretical Physics

University of Puerto Rico, Río Piedras Campus

Awarded: May 2012

Publications

Laboy-Juárez KJ, Langberg Tomer, Ahn Seoiyoung & Feldman DE. (2019) Elementary motion sequence detectors in whisker somatosensory cortex. *Nature Neuroscience*

LeMessurier AM, **Laboy-Juárez KJ**, McClain K, Chen S, Nguyen T & Feldman DE. (2019) Tactile enrichment drives emergence of functional columns and improves sensory coding in the whisker map in L2/3 of mouse S1. *eLife*

Laboy-Juárez KJ*, Ahn Seoiyoung* & Feldman DE. (2019) A normalized template matching method for improving spike detection in extracellular voltage recordings. *Scientific Reports* [* equal co-authors]

McGuire LM*, Telian G*, **Laboy-Juárez KJ***, Miyashita T, Lee DJ, Smith KA & Feldman DE. (2016) Short Time-Scale Sensory Coding in S1 during Discrimination of Whisker Vibrotactile Sequences. *PLoS Biology* [* equal co-authors]

Grants and awards

- National Institute of Health (NIH) DSPAN F99/K00 Award (2017 - 2023)
- National Science Foundation (NSF) GRFP Fellow (2013 - 2016)
- Member of the NIH Research Initiative for Scientific Enhancement program (RISE) (2010 - 2012)

Research Experience

Molecular Sciences Research Center, University of Puerto Rico

Principal Investigator

August 2023 – Present

Behavioral and computational neuroscience laboratory (aims)

- Will implement an automated behavioral training system to study decision-making and pathological alterations that lead to compulsive behaviors.
- Will implement neural circuit manipulation techniques (lesions & optogenetics) to identify neural populations associated with different behavioral computations.
- Will implement viral tracing techniques to delineate the anatomical structure of neural circuits associated with decision-making.
- Will have a computational neuroscience team that will analyze data from UPR researchers and collaborators.

Harvard University
Postdoctoral Fellow; Advisor: Dr. Bence P. Ölveczky

Cambridge, MA
March 2019 – Present

Behavioral and neurophysiological mechanisms underlying motor skill learning

- Used autoregressive models on time series data of kinematics to determine how rats update motor behavior and maximize reward acquisition on a fast timescale (seconds).
- Used nonlinear least squares to fit learning curves for skill acquisition of individual rats at slow timescales (days).
- Used dimensionality reduction and classification techniques on regression coefficients to understand how motor learning curves vary across individuals and change after neural manipulations.
- Used intersectional viral strategies for neuron-type specific manipulations.
- Incorporated optogenetics for acute neural circuit manipulation during automated behavioral training.
- Tracing and anatomical delineation of neural circuits.

University of California, Berkeley
Graduate Student; Advisor: Dr. Daniel E. Feldman

Berkeley, CA
August 2012 – December 2018

Identifying neural codes for complex tactile stimuli

- Used constrained and regularized regressions to identify sensory features that predict neural activity.
- Used Monte Carlo, bootstrapping, and mixed models for hypothesis testing.
- Trained multi-class classifiers to decode tactile stimuli from features in neural data.
- Performed long and stable extracellular voltage recordings of neurons in mouse somatosensory cortex in vivo.
- Trained mice in head-fixed sensory detection tasks.

Development of signal detection algorithms in voltage time series data from brain recordings

- Used template matching and signal detection theory to detect neural signals in low signal-to-noise data.
- Used Monte Carlo simulations to benchmark detection algorithm

University of Puerto Rico, Medical Sciences Campus
Undergraduate Student Researcher; Advisor: Dr. Carlos Jimenez-Rivera

San Juan, PR
August 2009 – August 2012

Role of the noradrenergic system in compulsive drug sensitization

- Stereotaxic surgery for cannula implant.
- Delivered pharmacological agents to specific brain areas in vivo to determine the role of specific neuromodulators in drug sensitization.
- Performed ex vivo patch clamp recordings to identify changes in neuronal excitability after drug sensitization.

Professional Experience

University of Puerto Rico, Medical Sciences Campus
Research Consultant, Supervisor: Dr. Carlos Jimenez Rivera

Hato Rey, Puerto Rico
March 2023 – July 2023

- Whole-cell voltage recording data analysis and modeling.
- Grant writing and experimental design.

Banco Popular Inc.

San Juan, Puerto Rico

Data Science Consultant, Supervisor: Carlos Lopez Cruz

February 2023 – Present

- Model governance policy design and monitoring strategy.
- Data-driven optimization of fraud detection models.

Emerald Bay Ventures Inc.

Coral Springs, FL

Data Science Consultant; Supervisor: Carlos Hermida, CPA

January 2022 – January 2023

- Co-designed charting software for stock market and macroeconomic data.
- Supervision of programmer that implemented software design in Python with Dash.
- Design of backtesting tools to validate and optimize investment strategies.

- Trained engineers on electroencephalogram (EEG) signal neurophysiology and data analysis.
- System design for synchronization of EEG data acquisition with virtual driving simulator.
- Designed experiments to detect event-related-potentials from EEG during use of the driving simulator.

Skills

Data analysis

- Proficient with MATLAB and Igor Pro
- Data mining and visualization: extensive experience making software for storing, processing and extracting insight from high dimensional data sets.
- Predictive modeling, data classification and clustering: generalized linear models, nonlinear least squares, multi-class classification, k-means, convolutional neural networks.
- Optimization methods, time series analysis and signal processing: Newton's method, gradient descent, autoregressive models, nonlinear filtering, and event detection.

Experimental methods

- Stereotaxic surgery for neural recordings.
- In vivo neurophysiology
- Hypothesis testing: mixed models, parametric and non-parametric tests, bootstrapping.
- Immunostaining, brain fixation and slicing.
- Automated and hands-on behavioral training in rodents.
- Model validation: k-fold cross-validation, likelihood ratio test, Monte Carlo simulation.

Written and verbal communication

- Peer-reviewed scientific publications
- Fully bilingual (Spanish / English)
- More than \$500k in research funding via federal proposals.
- Teaching in neurophysiology, signal processing and modeling.

Project management

- Team building and mentoring.
- Project design, scheduling, and milestone tracking.

Conference presentations

Oral Presentations:

- NEURAL conference, University of Alabama (Summer 2018)
- Cold Spring Harbor Laboratory, Neural Circuits meeting (Spring 2018)
- 30th Annual Barrels Conference at Johns Hopkins University (Fall 2017)

Poster Presentations:

- Society for Neuroscience meeting (2018 and 2015)
- UC Berkeley Neuroscience retreat (2017)

Leadership and teaching experience

- Panelist in professional development workshop at Society for Neuroscience (2018)
 - Discussed strategies for networking and collaborating in the academic environment.
- Co-founder, UC Berkeley Neuro-data-mining-group (2015-present)
 - Organized bi-weekly meetings where experimental and theoretical neuroscientists discuss data-analytic methods used to analyze neural data.
- Graduate Student Instructor, Biophysical Neurobiology MCB 166 (Spring 2015)
 - Discussed the biophysical processes underlying neurotransmission and electrical signaling in neurons.
- Instructor at Summer Math and Science Honors (SMASH) Academy (Summer 2014)
 - Designed and taught an introduction-to-physics course for high school students.
- Graduate Student Instructor, Drugs and the Brain MCB 62 (Fall 2013)
 - Discussed the physiological effects of psychoactive drugs in the nervous system.

Science communication and interviews

- Harvard Brain Initiative interview about my interests and postdoctoral research (2021)
(https://brain.harvard.edu/hbi_humans/keven-laboy-juarez/)
- Scientist on the Subway interview about my interests and neuroscience training (2020)
(<https://scisub.com/2020/10/05/keven-laboy-juarez/>)

References

Dr. Bence P. Ölveczky

Center for Brain Science
Harvard University
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Dr. Daniel E. Feldman

Helen Wills Neuroscience Institute
University of California, Berkeley
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Dr. Carlos Jimenez Rivera

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of Puerto Rico, Medical Sciences Campus.
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