Dr. **Mateo López Espejo**

Neuroscientist, Data Scientist, Swordsman

PROFILE

Systems neuroscientists interested in memory, learning, sensory-motor control, neural codes, their underlying physiology, and computational models to explain them.

EXPERIENCE

UNAL LABORATORY OF COGNITIVE ECOLOGY

Short Term Research Collaborator

July. 2023 – | Bogota, Colombia

Researched how flower preference of honey bees depends on flower manipulation.

- Design and build artificial puzzle flowers equipped with a low video recording systems controlled by raspberry-pi
- Acquire high speed videography of bee flower manipulations
- Generate pose estimation and behavior motif decomposition using machine learning tools (Deeplabcut + VAME)

OHSU LABORATORY OF BRAIN, HEARING AND BEHAVIOR

Graduate Researcher

Oct. 2017 – Dec. 2022 | Portland, OR

Researched how past sound information changes the response to ongoing sound in population of auditory cortex neurons.

- Develop sound stimulation paradigm optimizing sound combinations for a limited recording time. Done as an instance of an exact cover problem and solved with the Knuth's Algorithm X.
- Acquire *in vivo*, awake, neuronal population responses of ferrets to auditory stimuli using silicon microelectrode arrays: **Neuropixels** and others.
- Identify neuronal subtypes using viraly transfected **optogenetic** tools for optotagging and spike wave shape analysis.
- Quantify difference between inherently noisy neuronal responses with high sensitivity and low false positive rate using a combination of parametric statistics and Montecarlo methods.
- Quantify the effects of different brain regions, sound relationships, and cell types on the measured auditory responses using multivariate linear regression.
- Implement interpretable **linear Non-linear models** to predict neuronal auditory responses as a function of sound and prior neuronal activity.
- Quantify sound information present in the neuronal population activity using decoder models based on support vector machines.

UNAL NASI & GOMEZ LABORATORY

Undergraduate Researcher

2013 – June 2016 | Bogota, Colombia

- Develop snail single neuron dissociation protocol for patch clamp
- Identify protein complex implicated in light transduction in squid retina using co-immunoprecipitation
- Amplify and clone genes associates with the identified proteins

PUBLICATIONS

- *Lopez Espejo, M*, & David, S. V. (2023). **A sparse code for natural sound context in auditory cortex**. Current Research in Neurobiology. `https://doi.org/10.1016/j.crneur.2023.100118`.
- *Lopez Espejo, M*, Schwartz Z. P., & David, S. V. (2019). **Spectral tuning of adaptation supports coding of sensory context in auditory cortex**. PLoS Comput Biol 15(10): e1007430. `https://doi.org/10.1371/journal.pcbi.1007430`.

EDUCATION

OREGON HEALTH & SCIENCE UNIVERSITY (OHSU)

Ph.D in Neuroscience

2016 - 2022

UNIVERSIDAD NACIONAL DE COLOMBIA (UNAL)

BS in Biology

2010 - 2015

SKILLS

LABORATORY

- *In-vivo* multi-electrode array electrophysiology
- *In-vitro* patch-clamp
- Sterile surgery
- Histology and immunolabeling
- Cloning and basic molecular biology
- Familiar with 2-Photon microscopy

PROGRAMMING

Experienced:

• Python (NumPy, Pandas, SciPy, Plotly) • git

Familiar:

• Machine learning (TensorFlow, PyTorch) • SQL (MySQL, Postgres) • Linux • LaTeX

CONCEPTUAL

- Biological neuronal networks
- Deep artificial neural networks
- Supervised and unsupervised learning
- High dimensional latent spaces and neuronal representations
- Statistics and Montecarlo simulations
- Time series forecasting

SOFT

- Scientific writing
- Scientific illustration (Inkscape)
- Public speaking and science communication
- Teaching and mentoring
- 3D Modeling and printing (FreeCad)

LINKS

mateo.lopez.espejo@gmail.com

Github

Google Scholar

Personal Page

SELECTED ABSTRACTS

- *López Espejo M.*, Amaya Marquez, M. **Bee manipulation of flowers constraints foraging preference**. Janelia Research Campus, VA: Bridging Diverse Perspectives on the Mechanistic Basis of Foraging, 2024.
- *López Espejo M.*, David, S. V. **Sparse representation of sensory context by single neurons in auditory cortex**. San Diego, CA: Society for Neuroscience (SFN), 2022.
- *López Espejo M.*, David, S. V. **Differential temporal modulation tuning in auditory responses between inhibitory and excitatory neurons in ferret auditory cortex**. Chicago, Il: Society for Neuroscience (SFN), 2021.
- Heller C. R., Saderi D, *López Espejo M.*, David, S. V. **Task engagement selectively enhances population discrimination of behavior-relevant categories in primary auditory cortex**. Denver, CO: Computational and Systems Neuroscience (COSYNE), 2020
- *López Espejo M.*, David, S. V. **Long lasting contextual discrimination in non primary auditory cortex**. Chicago Il: Advances and Perspectives in Auditory Neuroscience (APAN), 2019.
- Prieto J.D., *López Espejo M.*, Gómez M., & Nasi E. **A phototransduction complex in the retina of squid: generality of the transducisome for light signaling**. Buenos Aires, Argentina: Congreso latinoamericano de neurociencias, 2017.

HONORS/AWARDS

2016 Promising scholar award CDI, OHSU.
2010 Best admission exams for Biology, B.S, UNAL.

TEACHING EXPERIENCE

2017 Systems Neuroscience, TA, OHSU.
2015 Microbiology, TA, UNAL.
2014 Animal physiology, TA, UNAL.

REFERENCES

DR. STEPHEN V. DAVID
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DR. ENRICO NASI LIGNAROLO
BS ADVISOR
enasil@unal.edu.co