Eliezyer Fermino de Oliveira
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Scholar Google Profile

Education

Ph.D. Candidate in Neuroscience
Albert Einstein College of Medicine, NY, USA 2018-Present
Expected completion: early 2025
Master of Science in Biomedical Sciences July, 2020
Albert Einstein College of Medicine, NY, USA
Master of Science in Neuroscience and Cognition
Universidade Federal do ABC, Santo Andre, Brazil July, 2018
Bachelor of Science in Biomedical Engineering
Universidade Federal do ABC, Santo Andre, Brazil June, 2017
Bachelor of Science in Science and Technology
Universidade Federal do ABC, Santo Andre, Brazil August, 2014

Research Interests

Systems neuroscience, computational neuroscience, reinforcement learning, signal processing, instrumentation and control systems.

Research Experience

Albert Einstein College of Medicine: PhD Candidate
Department of Neuroscience - Bronx, NY 2018 - Present
Investigator: Dr. Lucas Sjulson, MD PhD

- Investigating the constraints of internally generated activity into representations of movements and visual stimuli
- Development of a generalized contrastive PCA approach to unveil hidden structures in data from different experimental conditions
- Exploring network replay as a second window for reward updates in the ventral striatum

New York University: Research Scholar
Department of Neuroscience and Physiology - New York, NY 2017 - 2018
Investigator: Dr. Gyorgy Buzsaki, MD PhD

- Developed a real-time closed-loop detection of sharp wave - ripples for optogenetic stimulation
- Conceived a model of colliding sharp wave - ripples and performed analysis showing they create false oscillatory activity

Universidade Federal do ABC: Master of Science - Santo Andre, Brazil 2016 - 2018
Center for Mathematics, Computing, and Cognition
Investigator: Dr. Marcelo Bussotti Reyes, PhD

- Investigated the interaction between the prefrontal cortex and dorsal striatum of rats during the learning of a self-timed response duration task. This required the implementation of a dual brain region electrophysiology recording in freely moving rats.

Universidade Federal do ABC: Undergraduate Research - Santo Andre, Brazil 2014 - 2015
Center for Mathematics, Computing, and Cognition
Investigator: Dr. Marcelo Bussotti Reyes, PhD

- Assessed the physiological effects of trace fear conditioning in anesthetized animals.

Universidade Federal do ABC: Undergraduate Research - Santo Andre, Brazil 2011 - 2012
Center for Mathematics, Computing, and Cognition
Investigator: Dr. Francisco Fraga, PhD

- Inspected multiple biomarkers of Alzheimer's disease, specifically identifying the absence of gamma rhythm as one of the most significant predictors of the disease

Leadership and Community Engagement

Co-Founder
Open Science Brasil (opensciencebr.com), Brazil
2016 – Present

- Co-founded an open science initiative in Brazil to distribute affordable open hardware equipment and provide training to researchers in response to cuts in science funding.
- Led the modification of electrophysiological recording systems (Open Ephys) by replacing imported components with locally sourced materials, reducing costs by a factor of 24 compared to commercial systems.
- Distributed these systems to several research labs, enabling them to expand their research techniques to state-of-the-art.
- Organized training sessions to ensure researchers could effectively use the equipment and perform reproducible science.

Publications

Eliezyer Fermino de Oliveira*, Soyoun Kim*, Tian Season Qiu, Adrien Peyrache, Renata Batista-Brito, Lucas Sjulson, Off-manifold coding in visual cortex revealed by sleep. bioRxiv (2022) *https://doi.org/10.1101/2022.06.10.495710* - In review at Nature Neuroscience

Eliezyer Fermino de Oliveira*, Pranjal Garg, Jens Hjerling-Leffler, Renata Batista-Brito, Lucas Sjulson. Identifying patterns differing between high-dimensional datasets with generalized

contrastive PCA (2025). PLOS Computational Biology https://doi.org/10.1371/journal.pcbi.1012747

Gabriela Chiuffa Tunes*, **Eliezyer Fermino de Oliveira***, et al, (2022). Time-Encoding Migrates from Prefrontal Cortex to Dorsal Striatum During Learning of a Self-Timed Response Duration Task. eLife 11:e65495; doi: https://doi.org/10.7554/eLife.65495

Nicolas Guyon, Leonardo R. Zacharias, **Eliezyer Fermino de Oliveira,** et al., Network Asynchrony Underlying Increased Broadband Gamma Power. *J. Neurosci.* 41, 2944–2963 (2021). https://doi.org/10.1523/JNEUROSCI.2250-20.2021

Eliezyer Fermino de Oliveira, Clayton Thomas Dickson, Marcelo Bussotti Reyes (2020). Hippocampal and lateral entorhinal cortex physiological activity during trace conditioning under urethane anesthesia. *J. Neurophysiol.* **124**, 781–789. https://doi.org/10.1152/jn.00293.2020

Fernández-Ruiz, A., Oliva, A., **Fermino de Oliveira, E.**, Rocha-Almeida, F., Tingley, D., & Buzsáki, G. (2019). Long-duration hippocampal sharp wave ripples improve memory. ***Science***, *364*(6445), 1082–1086. https://doi.org/10.1126/science.aax0758

Oliva, A., Fernández-Ruiz, A., **Fermino de Oliveira, E.**, & Buzsáki, G. (2018). Origin of Gamma Frequency Power during Hippocampal Sharp-Wave Ripples. *Cell Reports*. https://doi.org/10.1016/j.celrep.2018.10.066

Fraga, F. J., Falk, T. H., Trambaiolli, L. R., **Oliveira, E. F.**, Pinaya, W. H. L., Kanda, P. A. M., & Anghinah, R. (2013). Towards an EEG-based biomarker for Alzheimer's disease: Improving amplitude modulation analysis features. In 2013 IEEE ICASSP (pp. 1207–1211). IEEE. http://doi.org/10.1109/ICASSP.2013.6637842

Kanda, P. A. M., **Oliveira, E. F.**, & Fraga, F. J. (2017). EEG epochs with less alpha rhythm improve discrimination of mild Alzheimer's. CMPB, 138, 13–22. http://doi.org/10.1016/j.cmpb.2016.09.023

*contributed equally

Journal Reviewer

Journal of Neuroscience Methods

Teaching Experience

Guest Lecturer

Spike Sorting Workshop - Graduate level class 2020 - 2024
Albert Einstein College of Medicine

Teaching Assistant
Neural Signal Processing (NCG-004) - Undergraduate level class 2016
Universidade Federal do ABC

Teaching Assistant
Advanced Biomedical Instrumentation (EN2331) - Undergraduate level class 2016
Universidade Federal do ABC

Scientific Presentations

Neuroscience Retreat - Albert Einstein College of Medicine, 2024
Sleep reveals differential coding of movements and stimuli in the visual cortex - **Invited Talk**

NEXTEN conference, 2024.
*Generalized Contrastive PCA (gcPCA): a generalized framework for finding low-dimensional subspaces that differ between experimental condition*s. Poster

NTT Data, 2024. Portugal
Generalized Contrastive PCA - **Invited Talk**

Universidade Federal de Minas Gerais, 2023. Belo Horizonte, Brazil
Neuroscientific databases use for refinement of the experimentalist research - **Invited Talk for Graduate School class**

Neuroscience, 2023.
*Generalized Contrastive PCA (gcPCA): a generalized framework for finding low-dimensional subspaces that differ between experimental condition*s. Poster

Lake Conference - Neural Coding & Dynamics, 2023, Seattle
Off-manifold coding in visual cortex revealed by sleep. Poster

Universidade Federal de Minas Gerais, 2022. Belo Horizonte, Brazil
Intrinsic neural correlations allow sparse coding in the visual cortex - **Invited Talk**

Neuromatch Conference, 2022.
Off-manifold coding in visual cortex revealed by sleep. **Short Talk**

Dominick P. Purpura Department of Neuroscience Retreat, 2022.
Off-manifold coding in visual cortex revealed by sleep. Poster Presentation (**Awarded best poster among graduate students**)

Computational and Systems Neuroscience, 2022. Lisbon, Portugal.
Movement and stimuli are differentially encoded in on- or off-manifold subspaces revealed by sleep. Poster Presentation

47th Annual Meeting of Society for Neuroscience, 2017.
The role of prefrontal cortex-striatum pathway in time tasks - Poster Presentation

Universidade Federal de Minas Gerais, 2017. Belo Horizonte, Brazil
Hippocampal and entorhinal cortex physiological activity during trace conditioning under anesthesia - **Invited Talk**

46th Annual Meeting of Society for Neuroscience, 2016.
Validation and biological relevance of a real-time ripple detection module for open-ephys - Poster Presentation

46th Annual Meeting of Society for Neuroscience, 2016.
Delta and Low Theta band mediates Tone Fear Conditioning under urethane anesthetized rats. Poster Presentation

1st Neuroscience and Cognition Graduate Program Symposium, 2016.
Trace conditioning in rodents under anesthesia. Poster Presentation (**Honorable Mention** - 2nd best work from the graduate program)

3rd Brazilian Meeting on Brain and Cognition, 2015.
Electrophysiological signatures of fear conditioning in the dorsal striatum of anesthetized rats. (**Honorable Mention** - 2nd best presented poster). Poster Presentation

Grants and Fellowship

Trainee Professional Development Award - Society for Neuroscience Meeting, 2023

Mentorship Travel Grant - Computational and Systems Neuroscience (CoSyne) conference, 2022

Student Travel Award - Big Data Neuroscience Workshop, 2019

Research Internships Abroad (grant #2017/0379-2) - Investigating the neural substrates of temporal task learning. Master of Science, São Paulo Research Foundation (FAPESP), 2017

Master of Science Fellowship (grant #2016/05473-2) - Electrophysiological characterization of prefrontal-striatal pathway activity in temporal task learning. Master of Science, São Paulo Research Foundation (FAPESP -), 2016.

Research Internships Abroad (grant #2014/12904-4) - Lateral Entorhinal Cortex role in modulation of Hippocampus LFP to bind discontiguous events. Undergraduate Research Program, São Paulo Research Foundation (FAPESP), 2015

Undergraduate Fellowship (grant #2013/13665-0) - Electrophysiological signatures of Fear Conditioning in the Dorsal Striatum. Undergraduate Research Program, São Paulo Research Foundation (FAPESP), 2014

Undergraduate Fellowship - Use of techniques of signal processing on discovery of a biomarker on Alzheimer's disease in EEG. Universidade Federal do ABC, 2012

References
Available upon request