Pantelis Antonoudiou, PhD

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pantelis-antonoudiou pantelisantonoudiou Publications

SUMMARY

Research Scientist with a background in neural signal analysis and electrophysiology, specializing in EEG/LFP data and the dynamics of brain oscillations. I develop end-to-end pipelines that combine classical signal processing with machine learning. My current work focuses on mechanistic interpretability in deep learning, using CNNs to uncover how models classify electrographic seizures.

EDUCATION

PhD Neuroscience, University of Oxford, UK 2014 - 2018
MSc Neuroscience, University of Oxford, UK 2013 - 2014
BSc Biomedical Science, University College London (UCL), UK, First Class Honors 2010 - 2013

RELEVANT SKILLS

LANGUAGES: Python, MATLAB, SQL, HTML, CSS, Arduino, IgorPro.
PYTHON TOOLBOXES: MNE, NumPy, Pandas, SciPy, Keras (TensorFlow), PyTorch, Scikit-learn, Numba, Flask, Seaborn, Matplotlib, Beautiful Soup, MySQL Connector, Click, Dash, Plotly.

RELEVANT SOFTWARE PROJECTS

SeizyML: Interpretable Seizure Detection Toolkit (2025)

- Developed an open-source Python application for semi-automated seizure detection using interpretable machine learning models.
- **Publication:** https://doi.org/10.1007/s12021-025-09719-4
- **GitHub:** https://github.com/neurosimata/seizy_ml

SAKE: Analysis Toolkit for Electrophysiology (2022)

- Co-developed a Python-based tool for organizing and efficiently analyzing EEG/LFP recordings.
- Enabled efficient data handling, analysis, and visualization for neuroscientific research.
- **GitHub:** https://github.com/SAKEverse/sake

MATWAND: Spectral Analysis GUI for EEG (2019)

- Developed a MATLAB application for interactive spectral analysis of EEG data.
- Streamlined analysis workflows, reducing processing time and improving reproducibility in experimental neuroscience.
- **GitHub:** https://github.com/pantelisantonoudiou/MatWAND

WORK EXPERIENCE

Scientist II, Tufts University, Boston, MA — May 2022 - Present

- Led and contributed to the publication of specialized articles in high-impact neuroscience journals, focusing on the intersection of neural oscillations and behavioral outcomes.
- Developed ML-based pipelines for detecting electrographic seizures using interpretable ML models.
- Currently dissecting a CNN model to reveal internal representations of neurons and understand how seizure classification decisions are formed.

Research Associate, Tufts University, Boston, MA — July 2020 - April 2022

- Responsible for implementation of data analysis pipelines and overseeing data management.
- Guided Postdocs and Graduate Students for independent data analysis including LFP/EEG recordings.

- Co-developed a Python application for organizing and analyzing EEG/LFP signals.
- Developed a web application using Flask, HTML and MySQL for mouse colony management.

Postdoctoral Researcher, Tufts University, Boston, MA **May 2018 - June 2020**

- Investigated emotional disorders using data analysis of electrical brain signals (EEG/LFP data).
- Established the first *ex-vivo* gamma oscillation model in Basolateral Amygdala from acute brain slices in mice.
- Developed a MATLAB application for efficient and interactive spectral analysis (MATWAND) of EEG signals.
- Developed MATLAB analysis for single cell current clamp and Opto-LFP recordings.

PhD Researcher (Mann Lab), University of Oxford, Oxford, UK **September 2014 - July 2018**

- Investigated the role of interneurons in hippocampal network oscillations using ex-vivo hippocampal LFP recordings and optogenetics.
- Wrote scripts using IgorPro for automated and unbiased analysis of electrophysiological data.
- Developed simple-closed loop monitoring using Arduino for barrel cortex stimulation (whisker deflection, optogenetics).
- Performed data exploration, cleaning and visualization of neurophysiological time-series data.

MSc Student (Bogacz & Lamsa Labs), University of Oxford, UK **December 2013 - April 2014**

- Explored how NMDA receptor hypofunction causes altered γ-oscillations using computational modelling and experimental data analysis.

SELECTED PUBLICATIONS

- ***Antonoudiou, P.**, Basu, T., & Maguire, J. (2025). SeizyML: An Application for Semi-Automated Seizure Detection Using Interpretable Machine Learning Models. Neuroinformatics, 23(2), 23.*
- **Antonoudiou P**., Colmers P.L.W., Walton N.L., Weiss G.L., Smith A.C., Nguyen D.P., Lewis M., Quirk M.C., Barros L., Melon L.C., Maguire J.L. Allopregnanolone Mediates Affective Switching Through Modulation of Oscillatory States in the Basolateral Amygdala. Biol Psychiatry. 2022 Feb 1;91(3):283-293.
- ***Antonoudiou, P**., Stone, B. T., Colmers, P. L., Evans-Strong, A., Teboul, E., Walton, N. L., ... & Maguire, J. (2024). Experience-dependent information routing through the basolateral amygdala shapes behavioral outcomes. Cell reports, 43(7).*
- *Stone, B. T., **Antonoudiou, P**., Teboul, E., Scarpa, G., Weiss, G., & Maguire, J. L. (2025). Early life stress impairs VTA coordination of BLA network and behavioral states. Journal of Neuroscience.*
- *Basu, T., **Antonoudiou, P**., Weiss, G. L., Coleman, E. M., David, J., Friedman, D., ... & Maguire, J. (2024). Hypothalamic–pituitary–adrenal axis dysfunction elevates SUDEP risk in a sex-specific manner. eneuro, 11(7).*
- ***Antonoudiou, P**., Stone, B., Colmers, P. L., Evans-Strong, A., Walton, N., & Maguire, J. (2023). Influence of chronic stress on network states governing valence processing: Potential relevance to the risk for psychiatric illnesses. Journal of neuroendocrinology, 35(9), e13274.*
- ***Antonoudiou, P.,** & Maguire, J. L. (2020). How Deep Learning Solved My Seizure Detection Problems. Epilepsy Currents, 20(5), 306-308.*
- ***Antonoudiou, P.**, Tan, Y. L., Kontou, G., Upton, A. L., & Mann, E. O. (2020). Parvalbumin and somatostatin interneurons contribute to the generation of hippocampal gamma oscillations. Journal of Neuroscience, 40(40), 7668-7687.*
- *Kontou, G., **Antonoudiou, P.**, Podpolny, M., Szulc, B. R., Arancibia-Carcamo, I. L., Higgs, N. F., ... & Kittler, J. T. (2021). Miro1-dependent mitochondrial dynamics in parvalbumin interneurons. Elife, 10, e65215.*
- *Fu, X., Teboul, E., Weiss, G. L., **Antonoudiou, P.**, Borkar, C. D., Fadok, J. P., ... & Tasker, J. G. (2022). Gq neuromodulation of BLA parvalbumin interneurons induces burst firing and mediates fear-associated network and behavioral state transition in mice. Nature communications, 13(1), 1-16.*