

Jacob Poschl

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Research Experience

Research Staff

Apr 2026 – Present

University of Pennsylvania — Advisor: Eva Dyer

- Built PyTorch training and evaluation pipelines for self-supervised representation learning across large-scale, multi-session neural datasets and multiple recording modalities, including electrophysiology (Neuropixels) and two-photon imaging paired with gene-expression measurements.
- **Cross-subject representation learning:** Designed evaluations for cross-subject generalization and zero-shot transfer, including held-out-animal experiments across 142 imaging sessions from 6 animals to test whether learned representations preserved biological identity in unseen subjects.
- **Zero-shot behavior decoding:** Extended the ZEN framework to a new large-scale electrophysiology dataset, training shared representations across subjects and recording conditions and implementing a supervised fine-tuning baseline; ZEN matched running-speed performance using 75% fewer target-subject trials.
- **Representation dynamics:** Analyzed how learned representations reorganize over time and across behavioral states, sessions, and subjects; used optimal transport to align embedding spaces and evaluate cross-session generalization.

Lead Undergraduate Researcher

Mar 2025 – Jun 2026

Neuromorphic Computing Group, UC Santa Cruz — Advisor: Jason Eshraghian

- Developed a self-supervised distillation framework to test whether biologically constrained spiking neural networks could learn representations similar to those produced by transformer-based predictive models.
- Built end-to-end preprocessing and training pipelines for large-scale neural recordings and implemented biologically motivated constraints on excitation, inhibition, and firing rates in spiking neural networks.
- Led a team of three undergraduates and designed cross-model representation analyses using Canonical Correlation Analysis (CCA) to quantify how closely spiking-network representations matched those learned by transformer models.

Research Assistant

Sep 2025 – Apr 2026

Bilingualism, Sociolinguistics, and Cognition Lab, UC Santa Cruz — Advisor: Ariel Chan

- Led the computational pipeline for a naturalistic Cantonese–English code-switching study, transforming **36+ hours** of transcripts from **41 speakers** into an analysis-ready corpus using Python, PyCantonese, machine translation, and reproducible preprocessing scripts.
- Designed matched linguistic controls and used language-model surprisal to quantify predictability differences between code-switched and unilingual contexts.

Publications

Active Inference with Reusable State-Dependent Value Profiles. Poschl, J. *Biological Cybernetics*, 2026.

ZEN: A Framework for Zero-Shot, Across-Subject Neural Decoding. Arora, V., Lachi, D., Mahato, S. P., Andre, A., Poschl, J., Chapuis, G., Whiteway, M. R., Dyer, E. L. *Under review, NeurIPS 2026.*

Word Predictability on Code-switching Points in Cantonese–English Discourse. Chan, A., Li, Y., Poschl, J. *Proceedings of the Society for Computation in Linguistics (SCiL)*, 2026.

Education

University of California, Santa Cruz

Sep 2023 – Jun 2026

B.S. Computer Science

GPA: 3.53

Technical Skills

Languages: Python, C

ML/Data: PyTorch, scikit-learn, NumPy, Pandas, Matplotlib, AllenSDK

Methods: Representation learning, self-supervised learning, transfer learning, optimal transport, representation analysis

Systems: Linux, Git, Docker, SLURM, Google Cloud Platform