Molin Zhao

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EDUCATION

University of California, Davis Sept. 2025 – Expected June 2029
B.S. Biomedical Engineering | **GPA:** 3.9/4.0 *Davis, CA*
Minor: Neuroscience

RESEARCH EXPERIENCE

Undergraduate Research Assistant September 2026 – Present
UC Davis Oehrn Lab *Davis, CA*

- Support DBS patient sessions and develop a single-launcher recording app integrating four GoPros, Pupil Neon eye tracking, and OpenBCI Cyton EEG/accelerometry via Lab Streaming Layer (LSL).
- Implement screen-flash calibration to align video within one frame (~33 ms at 30 fps), reject failed sessions, and export synchronized XDF recordings and multimodal review videos.

Undergraduate Research Assistant September 2026 – Present
UC Davis Health Stavisky Neuroprosthetics Lab *Davis, CA*

- Perform and analyze functional MRI (fMRI) brain scans to identify language networks in patients with aphasia.
- Serve as an MRI Safety Monitor, assisting with task procedures and supporting efficient scan sessions.

Undergraduate Research Assistant January 2026 – Present
UC Davis Starr-Luxton Lab *Davis, CA*

- Develop and package a PyTorch pipeline for automated *C. elegans* centerline detection, 3D straightening, and anatomical orientation.
- Combine synthetic-data pretraining and recurrent U-Nets to improve mean centerline F1 from 0.883 to 0.955.
- Achieve 0.95 Dice with multi-channel U-Net segmentation; cut manual data review from 45 to under 5 minutes.

INDEPENDENT RESEARCH PROJECTS

Causal Location Code in a Vision-Language Model | *PyTorch, LoRA, activation patching, Habitat* 2026

- Fine-tuned Qwen3-VL-8B with LoRA to tell where a new view was taken after a first-person walk through a room, raising accuracy from chance (52%) to 97.1% on ten held-out rooms and beating all 149 retrieval baselines tested.
- Showed with activation patching that its activations carry location and drive the decision; sole-author manuscript.

Diffusion Decoding for Brain-to-Text Speech BCI | *PyTorch, LoRA, block diffusion* 2026 – Present

- Reproduced the BIT intracortical speech decoder (Zhang et al., ICLR 2026), then cut free-generation word error from 34.2% to 21.8% with no phoneme stage by training its language model with block diffusion instead of autoregressively.

Inner-Speech Decoding from Intracortical Recordings | *PyTorch, TensorFlow, scikit-learn, Whisper* 2026

- Reproduced the brain-to-voice decoder of Wairagkar et al. (2025, *Nature*) offline, rebuilt its successor in PyTorch, and adapted it to inner speech from text alone, identifying the cued sentence among 50 in 85% of trials (chance 2%).
- Reproduced Kunz et al. (2025, *Cell*); showed listening-trained decoders recover 1/3–1/2 of inner speech's decodability.

Self-Supervised Pretraining for fMRI Semantic Decoding | *PyTorch, ridge regression* 2026

- Tested under pre-specified protocols whether self-supervised pretraining helps decode story-listening fMRI: it did not beat ridge regression on raw BOLD, while dense targets and encoding-weighted voxels raised test r from 0.122 to 0.230.

ACTIVITIES

Clinical Volunteer December 2025 – Present
Kaiser Permanente Medical Center *Vacaville, CA*

- Assist ~150 patients per shift with wayfinding and front-desk support; transport ~12 patients by wheelchair.

TECHNICAL SKILLS

Programming/Data:	Python, MATLAB, R, Java, Swift, C; NumPy, SciPy, pandas, scikit-learn, scikit-image.
Machine Learning:	PyTorch, TensorFlow, LoRA, diffusion language models, activation patching, U-Nets.
Neural Data/BCI:	Intracortical speech decoding, fMRI analysis and decoding, EEG, eye tracking, LSL, napari.
Lab/Prototyping:	qPCR, cell culture, Western blot, microscopy; Arduino, Raspberry Pi, 3D printing, MuJoCo.
AI Tools/Integration:	Claude Code, OpenAI Codex, Cursor, Ollama, Model Context Protocol (MCP).