Eric Xu

Applied math M.S. | *Machine learning for rare-event forecasting, scientific computing, GPU inference*
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Education

University of California, Santa Cruz — Santa Cruz, CA
M.S. in Scientific Computing and Applied Mathematics (Plan I thesis) — *Expected Jun 2027*
B.S. in Applied Mathematics, Highest Honors in the Major | GPA 3.77/4.00 | Dean's Honors (4 quarters) — *2024 – 2026*

- **Relevant coursework:** Scientific Machine Learning (grad), Applied Dynamical Systems (grad), Numerical Linear Algebra (grad, in progress), GPU Programming, Probability and Statistics, Classical and Bayesian Inference, Financial Mathematics

Experience

Vayuh.ai
ML Researcher (part-time) — *Jul 2026 – Present*

- Put the AI+RES rare-event sampling algorithm into production for extreme-weather forecasts 3 to 4 weeks ahead.
- Benchmarked GenCast, FourCastNet 3, and SFNO in different ensemble configurations on H100 nodes and cut compute per forecast case about 27x (33.5 to 1.23 H100-hours).
- Profiled runs with NVIDIA Nsight and nvidia-smi to find the slowest stages and GPU kernels, then optimized them.

TACS Lab, UC Santa Cruz — Santa Cruz, CA
Undergraduate and Graduate Researcher (Advisor: Prof. Ashesh Chattopadhyay) — *Sep 2025 – Present*

- Adapting AI+RES (Lancelin et al., 2025) to weather forecasts 3 to 4 weeks ahead. The method clones and prunes AI weather-model ensembles (FourCastNet 3, GenCast) by score to oversample rare heat waves and cold outbreaks.
- Built the batch pipeline (JAX, PyTorch; Slurm on H100 nodes, PBS on NCAR Derecho) that launches ensembles weeks before past US extremes and backtests them against historical observations (ERA5).

Projects

4D-Var Data Assimilation with a Learned Inverse Operator | *PyTorch, L-BFGS* — Apr – May 2026

- AM 170B capstone on variational state estimation (team of 5). Wrote most of the PyTorch port of Frerix et al. (ICML 2021, originally JAX) and reproduced the learned inverse observation operator and its Lorenz-96 results.
- Extended the paper with the full 4D-Var cost, noisy observations, and sliding-window cycling. Studied gradient blow-up over long assimilation windows and ran the sliding-window experiments on Lorenz-96 and 2D Kolmogorov flow.

Cross-Species Transfer Learning with DeepSEA | *PyTorch, scikit-learn* — Jun 2026

- Fine-tuned the human-trained DeepSEA CNN on mouse ENCODE DNA windows. It beat training from scratch on 115 of 133 chromatin features (median AUROC 0.877 vs 0.865).
- The fine-tuned model reached its best validation loss in 5 epochs vs 12 from scratch.

Council of Sumer | *Python, FastAPI, AGNTCY SLIM, OpenTelemetry* — Oct 2026

- Built a council of five LLM agents with conflicting goals at a hackathon (team of 3). The agents run as separate processes, debate over AGNTCY SLIM, and vote under runoff and human tie-break rules to govern the city in Hamurabi.
- Co-wrote the deliberation engine and benchmark. Over 16 seeded games the council improved on the single-LLM baseline.

Skills

Languages: Python (primary), C++ (working knowledge), MATLAB, R, Bash
ML and Scientific Computing: PyTorch, JAX, NumPy, scikit-learn; familiar: Triton (GPU kernels)
HPC and Tools: Slurm, PBS, NCAR Derecho, multi-GPU H100 nodes, Linux, Git, SSH
Mathematics: Linear algebra, ODEs and PDEs, numerical methods, optimization, inverse problems, probability, statistics

Teaching Experience

Baskin School of Engineering, UC Santa Cruz — Santa Cruz, CA
Teaching Assistant: Ordinary Differential Equations, Differential Calculus for Economics — *Sep 2026 – Present*

- Lead weekly discussion sections, hold office hours, and grade assignments.

Tutor (3 quarters) and Reader (1 quarter): Linear Algebra, Discrete Mathematics, Calculus II — *Sep 2025 – Jun 2026*