Eric Xu

Curriculum Vitae | *November 2026*
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Research Interests

Scientific machine learning; rare-event sampling and AI ensemble forecasting of weather extremes; data assimilation; dynamical systems; GPU computing for large AI weather models.

Education

University of California, Santa Cruz — Santa Cruz, CA
M.S. in Scientific Computing and Applied Mathematics, Plan I (thesis) — *Expected Jun 2027*
- One-year accelerated track. Advisor: Prof. Ashesh Chattopadhyay (TACS Lab).

B.S. in Applied Mathematics — *2024 – 2026*
- Highest Honors in the Major. GPA 3.77/4.00. Dean's Honors (4 quarters).

Research Experience

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).

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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.

Selected 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.
- Code: github.com/ericxu1070/invobs-data-assimilation

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.
- Code: github.com/ericxu1070/DeepSEA-Transfer-Learning

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.
- Code: github.com/ericxu1070/council-of-sumer

Teaching

Baskin School of Engineering, UC Santa Cruz — Santa Cruz, CA
Teaching Assistant — *Fall 2026*
- AM 20 Ordinary Differential Equations for Engineers; AM 11A Mathematical Methods for Economists I.
- Lead weekly discussion sections, hold office hours, and grade assignments.
- Pedagogy training: AM 200 Teaching in Applied Mathematics (Fall 2026).

Tutor and Reader *Fall 2025 – Spring 2026*

- Tutor for AM 10 Mathematical Methods I (Linear Algebra), 3 consecutive quarters.
- Reader for CSE 16 Applied Discrete Mathematics; tutor for MATH 19B Calculus II.

HONORS

Highest Honors in the Major, B.S. Applied Mathematics, UC Santa Cruz, 2026
Dean's Honors, UC Santa Cruz, 4 quarters

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

COURSEWORK

Graduate: Scientific Machine Learning (AM 261); Applied Dynamical Systems (AM 224); Machine Learning and AI in Genomics (AM 234); Numerical Linear Algebra (AM 213A, in progress); Teaching in Applied Mathematics (AM 200, in progress)

Mathematics and numerics: Mathematical Methods I–III (AM 10, 20, 100); Intro to PDEs (AM 112); Dynamical Systems (AM 114); Scientific Computing (AM 129); Computational Methods (AM 147); Mathematical Modeling I–II (AM 170A/B); Applied Discrete Mathematics (CSE 16)

Probability, statistics and finance: Probability and Statistics (CSE 107); Classical and Bayesian Inference (STAT 132); Financial Mathematics (MATH 114)

Computing: GPU Programming (AM 148); Computer Systems and Assembly (CSE 12)

ADDITIONAL INFORMATION

Citizenship: U.S. citizen

REFERENCES

Available on request.