Miles Waugh

Irvine, CA | contact@mileswaugh.com | (408) 470-0583 | miles-waugh | piano-miles

Education

BS **University of California, Irvine**, double major: Computational Physics and Computational & Applied Mathematics, third-year undergrad — Sep 2023 to present, **GPA**: 3.9

- **Coursework:** Numerical Analysis, Thermal Physics, Experimental Physics, Real Analysis, Relativity, Quantum Mechanics, Fluids, Optics, Electromagnetism, Classical Mechanics, Linear Algebra, Multivariable Calculus
- **Awards & Honors**: Dean's list all quarters, selected by Professor Whiteson to conduct high-energy particle physics research at CERN (summer 2024)

Professional Experience

Caltech SURF Program, Summer Undergraduate Researcher, Anima Lab — Pasadena, CA, Jun 2025 to present

- Trained Fourier Neural Operators (FNOs) on nonequilibrium Mott insulator dynamics in PyTorch to extrapolate toward the thermodynamic limit.
- Ran large-scale GPU jobs with SLURM and conducted ablation studies against vision transformers.
- Achieved $\sim$1500$\times$ faster runtimes with FNOs, scaling to 2048$\times$2048 lattices and generalizing far beyond the training regime.
- Results provide a novel pathway to probe avalanche photoexcitations relevant to solar cell efficiencies beyond the classical limit.

UCI, Whiteson Lab, Undergraduate Researcher — Irvine, CA, Nov 2023 to present

- Conducting high-energy physics research with the ATLAS experiment at CERN to investigate dark matter production from W' bosons.
- Generated large-scale simulated collision data using MadGraph, Pythia8, and Delphes, modeling event generation, hadronization, and detector responses.
- Trained a transformer-based machine learning model on simulated data in Python using NVIDIA A100 GPUs on a high-performance computing (HPC) cluster, outperforming the standard χ^2-based method.

European Organization for Nuclear Research (CERN), Summer Student — Geneva, Switzerland, Jun 2024 to Aug 2024

- Participated in the CERN Summer Student Program, continuing research on W' bosons and dark matter hypotheses as part of the ATLAS experiment.
- Attended lectures by leading scientists on experimental and theoretical particle physics.

Pandora Bio, Inc, Data Science Intern — Sunnyvale, CA, May 2023 to Sep 2024

- Built interactive visualizations for a cross-platform mobile app using Flutter and Dart to monitor emotional health with collected smartphone data.
- Implemented ML models with Python to extract and process user app usage data on AWS.

theCoderSchool, Computer Science Instructor — Cupertino, CA, May 2022 to August 2023

- Designed and instructed classes and workshops for students 7-17 in Scratch, Python, HTML/CSS/JS, and Java, practicing various topics including game and software development, computer simulations, and neural networks.

Delfi Diagnostics, Clinical Data Science Intern — Palo Alto, CA, Jun 2021 to Jul 2021

- Developed interactive R Shiny dashboards to visualize clinical trial data, including patient history and blood sample metrics, enabling consistent quality monitoring for early-stage cancer detection.

Publications, Patents, and Presentations

US Patent Application #63/616,140: **Early Detection Tools for Mental Health** Dec 2024

Tara Maddala, Megan Rothney, Jason Carlson, Akhil Nistala, ***Miles Waugh***, Daniel Civello, Jennifer Geis

Undergraduate Research Paper (Whiteson Lab) in progress

- Applying Generalized Permutationless Set Assignment for Particle Physics using Symmetry Preserving Attention (SPANet) to Dark Matter with Hadronically Decaying W'.

Undergraduate Research Paper (Anima Lab) in progress

- Leveraging Fourier Neural Operators (FNOs) to extrapolate time dynamics of Mott insulators toward the thermodynamic limit.

Poster Presentation: *Toward the Thermodynamic Limit: Neural Operators for Non-equilibrium Dynamics of Mott Insulators* November 2025

- Presented research poster at the *Caltech and University of Chicago Conference on AI+Science*, Pasadena, CA.

Skills & Interests

Languages: Python, C++, Java, MATLAB, Mathematica, R, ROOT, HTML/JS/CSS

Computational Skills and Frameworks: Numerical methods, optimization, machine learning, Monte Carlo simulation, data analysis

Soft Skills: Analytic thinking, problem-solving, team collaboration, technical writing, detail-oriented

Interests: Weightlifting, tennis, cooking, piano

Selected Projects

Waugh Blog blog.mileswaugh.com Sep 2024

- Developed and deployed a personal blog to write about cool concepts in math and physics.
- Tools Used: Hugo, HTML, CSS, JavaScript

Car Physics Simulator git.mileswaugh.com/t?cps Jul 2023

- A 2D car physics simulator. Simulates accurate vehicle mechanics and road forces.
- Tools Used: Turbowarp, HTML, CSS, JavaScript

Wavefunction Simulator git.mileswaugh.com/t?ws Apr 2023

- A real-time simulator to solve the time-dependent Schrödinger equation using fourth-order Runge-Kutta.
- Tools Used: HTML, CSS, JavaScript