

Miles Waugh

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Education

- BS** **University of California, Irvine**, double major: Computational Physics and Computational & Applied Mathematics, third-year undergrad Sep 2023 to present
GPA: 3.93
- **Coursework:** Numerical Analysis, Thermal Physics, Experimental Physics, Real Analysis, Complex 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)

Research Experience

- Caltech SURF Program**, Summer Undergraduate Researcher, Anima Lab Pasadena, CA
 Summer 2025
 Summer 2026
- 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 2048×2048 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 May 2026
- 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
 Summer 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.

Professional Experience

- 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

Waugh, M. , et al. (in preparation). SPANet for Dark Matter with Hadronically Decaying W' .	Paper in preparation
Waugh, M. <i>Toward the Thermodynamic Limit: Neural Operators for Non-equilibrium Dynamics of Mott Insulators</i> . Poster at ICLR 2026 Workshop on Artificial Intelligence and Partial Differential Equations.	Poster, 2026 (upcoming)
Waugh, M. , et al. (2026). <i>Toward the Thermodynamic Limit: Neural Operators for Non-equilibrium Dynamics of Mott Insulators</i> . <i>arXiv preprint</i> arXiv:2602.19484  .	Paper, 2026
Accepted to <i>ICLR 2026 Workshop on Artificial Intelligence and Partial Differential Equations</i> (poster).	
Waugh, M. (2025, November). <i>Toward the Thermodynamic Limit: Neural Operators for Non-equilibrium Dynamics of Mott Insulators</i> [Poster]. Caltech & University of Chicago Conference on AI+Science, Pasadena, CA.	Poster, 2025
Tara Maddala, Megan Rothney, Jason Carlson, Akhil Nistala, Miles Waugh , Daniel Civello, Jennifer Geis (2024). <i>Early detection tools for mental health</i> (U.S. Patent Application No. 63/616,140).	Patent, 2024

Technical Skills & Languages

Programming:

- **Advanced:** Python, Mathematica, Processing, P5js
- **Intermediate:** C++, MATLAB, Java, ROOT, R, HTML/CSS/JavaScript

Frameworks/Tools: PyTorch, NumPy, SciPy, Matplotlib, TensorFlow, LaTeX, Git, Linux, SLURM, AWS

Methods: Numerical methods, optimization, machine learning, Monte Carlo simulation, data analysis, HPC workflows

Interests: Weightlifting, tennis, cooking, piano

Academic & Professional Engagement

- **Undergraduate Mathematics Committee, UCI** — Member (2025–present)
- **Quantum Computing @ UCI** — Project Lead (2023)
Led a small team developing a variational quantum eigensolver (VQE) to approximate ground states of simple molecules using Qiskit; the project was exploratory in scope.
- **Society of Physics Students (SPS)** — Member (2023–present)
- **Astronomy Club, UCI** — Member (2023–present)
- **TKA FTC Robotics Team** — Member and Hardware Lead (2020–2022)
Designed and maintained robot hardware; awarded the *Hardware Excellence Award (2021)* for mechanical design and innovation.
- **TKA Math Club & Coding Club** — President (2021–2022)

Selected Projects

Waugh Blog	blog.mileswaugh.com 
• Developed and deployed a personal blog to write about cool concepts in math and physics (tools used: Hugo, HTML, CSS, JavaScript).	Sep 2024
Car Physics Simulator	projects.mileswaugh.com/t?cps 
• A 2D car physics simulator. Simulates accurate vehicle mechanics and road forces (tools used: Turbowarp, HTML, CSS, JavaScript).	Jul 2023
Wavefunction Simulator	projects.mileswaugh.com/t?ws 
• A real-time simulator to solve the time-dependent Schrödinger equation using fourth-order Runge-Kutta (tools used: HTML, CSS, JavaScript).	Apr 2023