Eric Sun

37-09 College Point Blvd. Flushing, New York 11354
(347) 849 0249 | ericsun@seas.upenn.edu | ericsun.net

Education

University of Pennsylvania **August 2023 – May 2027**
M.S. Physics, *Submatriculant (Joint B.A./M.S.)* *Philadelphia, Pennsylvania*
B.A. Physics, *Concentration in Computational Techniques*
B.S.E. Computer Science
Minor in Mathematics
GPA: 4.00/4.00, Vagelos Integrated Program in Energy Research (VIPER)

Experience

Amazon Web Services (AWS) **May 2025 – August 2025**
Software Development Engineer (SDE) Intern *San Francisco, California*

- Implemented abstract syntax tree (AST) based retrieval augmented generation (RAG) via Model Context Protocols (MCPs) for AWS Bedrock, boosting zero-shot accuracy for generating code from scientific papers from 15% to 95%.
- Collaborated with physicists in Professor Oscar Painter's group at Caltech to create agentic research models that can automate the process of creating, executing, and processing experiments orchestrated with Prefect on AWS EC2.
- Accelerated a Python to OpenQASM compiler to help physicists execute experiments on Ocelot chip cat qubits.
- Used Docker and Selenium to deploy automated web scrapers on AWS Lambda to populate RAG databases.

University of Pennsylvania **January 2024 – Now**
Researcher, Andrew M. Rappe Group *Philadelphia, Pennsylvania*

- Led computational quantum mechanics project to use physics-informed neural networks (PINNs) to optimize norm-conserving fully nonlocal pseudopotentials, incorporating relativistic corrections and hybrid functionals.
- Wrote FLASH, a new C++ library that's amongst the world's fastest single-atom self-consistent field (scf) solvers for the Kohn-Sham Equations with nonlocal pseudopotential support. It is expected to be released by the end of this year.
- Refactored 50k lines of self-consistent field density functional theory (DFT) routines for the OPIUM library in C and FORTRAN, including writing over 15k lines of new Kohn-Sham, Hartree-Fock, and Dirac-Fock solvers.
- Implemented simplex optimization, spline interpolation, gradient descent, Numerov's method, Verlet integration, Levenberg–Marquardt (LM) algorithms, Newton–Raphson methods, and Runge–Kutta (RK) methods in OPIUM.

Stanford University & ShanghaiTech University **January 2022 – March 2023**
Researcher, Computer Vision and Augmented Reality Group *Stanford, California*

- Worked with a joint Stanford-ShanghaiTech research project led by Kevin Fry and Professor Jingyi Yu.
- Created neural radiance fields (NeRFs) in PyTorch and augmented performance with pixel-shuffle down-sampling, increasing peak signal-to-noise ratio (PSNR) from 19.02 dB with Google's method to 33.10 dB.
- Used marching cube algorithms to turn trained NeRFs into 3-D meshes and colored using geometric projection code.
- Trained convolutional neural networks for object detection which coordinates drone swarms using the DJI SDK.

Yale University **March 2022 – November 2022**
Researcher & Summer Session Instructor, BCT 326 Group *New Haven, Connecticut*

- Wrote clustering tools for angle-resolved photoemission spectroscopy (ARPES) data of correlated insulators and cuprate superconductors with convolutional autoencoders built using TensorFlow and SciPy, improving clustering results over standard principal component analysis (PCA) by 8.86%.
- Generated artificial training data by applying Poisson sampling to tight-binding spectral bands of topological materials.
- Co-instructed superconductor seminar for the 2022 Yale Pathways to Science summer program.

Select Awards

SBB Research Group STEM Scholar (2025)
United States Physics Olympiad (USAPhO) Semifinalist, Top 200 (2023)
Tournament of Champions National Finalist, Parliamentary Debate (2023)
AAPT PhysicsBowl World Ranked 98th/5000+, Captain of Highest Ranked US Team (2022)

Technical Skills

Languages: Python, C, C++, Java, JavaScript, FORTRAN, Bash, Zsh, SQL, LaTeX
Libraries: PyTorch, Scikit-learn, Pandas, Polars, OpenCV, NumPy, SciPy, Sphinx, Matplotlib, Selenium, FastAPI, FastMCP, SQLalchemy, Prefect, MyPy, Ruff, Pydantic, Pybind11, Numba, React, React Native
Tools: Git, Docker, PostgreSQL, Slurm, Jupyter, AWS (Bedrock, Lambda, EC2, S3, OpenSearch, Aurora, Neptune)