Xing Liu

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CURRICULUM VITAE · JANUARY 2024

EDUCATION

UC Berkeley *Fall 2023 → (Spring 2027)*
Undergraduate intending to major in physics, astrophysics, and applied math. GPA: 3.94
Coursework includes Physics 5A (A^+), Physics 105 (A), and Math 110 (A).

Arcadia High School *Fall 2019 → Spring 2023*
Focused studies on physics, astronomy, and web development. GPA: 3.90
Coursework includes AP Calculus BC (5), AP Physics C (5, 5), and AP Chemistry (5).

EXPERIENCE

***Mentee,* Undergraduate Lab for Physics & Astronomy**, UC Berkeley. *Fall 2023 →*
Under the mentorship of Cooper Jacobus, my group is building a deep learning convolutional neural network to infer the large-scale distribution of extragalactic dark matter from the distribution of galaxy halos. We hope this will aid in verifying more direct surveys on dark matter structure.

***Teacher,* Society of Physics Students outreach program**, UC Berkeley. *Fall 2023 →*
My group is teaching physics lessons to elementary, middle school, and high school students in the Bay Area to inspire them with a curiosity for science. For *Splash@Berkeley*, I have wrote and taught several introductory special relativity, optics, and cosmology lessons for high schoolers.

***Co-captain,* FTC 15303 Robotics Team**, Arcadia High School *Fall 2019 → Spring 2023*
I led the design and autonomous programming of our robot's drivetrain. I modeled our ideas in CAD, including many 3D-printed parts. In our final season, I created an autonomous navigation program based on computer vision odometry, which mitigated the usual errors from IMU integration drift.

***Web & database lead,* App Development Team**, Arcadia High School *Fall 2019 → Spring 2023*
I designed and programmed my high school news app's cloud-hosted database and web-based article editing system. I added new features including a course schedule viewer, calendar, and a 3D map.

SKILLSET

Classical mechanics and relativity
Competent with tensor algebra for special relativity, Lagrangian/Hamiltonian mechanics for discrete systems, as well as vector calculus EM. Currently self-studying tensor calculus and Lagrangian/Hamiltonian classical field theory.

Quantum mechanics
Understands solutions to Schrödinger's equation in 1D, quantum states, and quantum operators. Conceptually familiar with the standard model of particle physics.

Astrophysics
Conceptually familiar with the concordance model of cosmology, as well as stellar formation, evolution, and remnants. Currently studying theoretical cosmology, in particular the growth of structure.

Data analysis and machine learning
Experienced with making numerical simulations, analyses, and visualizations in Python with NumPy, SciPy, and OpenCV. Have implemented deep-learning convolutional neural networks (CNNs) with PyTorch. Familiar with C, C^{++}, and OpenGL. Currently experimenting with generative adversarial networks (GANs).

System administration
Uses Linux (Ubuntu). Experienced with bash scripting, git/GitHub, and other command-line tools, as

well as Google Cloud, Colab, and Firebase for cloud computing, databases, hosting, and APIs.

Web design and development
Experienced with vanilla HTML/JS/CSS, as well as Jekyll, Node/NPM, React, and WebGL/ThreeJS.

CAD and electrical engineering
Experienced with OnShape CAD. Familiar with Arduinos and basic breadboard circuitry.

Miscellaneous
Dabbles in fractal art and graphic design. Fluent in English, French, Mandarin Chinese, and LaTeX.

PROJECTS

Starherd, independent work (xingyzt.net/starherd) *Summer 2023 →*
An interactive website for teaching stellar evolution, built in JS/WebGL.

Polarizar, FTC Robotics (github.com/flyorboom/polarizar) (demo) *Fall 2022 → Spring 2023*
A real-time computer vision algorithm for autonomous navigation, built in Python/OpenCV.

Map.ahs.app, App Dev Team (github.com/ahsappdevteam/voxmap) (demo) *Fall 2021 → Fall 2022*
An interactive 3D map of Arcadia High School, supporting location tags and featuring real-time ray-marched rendering, built in C/C^{++}/JS/WebGL.

ACES, App Dev Team (github.com/ahsappdevteam/aces) *Fall 2019 → Fall 2022*
A web-based content editing system for the Arcadia High School app, supporting rich text formatting, media embeds, and article recommendations, built in JS with a Google Cloud/Firebase backend.

TECHNICAL COURSEWORK

Spring 2024 (intended; may drop courses marked with * if time commitments conflict with research)
Physics 5B: *Introductory Electromagnetism, Waves, and Optics*
Physics 5BL: *Introduction to Experimental Physics I*
Physics 5C: *Introductory Thermodynamics and Quantum Mechanics*
Physics 110A: *Electromagnetism and Optics I* *
Physics 137A: *Quantum Mechanics I*
Math 104: *Introduction to Analysis* *
Astronomy/Physics C161: *Relativistic Astrophysics and Cosmology* *

Fall 2023
Physics 5A: *Introductory Mechanics and Relativity* A^{+}
Physics 24: *Freshman Seminar on Particle Physics* P
Physics 105: *Analytical Mechanics* A
Math 110: *Abstract Linear Algebra* A

Credits by examination
Math 53: *Multivariable Calculus*
Math 54: *Linear Algebra and Differential Equations*
AP Calculus BC 5
AP Physics C: *Mechanics* 5
AP Physics C: *Electricity and Magnetism* 5
AP Chemistry 5