

Xing Liu

xingyzt@berkeley.edu

I'm a second-year undergraduate at UC Berkeley with an interest in the computational and theoretical sides of planetary, stellar, and cosmological physics. I intend to major in physics and applied math.

RESEARCH & ENGINEERING

Radio astronomy phenomenology, C. Leung, UCB/CHIME:FRB. *Summer 2024* →
Calvin Leung and I are examining the effects of coherence and caustic crossings on the magnification of finite sources. These analytical models are made in anticipation for orders-of-magnitude increases in fast radio burst detections in the upcoming decade.

Stellar axion phenomenology, W. Haxton, UCB/N3AS. *Summer 2024* →
Aided by stellar simulations, Wick Haxton and I are studying the impacts that the two-photon coupling of QCD pseudoscalar axions may have on the late-stage evolution of massive stars, through energy losses and magnetospheric gamma ray signatures.

Dark Energy Spectroscopic Instrument data group, S. Bailey, LBL/NERSC. *Spring 2024*
Under Anthony Kremin, I developed a highly parallel NERSC-to-AWS data pipeline, and a cross-platform Docker environment that together make accessing and analyzing terabytes of DESI data as seamless a process to outside scientists as it is to people within the DESI collaboration.

Undergrad. Lab for Physics & Astronomy, W. Haxton, UCB. *Fall 2023 – Spring 2024*
With Cooper Jacobus, we prototyped a deep learning convolutional neural network to paint baryonic matter into dark-matter-only N-body simulations, generating statistically-accurate mock data at a fraction of the time it takes to run traditional full hydrodynamic simulations.

FTC 15303 robotics team, S. Pei, Arcadia High School. *Fall 2019 – Summer 2023*
I led the design and programming of our robot's drivetrain, using a combination of CAD, 3D printing, and machining to create many custom parts. In our final season, I created an autonomous navigation program based on computer vision odometry, mitigating the usual errors from IMU integration drift.

TEACHING

Physics department peer tutoring program, UCB. *Spring 2024* →
We work to support students in lower-division physics courses, with an emphasis on helping new students develop good study habits and feel welcome in the Berkeley physics community.

Society of Physics Students outreach program, UCB. *Fall 2023* →
Our group travels weekly to elementary, middle, and high schools across the Bay Area to inspire them with a curiosity for science. For *Splash@Berkeley*, I have wrote and taught several introductory special relativity, cosmology, and programming lessons for high schoolers.

COURSEWORK

Physics 105: <i>Analytical Mechanics</i> (C. Chiang)	A
Physics 110A: <i>Electromagnetism and Optics I</i> (C. Chiang)	A
Physics 112: <i>Thermodynamics and Statistical Mechanics</i> (M. Zaletel)	A
Physics 137A/B: <i>Quantum Mechanics</i> (W. Haxton / L. Hall)	A ⁺ / A ⁺
Physics 139: <i>Special and General Relativity</i> (O. Ganor)	A ⁺
Physics C180: <i>Order-of-Magnitude</i> (E. Chiang)	A ⁻
Math 104: <i>Real Analysis</i> (Z. Ding)	A ⁻
Math 110: <i>Linear Algebra</i> (O. Holtz)	A
Math 118: <i>Fourier Analysis</i> (K. Tawri)	<i>in progress</i>
Math 142: <i>Algebraic Topology</i> (J. Lott)	<i>in progress</i>
AP Chemistry	5

ADDITIONAL SKILLS

Data analysis and machine learning

Experienced in making numerical simulation, analysis, and visualization with Python (NumPy, SciPy, AstroPy, OpenCV). Experienced in symbolic analysis with Mathematica. Have implemented convolutional neural networks (CNNs) with PyTorch. Familiar with C, C++, Fortran, MatLab, and OpenGL.

System administration

Uses Ubuntu Linux. Experienced with shell-scripting, git/GitHub, and other command-line tools, as well as Google Cloud, Firebase, S3, and EC2 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 sculpture, painting, game development, and 2D/3D digital animation. Fluent in English, French, Mandarin Chinese.

SIDE 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, raymarched 3D map of Arcadia High School, supporting location tags and featuring real-time raymarched 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.