Xing Liu

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I'm a second-year undergraduate at UC Berkeley with an interest in the computational and theoretical sides of stellar, cosmological, and high-energy 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 looking for new constraints of theoretical physics in radio astronomy. We are currently analyzing the wave optics of finite, spatially coherent sources, such as fast radio bursts.

Stellar axion phenomenology, W. Haxton, UCB/N3AS. *Summer 2024 →*
Wick Haxton and I are studying the mechanisms for pseudoscalar axion emission in the late stages of massive stars, and predicting their observational signatures using the MESA 1D stellar simulator.

Dark Energy Spectroscopic Instrument data group, S. Bailey, LBL/NERSC. *Spring 2024*
Under the mentorship of 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, D. Kasen, UCB. *Fall 2023 – Spring 2024*
Under the mentorship of 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, E. Chiang, 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: *Analytical Mechanics* (C. Chiang)	A
Physics 110A: *Electromagnetism and Optics I* (C. Chiang)	A
Physics 112: *Thermodynamics and Statistical Mechanics* (M. Zaletel)	*in progress*
Physics 137A: *Quantum Mechanics I* (W. Haxton)	A^+
Physics 137B: *Quantum Mechanics II* (L. Hall)	*in progress*
Physics 139: *Special and General Relativity* (O. Ganor)	A^+
Physics C180: *Orders of Magnitude* (E. Chiang)	*in progress*
Math 104: *Introduction to Analysis* (Z. Ding)	A^-
Math 110: *Linear Algebra* (O. Holtz)	A
Math 113: *Abstract Algebra* (I. Nekrasov)	*in progress*
AP Chemistry	5

ADDITIONAL SKILLS

Data analysis and machine learning
Experienced with making numerical simulations, analyses, and visualizations in Python with NumPy, SciPy, AstroPy, and OpenCV. Have implemented deep-learning convolutional neural networks (CNNs) with PyTorch. Familiar with C, C^{++}, Fortran, 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 fractals, sculpture, painting, and Blender. 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.