Berkeley, CA
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Cooper Jacobus

LinkedIn ⬀

Research Interests: Theoretical Cosmology, Computational Physics, Inflation, Large Scale Structure, Philosophy of Physics.

EDUCATION

University of California, Berkeley
BA, Astrophysics and Logic — GPA: 3.9/4.0   **Aug 2021 — May 2025**

RESEARCH EXPERIENCE

Student Researcher   **April 2022 — Present**
National Energy Research Scientific Computing Center (NERSC)   Berkeley, CA

Employing machine learning to develop powerful and accurate surrogate cosmological hydrodynamic simulations. Using our technique, researchers can generate models of the large-scale structure of the universe, which are orders of magnitude computationally cheaper than traditional simulations.

Lab Affiliate   **Aug 2021 — Present**
Lawrence Berkeley National Lab - Computational Cosmology Center (C^3)   Berkeley, CA

Using super-computing techniques to simulate potential future ground-based observing runs of the Cosmic Microwave Background (CMB). Examining cross-correlations between the CMB and the distribution of galaxies in the local universe. Developed publicly available software ⬀ that simulates progress towards the CMB-S4 science goals over time and presented cost analysis to the NSF.

Undergraduate Researcher   **Jan 2022 — Present**
UC Berkeley Dept. of Astronomy   Berkeley, CA

Operating telescopes at Lick and Palomar Observatories and validating supernovae and other transient candidates with Zwicky Transient Facility at Palomar. Collaborating with grad students in the group on supernova photometry analysis.

Research Assistant   **Jun 2021 — Dec 2021**
Princeton Plasma Physics Laboratory (PPPL)   Remote

Developed machine learning techniques capable of automatically analyzing magneto-hydrodynamic instabilities and the emergence and dynamics of edge-localized filamentary structures inside tokamak h-mode plasmas. This work verified predictions about the behavior of turbulence inside tokamaks, which were previously entirely theoretical, as described in our original paper ⬀ .

Lab Affiliate   **Mar 2020 — May 2020**
Lawrence Berkeley National Lab - Advanced Light Source (ALS)   Berkeley, CA

Prototyped large-scale, intricate assemblies of the synchrotron's new power system and shielding. Used computer simulations to validate my designs.

Intern   **Mar 2019 — Jul 2019**
Integrated Dynamic Electron Solutions   Pleasanton, CA

Spent several months away from high school to design specialty parts for electron microscopes. Produced several optical mechanisms that have been successfully implemented at labs in Berkeley, Tel Aviv, and Tokyo. Performed computational research on electron deflection patterns in MATLAB.

AWARDS & HONORS

2023   NASA Astronaut Scholar; Goldwater Scholarship Nominee
2022   UC Berkeley Dean's List
2021   UC Berkeley Alumni Scholar; FIRST Robotics Regional Medalist
2020   National Merit Scholar Finalist; International Physics Olympiad Finalist; California Math League Finalist

TECHNICAL SKILLS

Tools   Python, Java, MATLAB, Linux, Pytorch, Tensorflow, Solidworks, LaTeX, Photoshop
Techniques   Machine Learning, Signal Processing, High-Performance Computing, Observational Astronomy, Lasers

Teaching Experience

Student Instructor   **Aug 2022 — Present**
UC Berkeley Dept. of Astronomy   Berkeley, CA

Held 20 hours/week of supplementary lectures, labs, and study halls each week and operated telescopes for class viewings. Guided undergrads through their introduction to Astrophysics.

Science Communicator   **Oct 2019 — Feb 2021**
Chabot Space and Science Center   Oakland, CA

Engaged the public with kid-friendly, interactive demonstrations and accessible lectures on astronomy.

Teacher's Assistant   **Sep 2018 — Jun 2020**
The Athenian School   Danville, CA

Assisted students with Physics and Chemistry during weekly office hours and graded their assignments .

Volunteer Work

Astronomy "Climate" Advisor   **Aug 2022 — Present**
UC Berkeley Dept. of Astronomy   Berkeley, CA

One of two undergrads recommended by our peers to serve on the department's advisory committee ⬀, which addresses interpersonal and civil concerns within Berkeley's astronomy community.

Alumni Mentor   **Jun 2022 — Present**
The Summer Science Program   Remote

Mentor for current and recent students in the SSP community ⬀ on college admissions and undergraduate research.

Student Mentor   **Oct 2018 — Jun 2020**
FIRST Lego League   Oakland, CA

Volunteered as a coach and resource for elementary and middle school students during their first encounter with robotics and computer programming.

Extracurricular Activities

Student Researcher   **Jun 2020 — Aug 2020**
The Summer Science Program   Remote

Participated in a competitive and highly intensive research-study program ⬀ in observational astronomy, orbital mechanics, and computational research. Performed observations and gathered data on the orbit of a near-earth asteroid and developed a program capable of calculating its orbit from observations. Presented our findings in a brief paper ⬀, which are now used in the official asteroid database ⬀ .

Team Captain   **Nov 2017 — Apr 2021**
FIRST Robotics Team 852   Danville, CA

Served first as mechanism design lead, then CAD integration lead, and finally as Team Captain. Designed and Fabricated a competitive robot and managed and mentored a team of 60 students.

Co-Founder & Board Member   **Jan 2018 — Apr 2021**
STEM Gender Equity Coalition   Oakland, CA

Raised money and launched a series of talks, panels, and fairs showcasing Women in Science and Technology ⬀ .

Founder & Captain   **Oct 2017 — Apr 2021**
High-School Math Olympiad   Danville, CA

Founded and led High School's Math Olympiad team.

PUBLICATIONS

Jacobus, C. Harrington, P. Lukic, Z. Lyα field estimation with Convolutional Neural Networks. *In Prep* (2023)

Risin, S. **Jacobus, C.** Altunin, I. Patra, K. Multiwavelength Observations of Type 1a Supernova 2022hrs. *In Prep* (2023)

Jacobus, C. Harrington, P. Lukic, Z. Closing the resolution gap in Lyman alpha simulations with deep learning. *NeurIPS: Machine Learning and the Physical Sciences* ⬀ (2022)

Jacobus, C. Kube, R. Machine-Learning enabled analysis of ELM filament dynamics in KSTAR. *Pre-print* ⬀ (2022)

Abazajian, K. **et al.** Snowmass 2021 CMB-S4 White Paper. *Pre-print* ⬀ (2022)

PRESENTATIONS

Jacobus, C. Harrington, P. Lukic, Z. Lyα field estimation with Convolutional Neural Networks. **Oral Presentation** at: *Future Science with CMB x LSS* ⬀ Kyoto, Japan (Apr 2023)

Jacobus, C. Modelling the Large Scale Structure of the Universe with Convolutional Neural Networks. **Oral Presentation** at: *Berkeley Physics Seminars* ⬀ Berkeley, CA (Feb 2023)

Jacobus, C. Harrington, P. Lukic, Z. Closing the resolution gap in Lyman alpha simulations with deep learning. **Poster** at: *NeurIPS: Machine Learning and the Physical Sciences* ⬀ New Orleans, LA (Dec 2022)

Jacobus, C. Harrington, P. Lukic, Z. Closing the resolution gap in Lyman alpha simulations with deep learning. **Oral Presentation** at: *Berkeley Center for Cosmological Physics Colloquium* ⬀ Berkeley, CA (Nov 2022)

Jacobus, C. Kube, R. Machine-Learning enabled analysis of ELM filament dynamics in KSTAR. **Poster** at: *APS Division of Plasma Physics Annual Meeting* ⬀ Pittsburgh, PA (Nov 2021)

Jacobus, C. Kube, R. Machine Learning enabled detection of ELM-Precursors in KSTAR ECEI data. **Oral Presentation** at: *PPPL Summer Closing Talks* ⬀ Online (Aug 2021)