Xinze (Sunny) Guo

sunnyguo@berkeley.edu | sunnyxinzeguo.github.io/

RESEARCH INTERESTS

My primary research interest lies in Time-domain Observational Astrophysics. I focus on understanding the multi-wavelength evolution of these events by studying spectroscopic and photometric data from observatories. I aim to connect these discoveries to broader questions in astrophysics.

EDUCATION

University of California, Berkeley Berkeley, CA

Bachelor of Arts in Astrophysics and Computer Science | GPA: 4.0 Expected May 2025

Related Coursework:

Astrophysics: Astron 160 (Stellar Physics), Astron 161 (Relativistic Cosmology), Astron 121 (Radio Lab, Spring 2025), Physics 112 (Stat Mech), Physics 137A (Quantum), Physics 110A (E&M), Physics 105 (Analytic Mech, Spring 2025)

Computer Science: CS 170 (Efficient Algorithms), DS 100 (Data Analysis), CS 169A (Software Eng), CS 168 (Internet Arch)

Honor thesis: *"AT 2022dbl: A Theory Defying Tidal Disruption Event"* Advisor: Prof. Ryan Chornock

RESEARCH EXPERIENCE

Research in Transient Physics | UCB TRansients, EXtragalactic (TRex Group) Sep 2023 – Present

PIs: Professor Ryan Chornock and Professor Raffaella Margutti

- Developed a script to reduce Swift-UVOT data, applying it to the partial TDE AT 2022dbl, and FBOT AT 2024wpp
- Triggered and reduced 11 Swift requests on ZTF AGN-TDE group TDE candidates, resulting in 7 AstroNotes co-authorship
- Acquired and performed extinction correction and host galaxy subtraction on multi-wavelength photometric and spectroscopic data from observatories including Swift, ZTF, ATLAS, LT, SDSS, Lick, and Keck
- Fit the blackbody temperature and radius through photometry of AT 2022dbl over time and compare with other TDEs
- Determined the evolution of velocity dispersion and luminosity of $H\alpha$, HeII, and NIII features through AT 2022dbl spectra
- Observed 8 nights at Lick on Shane with Kast and one half night at Keck with LRIS
- Preparing first-author publication: *AT 2022dbl: A Theory Defying Tidal Disruption Event*
- Awarded the MPS Summer Scholarship for this project and presented the findings at the MPS/Astronomy Research Fair

Research in Cosmology | SSL Mapper of the IGM Spin Temperature (MIST) Group Feb 2022 – Present

PI: Dr. Raul Monsalve

- Developed and implemented polar shapelets to decompose beam directivity analytically, achieving accurate modeling with less basis and improved flexibility in beam modification and computational efficiency
- Simulated antenna temperature spectra and applied chromaticity correction to recover the 21cm signal, assessing the performance of shapelets models
- Created and tested 2D Gaussian beams with noise to evaluate data fitting via `UltraNest` for freq-dependent beam models
- Visited McGill University to collaborate with colleagues for two weeks, gaining insight into multidisciplinary research
- Preparing first-author publication: *Modeling the Beam Directivity of the MIST Global 21 cm Experiment Using Shapelets*

Research in Exoplanets | Undergraduate Laboratory at Berkeley (ULAB) Sep 2021 – May 2022

- Discovered an unknown exoplanet by filtering data from TESS and observations of potential candidates
- Found three potential candidates by Examining light curves, periods, Even-Odd Test, SNR, and other metrics
- Observed two transits through Leuschner 30" Optical Telescope and processed images in `AstroImageJ` for luminosity plots
- Presented the findings at the ULAB Symposium

PUBLICATIONS

- Raul A. Monsalve, et al. (include **Xinze Guo**), "Simulating the Detection of the Global 21 cm Signal with MIST for Different Models of the Soil and Beam Directivity", *The Astrophysical Journal* (2024)
- Raul A. Monsalve, et al. (include **Xinze Guo**), "Mapper of the IGM spin temperature: instrument overview", *Monthly Notices of the Royal Astronomical Society* (2024)
- *AT 2022dbl: A Theory Defying Tidal Disruption Event* | First-author (In Prep)
- *Modeling the Beam Directivity of the MIST Global 21 cm Experiment Using Shapelets* | First-author (In Prep)

POSTERS & PRESENTATIONS

- **Xinze Guo**. *AT 2022dbl: A Theory Defying Tidal Disruption Event.* 2025 Conference for Undergraduate Women and Gender Minorities in Physics (CU*iP) January 24-26, 2025
- **Xinze Guo**. *AT 2022dbl: A Theory Defying Tidal Disruption Event*, Fall 2024 MPS Research Fair August 29, 2024

- Evan Imata, Tommaso Frigerio, **Xinze Guo**, Nadia Laswi, Anders Liu, Jeffrey Martinez *Observing and Obtaining a Light Curve from a Potential Transiting Exoplanet*, ULAB Symposium May 4, 2022

ASTRONOTES

- Margutti, R. ; J, N. A. ; Chornock, R. ; **Guo, X.**, et al. "X-ray re-brightening and spectral hardening of the FBOT AT2024wpp", *Transient Name Server AstroNote* (November, 2024)
- Chornock, R. ; LeBaron, N. ; **Guo, X.**, et al. "ZTF Confirmation of AT 2024zau/ZTF24abmzcpa as a Tidal Disruption Event", *Transient Name Server AstroNote* (November, 2024)
- Stein, R., et al. (include **Guo X.**), "ZTF Transient Classification Report for 2024-08-14", *Transient Name Server AstroNote* (August, 2024)
- Stein, R., et al. (include **Guo X.**), "ZTF Classification of ZTF18abxnvoz/AT 2024pvu as a Bright TDE", *Transient Name Server AstroNote* (August, 2024)
- Yao, Y. ; Chornock, R. ; **Guo, X.**, et al. "Classification of AT 2024lhc as a Tidal Disruption Event with Luminous and Variable X-ray Emission", *Transient Name Server AstroNote* (July, 2024)
- Somalwar, J., et al. (include **Guo X.**), "Transient Classification Report for 2024-06-07", *Transient Name Server AstroNote* (June, 2024)
- Somalwar, J., et al. (include **Guo X.**), "ZTF Classification of TDE Candidates", *Transient Name Server AstroNote* (June, 2024)

TEACHING & OUTREACH

Observing Assistant | UCB Public Astronomy Night Sep 2022 – Present
- Set up and operated telescopes, guiding over 60 attendees to observe in public stargazing sessions four times a year
- Provided engaging explanations about celestial objects, enhancing the public's understanding of astronomy

Astronomy Peer Advisor | UCB Astronomy Department Jan 2024 – Present
- Provide academic support during weekly advising hours, assisting students with coursework, research, and career advice
- Participate in the UAS Discord server to answer questions and promote a supportive environment for undergraduates

Volunteer | Kits Cubed STEM Fair Sep 2024 – Present
- Engaged kids with hands-on demonstrations, including a solar telescope and marshmallow roasting with a parabolic mirror
- Explained concepts like albedo and the solar system using creative analogies to inspire children's interest in science

Astronomy 7A Introduction to Astrophysics Tutor | UCB Student Learning Center Sep 2023 – Dec 2023
- Held drop-in office hours for 8 hours per week to assist students with concepts, homework, and exam prep
- Attended weekly meetings to improve my teaching skills and how to create an inclusive and welcoming study environment

CS 61B Data Structures Mentor | UCB Computer Science Mentor Jan 2023 – May 2023
- Led weekly one-hour sections to help students understand concepts and held review sessions to prepare them for the exams
- Gave mini-lectures to review the topics and guided students to discuss and work out the practice problems

Discussion Academic Intern | UCB CS Department Sep 2022 – May 2023
- Assisted with discussion sections twice a week for CS 70: Discrete Mathematics and Probability Theory
- Answered conceptual and discussion questions and guided the students to come up with the answers

HONORS & AWARDS

Mathematical & Physical Sciences (MPS) Scholarship June 2024 – August 2024
- Selected as a student of high academic standing to receive a research grant ($5500) to work under the close mentorship of a faculty member

Undergraduate Research Apprentice Program (URAP) Summer Fellows June 2024 – August 2024
- Awarded a $3,500 stipend to continue research for five weeks on MIST project

SKILLS

- **Programming Languages**: Python, Java, C, RISC-V, Ruby
- **Computer Skills**: MCMC (`UltraNest`), galaxy spectra fit (`Prospector`), Plotting (`matplotlib`, `seaborn`), `NumPy`, `SciPy`, `AstroPy`, `pandas`, `Scikit-learn`

ACTIVITIES

- Member, Undergraduate Astronomical Society (UAS) | UCB Sep 2021 – Present
- Member, Cal Science Fiction Club Sep 2022 – May 2023
- Mentee, Berkeley Physics Directed Reading Program (PDRP) Sep 2021 – Dec 2021