James Sunseri

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EDUCATION

University of California Berkeley   Berkeley, CA
BA in Physics and Astrophysics; GPA: 3.947/4.0   *Expected December 2022*

RESEARCH INTERESTS

I am most interested in Computational Astrophysics. I am most passionate about simulating magnetohydrodynamics, cosmology, and numerical relativity of compact objects. I also have a strong interest in observation of supernovae, compact objects, and other extreme astrophysical phenomena.

PUBLICATIONS

citations: 15 / h-index: 2 (2022-09-22)

1. **Sunseri, James**; Portillo, Stephen; Slepian, Zachary; Hou, Jiamin; Kahraman, Sule; Finkbeiner, Douglas P., 2022, SARABANDE: 3/4 Point Correlation Functions with Fast Fourier Transforms, in Prep.

2. **Sunseri, James**; Li, Zack; Liu, Jia, 2022, Effects of Baryonic Matter Beyond the Galactic Halo in Cosmological Simulations, in Prep.

3. Murakami, Yukei S.; Jennings, Connor; Hoffman, Andrew M.; Savel, Arjun B.; *et al.* (6 other co-authors, incl. **Sunseri, James**), 2022, *PIPS, an advanced platform for period detection in time series - I. Fourier-likelihood periodogram and application to RR Lyrae stars*, MNRAS, **514**, 4489 (arXiv:2107.14223)

4. Zheng, WeiKang; Stahl, Benjamin E.; de Jaeger, Thomas; Filippenko, Alexei V.; *et al.* (84 other co-authors, incl. **Sunseri, James**), 2022, *The Lick Observatory Supernova Search follow-up program: photometry data release of 70 SESNe*, MNRAS, **512**, 3195 (arXiv:2203.05596) [2 citations]

5. Kilpatrick, Charles D.; Coulter, David A.; Arcavi, Iair; Brink, Thomas G.; *et al.* (79 other co-authors, incl. **Sunseri, James**), 2021, *The Gravity Collective: A Search for the Electromagnetic Counterpart to the Neutron Star-Black Hole Merger GW190814*, ApJ, **923**, 258 (arXiv:2106.06897) [13 citations]

RESEARCH EXPERIENCE

Undergraduate Researcher   Spring 2019 - Present
Nickel Observer and Researcher under Alex Filippenko

- **Period-determination and Identification Pipeline Suite (astroPIPS) Developer**: In this project I have been adding methods to the PIPS pipeline developed in python. These methods allow one to determine stellar properties of RR Lyrae stars using the morphology of a lightcurve. Package is available for python via pip installation.
- **Regular KAIT Telescope Checker**: As part of this research team I am responsible for routinely analyzing the images KAIT takes in a given night and search for type 1a supernovae in the data
- **Zwicky Transient Facility Remote Checker**: Our research group has joined the ZTF collaboration to discover supernovae candidates, my role is to check the data from the previous night I am assigned to and check for any interesting candidates and request followups for potential candidates
- **Nickel 1 Meter Observer**: Monthly overnight observer for the Nickel 1 Meter Telescope at Lick observatory

    Observed on the Nickel 20+ Nights

    Fully Checked Out Observer for the Nickel

    Recorded data for a potential binary neutron star merger and was part of several GCN Circulars

- **Shane 3 Meter Observer**: Using the KAST instrument to collect spectroscopic data for supernovae and other interesting candidates.

Cosmological Multiscale Morphological Analysis of Baryonic Matter in IllustrisTNG simulations   Fall 2020 - Present
UC Berkeley & University of Tokyo

- **Summary**: The goal of this project is to either confirm or deny the validity of assumptions made about the presence of baryonic matter in large scale cosmological simulations. This project is done under the guidance of professor Jia Liu at UC Berkeley with the use of the NERSC supercomputer at LBNL.

UF Astronomy REU Program   Summer 2021
University of Florida

- **Fast Four Point Statistics of Turbulence in the Interstellar Medium**: In this summer research experience, I worked closely with professor Zachary Slepian to write an FFT based algorithm of $\mathcal{O}(N \log N)$ complexity to measure the four point correlation function on the ISM.

LIGO Summer Undergraduate Research Fellowship   Summer 2020
California Institute of Technology

- **Measuring The Hubble Constant With Dynamical Tides In Inspiraling Neutron Star Binaries**: In this research fellowship I worked under Dr. Hang Yu at Caltech to do theoretical astrophysics research involving relativistic dynamics, neutron star modes, and cosmology. This project used extensive computational methods in python.

ULAB Computational Astrophysics Project   Fall 2019 - Spring 2020
ULAB Mentee - UC Berkeley

- **Mixing Layers**: In this project I learned how to use Athena++ to run MHD simulations by learning C++ and applying it to look into the mixing layer phenomena found in the interstellar medium. Along with this we created a research project poster and delivered a presentation on our project.

Intro to Astro Research Summer Workshop   Summer 2019
UC Berkeley

- **Topics**: In this workshop we were shown certain tools and libraries for astrophysics data analysis in python, how to use LaTeX, how to pull data from databases using SQL, and how to use ADS and ArXiv to read and analyze scientific papers effectively

Intro to Computational Physics Final Project   Spring 2019
We wrote a simulation of billiards in Python - UC Berkeley

- **Physics Engine**: I wrote the physics engine that models the elastic collisions between pool balls, utilizing vector based object oriented programming

POSTERS & RESEARCH TALKS

- **LIGO Caltech SURF Summer Talk**: Presented my research to fellow SURF participants, LIGO research scientists, and mentors of the program.
- **Astro 198: Introduction to Research Talk**: I gave a talk about gravitational wave cosmology with binary neutron star mergers to fellow students and Professor Mariska Kriek.
- **237th American Astronomical Society Meeting iPoster Presentation**: Presented a research project via iPoster about gravitational wave cosmology I had done over summer in the LIGO SURF Program. (Featured on AstroBites)
- **238th American Astronomical Society Meeting iPoster+ Presentation**: Our group presented a research project via iPoster+ on a new four band photometry approach of measuring the temperature of variable stars over a period cycle.
- **Filippenko Research Group Talk**: Presented a research project about gravitational wave cosmology I had done over summer and it's possible applications in our own research.

SKILLS & ASSETS

- **Programming Languages**: Python, UNIX, Julia, Java, C++, HTML, Javascript, CSS
- **Clusters**: **Cori** at National Energy Research Computing Center (NERSC), **HiPerGator2.0** at University of Florida, **Savio** at UC Berkeley
- **Astrophysical Simulation Codes**: Athena++, Modules for Experiments in Astrophysics (MESA)
- **Technologies**: GitHub, SLURM, OpenMP, MPI, Adobe Illustrator, Adobe Photoshop, Adobe Premier Pro, Microsoft Office Programs, Google Drive
- **Libraries**: Numpy, Scipy, Pandas, astropy, yt, H5py, Jupyter, PyGame, MatPlotlib, ffmpeg
- **Languages**: English, French

OUTREACH

World of Wonders Science Museum   Lodi, CA
The local science museum of the San-Joaquin County   *Summer 2017 - Present*

- Co-wrote and Wrote 5 lessons for the WOW Education Programming. *Art of Alchemy, Narrowing on Newton, Solar System and Beyond II, What is Gravity, and Lunar School* and compiled 80+ Lessons for summer camps

- Helped plan and teach several summer camps for the past few years. *Astronaut Training, Science Wizards, Science Detectives, Terrific Tinkering, etc...*

- Trained to operate Lodi Unified School District's portable planetarium known as the StarLab

- Taught several Lunar School lessons for the WOW during the Apollo 11 50th Anniversary

- Helped teach with the outreach program for the WOW known as WOW on Wheels and helped run both Forensics and Astronaut Camps

- In the promotional video for the huge future expansion of the WOW

- Successfully taught two lessons at the local middle school during my senior year of high school

- Was on the news network known as Good Day Sacramento for the WOW Museum to celebrate the Apollo 11 50th Anniversary

SPLASH at UC Berkeley   Berkeley, CA
student led High School outreach program at UC Berkeley   *Spring 2021*

- **Video Games & Simulations 101**: A talk where I teach high school students the basics of Python and walk through how to build a video game using only Python followed by a discussion of how it all relates to Astrophysical Simulations in research.

TEACHING

Head Undergraduate Student Instructor for Astro C10 Berkeley, CA
Astro C10 - Introduction to Astronomy *Fall 2022*

- I am the first undergrad to be the head student instructor that oversees the logistics of the Introduction to Astronomy course at UC Berkeley containing 900+ students. In this role I teach students, plan the logistics for the entire course, and oversee other student instructors and graders for the course.

Head Facilitator for the Python Decal: Astro 98 Berkeley, CA
Python Decal - Introduction to Computational Methods for Astronomers *Fall 2020 - Present*

- As head facilitator for this course I have planned the entire course with the help of other facilitators, developed the curriculum, given lectures, hosted office hours, and assigned and graded homework and projects. I also secured funding to pay the course staff and interns with the funds of the Berkeley Discover grant.

Undergraduate Student Instructor for Astro C10 Berkeley, CA
Astro C10 - Introduction to Astronomy *Fall 2020*

- I was a UGSI for the Introduction to Astronomy course taught by Professor Alex Filippenko at UC Berkeley. I taught 4 sections, hosted office hours, prepared lessons and quizzes, and proctored exams

MENTORSHIP

ULAB Research Mentor: Numerical Spin Analysis of Relativistic Bondi Accretion in M87* Berkeley, CA
ULAB - Undergraduate Laboratory at Berkeley *Fall 2021 - Spring 2022*

- I mentored a group of undergraduate students to complete a year long research project where they explored the effects of black hole spin on relativistic Bondi Accretion for a simple model of M87*. In this project I taught basic fundamentals of relativity and computational hydrodynamics. Their poster can be found here.

UC Berkeley Compass Mentor Berkeley, CA
Served as a mentor for a younger undergraduate student *Spring 2021*

Berkeley High School RISE Mentor Berkeley, CA
A tutor and mentor to struggling high school students from underprivileged families *Fall 2018 - Spring 2020*

Lodi High School Academic Tutor Lodi, CA
Was the president of the tutoring club at Lodi High, and worked for the school district as an after school tutor *Fall 2017 - Spring 2018*

AWARDS & CONFERENCES

- 237th American Astronomical Society Meeting
- 238th American Astronomical Society Meeting and our poster won the Chambliss Astronomy Achievement Student Award
- Outstanding (U)GSI Teaching Award: Given for outstanding teaching performance recognized by the Astronomy Department at UC Berkeley
- Recipient of the Northern California Scholarship Foundations Award
- Attended the California Boys State Conference held at Sacramento State in the summer of 2017

EXTRACURRICULARS

- Undergraduate Student Representative for the Astronomy Department at UC Berkeley
- Undergraduate Peer Advisor for the Astronomy Department at UC Berkeley
- Camp Kesem Berkeley Counselor, Unit Leader, and Program Coordinator
- Society of Physics Students member
- Undergraduate Astronomy Society member
- Member of the Cercle de Français at UC Berkeley