Aditya Rohan Sengupta

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Research Interests

Modeling and data fitting for clouds and general circulation in exoplanetary atmospheres
Noise characterization and optimal control in adaptive optics
High-performance numerical simulation methods and open-source programming

Education

University of California, Santa Cruz   Sep 2022-present
PhD Student, Astronomy and Astrophysics
    Advisors: Jonathan Fortney, Rebecca Jensen-Clem

Girton College, University of Cambridge   Oct 2021-Jun 2022
Master of Advanced Study, Part III Applied Mathematics
    Essay: Clouds in Exoplanetary Atmospheres

University of California, Berkeley   Aug 2017-May 2021
B.S. with Honors, Engineering Physics; B.S. with Honors, Engineering Mathematics and Statistics

Publications

2. **Aditya R. Sengupta**, Benjamin L. Gerard, Daren Dillon, Maaike van Kooten, Donald Gavel, Rebecca Jensen-Clem, 2022. "Laboratory demonstration of optimal identification and control of tip-tilt systems". *Proceedings of the SPIE*, Volume 12185, Adaptive Optics Systems VIII; 1218578 (2022) https://doi.org/10.1117/12.2630765.

1. **Aditya R. Sengupta** and Rebecca Jensen-Clem, 2020. "Kalman Filtering for Tip-Tilt Correction in Adaptive Optics." *Research Notes of the American Astronomical Society.*

Posters

2. **Aditya R. Sengupta**, Benjamin L. Gerard, Daren Dillon, Maaike van Kooten, Donald Gavel, Rebecca Jensen-Clem, 2021. "Laboratory Demonstration of Optimal Control and System Identification of Tip-Tilt Mirrors in Adaptive Optics". *Spirit of Lyot*, 2022; *SPIE Astronomical Telescopes + Instruments*, 2022.

1. **Aditya R. Sengupta**, Benjamin T. Montet, Kaiming Cui, Adina D. Feinstein, Courtney D. Dressing, 2021. "Improved PSF Fits for TESS Lightcurve Detrending." Poster, *American Astronomical Society Meeting #237*, Virtual.

Talks

4. "Effective Real-World Scientific Computing". Exun Talks, Delhi Public School R. K. Puram, January 2022.

3. "Laboratory Demonstration of Optimal Control and System Identification of Tip-Tilt Mirrors in Adaptive Optics". WFS Workshop 2021 (Wavefront Sensing in the VLT/ELT Era), December 2021.

2. "System Identification for Tip-Tilt Mirrors in Adaptive Optics". Lamat REU Final Presentations, UC Santa Cruz, August 2021.

1. "Improved PSF Fits for TESS Lightcurve Detrending". American Astronomical Society Meeting #237, January 2021.

Teaching and Mentoring

UC Berkeley Teaching   Jan 2018-May 2021
- Instructor and Course Designer, Democratic Education at Cal, Spring 2021. *Physics 198: Physics-based High-Performance and Scientific Computing and Technology.* Lectured, designed homeworks and final project for a 20-student 2-credit pass/fail class.
- Undergraduate Student Instructor, Fall 2020 and Spring 2021. *EECS 126: Probability and Random Processes.* Developed new lab assignment on the Kalman filter; wrote new official course notes.
- Study Group Facilitator, UC Berkeley Student Learning Center, Spring 2020. *Math 53: Multivariable Calculus.* Developed and taught twice-weekly problem solving worksheets.
- Tutor, Spring 2018-Fall 2020, UC Berkeley Student Learning Center (SLC), for single-variable calculus I and II, multivariable calculus, linear algebra.
- Tutor/Reader, Spring 2019-Spring 2020, for Data Structures, Control Systems, Probability.

Curriculum Chair, Undergraduate Lab at Berkeley   May 2020-May 2021
Created instructional modules, gave lectures, oversaw content development to introduce new researchers to essential skills: programming, Git, research literacy, communication, statistics.

Mentor, Undergraduate Lab at Berkeley   Aug 2019-May 2020
Led an independent research team of freshman/sophomore-level physics students to construct a Cosmic Microwave Background detector. Ran subgroups for detector printed-circuit-board design, mechanical construction, data denoising and inference algorithms. Progress halted due to COVID-19 pandemic.

Projects and Experience

Electronic Design Automation software intern, Julia Computing   Dec 2021-Jan 2022
Worked on the JuliaSPICE package for circuit simulation.

Personal and class projects

- comp-alg-top: learning and writing about computational algebraic topology.
- wordle-solver: solves the word game Wordle by making maximum-entropy guesses.
- SudokuHuman.jl: a Sudoku solver that works using human-style steps.
- SparseTransforms.jl: an implementation of coding-theoretic methods for the Walsh-Hadamard and Fourier transforms. Final project, Berkeley EE 229A: *Information Theory and Coding.*
- CircuitModels.jl: a differential-algebraic modeler and solver for circuits. Final project, Berkeley EE 219A: *Numerical Simulation and Modeling.* (Private as per class policy.)
- Anastasi: the Grand Prize-winning entry to the 2017 NASA Ames/NSS Space Settlement Contest. (I advised the winning team and was listed as the teacher for the entry.)
- Personal expository papers and course notes available at aditya-sengupta.github.io/notes.html.