

Dimple Sarnaik

EDUCATION

Doctor of Philosophy, Astrophysics | *University of Southern California (USC)* 2021–Present

- Women+ in Physics (Co-Founder), GASP (President), Teaching Assistant, Research Assistant, Tutor, Mentor

Bachelor of Science, Physics–Computer Science | Minor in Astronomy | *USC* 2017–2021

- GPA: 3.76 | Astronomy GPA: 3.9 | Dean's List 2017–2021
- Society of Physics Students (Co-President), Resident Assistant, Student-Athlete Tutor

RESEARCH EXPERIENCE

Dr. Andrew Benson's Research Group | *Carnegie Observatories* Fall 2022–Present

- Implemented an algorithm to correctly categorize dark matter subhalos, directly improving the accuracy of Galacticus' detection module — an open-source semi-analytic model of galaxy formation
- Utilized Monte Carlo Markov Chain (MCMC) sampling on various large N-body simulation datasets to improve agreement of Galacticus' semi-analytic model through calibration to beyond-CDM models.
- Built and validated Galacticus' target dataset by analyzing merger trees with the updated algorithm and simulation data
- Constructed a pipeline to systematically test formation histories across dark matter models, yielding new insights into subhalo merging history

Dr. Kris Pardo's Research Group | *USC* Fall 2022–Present

- Built analysis modules to probe weak lensing signatures in survey data across multiple dark matter models and their subhalo populations
- Applied MCMC forward-modeling to forecast astrometric weak lensing effects in mock Nancy Grace Roman Space Telescope data

Dr. Vera Gluscevic's Research Group | *USC* Summer 2020–2021

- Constrained dark matter–electron interaction cross-sections by deploying MCMC sampling and CLASS code on a high-performance computing cluster, resulting in a publication in *Physical Review D*
- Developed a visualization module for dark matter–baryon interactions at cosmological scales; presented findings at conferences and contributed to course lectures

Dr. Edward Rhodes' Research Group | *USC* Spring 2018–2021

- Produced data visualizations of solar observations spanning multiple solar cycles for the Solar Internal Structure and Dynamics Project
- Identified and catalogued sunspots in full-disk intensity images to support the Solar Rotation project

PUBLICATIONS

Peer-Reviewed Publications

Nguyen, D. V., **Sarnaik, D.**, Boddy, K. K., Nadler, E. O., & Gluscevic, V. (2021). Observational constraints on dark matter scattering with electrons. *Physical Review D*, 104(10), 103521. doi: 10.1103/PhysRevD.104.103521

In Preparation

Sarnaik, D., et al. "Probing Dark Matter Subhalo Populations with the Nancy Grace Roman Telescope." In preparation.

Sarnaik, D., et al. "Merger Tree Calibration to Beyond-CDM." In preparation.

Science Writing

Sarnaik, D. (2025). "Astronomy across barriers." *The Lab Report*, Volume 2. USC Department of Physics and Astronomy.

WORK EXPERIENCE

Teaching Assistant | *USC Department of Physics & Astronomy* Fall 2021–Present

- Taught 20+ labs (sections of 20 students each) spanning introductory to advanced levels of physics and astronomy over 5 academic years
- Led lab instruction, graded assignments, held office hours, and provided individualized academic support

Resident Assistant | *Residential Education, USC* Fall 2019–2021

- Mentored and oversaw 120 residents across academic years 2019–2021
- Organized professional development, social, and community-building events using strong time management and event planning skills

Tutor, Student-Athlete Academic Services | USC

Fall 2019–Spring 2020

- Tutored 15 student-athletes in Computer Science, Physics, Mathematics, Business, and Statistics
- Strengthened foundational concepts and advanced problem-solving skills across a range of disciplines

LEADERSHIP & OUTREACH

Women+ in Physics (W+iP) | Co-Founder

2024–Present

- Established the USC Physics Department's first organization dedicated to supporting women and gender minorities in physics
- Attended APS StepUp as a panelist, supporting high school teachers in strengthening physics curriculum and inclusive practices
- Initiated W+iP Clips, a science communication series highlighting gender minorities in physics for representation and visibility
- Conducted astronomy outreach event for elementary school students, fostering early interest in STEM at Foster Elementary

Undergraduate Research Symposium | Judge

2026

- Served as a judge for the Physical Sciences panel for the 27th Annual university-wide symposium celebrating undergraduate research, scholarship, and creative activity across five academic categories

The Lab Report, USC | Science Journalist / Contributing Author

2026–Present

- Authored "Astronomy across barriers" (Vol. 2), profiling USC faculty efforts to bring astronomy to underserved populations active contributor with additional articles in progress

Letter to a Pre-Scientist | STEM Pen Pal Volunteer

2023–2024

- Exchanged letters throughout the year with an 5th-grade student in North Carolina, discussing astrophysics research, STEM careers, and overcoming obstacles — helping demystify science for a student in a low-income school community

Skype a Scientist | Contributing Scientist

2023–2024, 2026

- Led live virtual classroom sessions for students from kindergarten through 8th grade on topics including black holes, dark matter, phases of the moon, and Earth's seasons — adapting complex astrophysics concepts to age-appropriate explanations across multiple classrooms

Graduate Association of Students in Physics (GASP) | President

2022–2024

- Gathered 100+ student experiences to petition a successful change in the PhD curriculum
- Hosted 5 community-building events for 90+ graduate students over 4 semesters
- Regularly facilitated conflict resolution meetings, bringing student concerns directly to the department

Society of Physics Students (SPS) | Co-President

2019–2021

- Led the executive committee in expanding SPS reach to all physics undergraduates
- Initiated a department-wide mentorship program among 100+ undergraduate students; personally mentored 6 underclassmen
- Led a graduate school workshop to encourage undergraduates to pursue advanced degrees

Joint Education Program

2018

- Volunteered as a mentor to middle school students at St. Vincent's School; helped student develop time management and focus skills

PRESENTATIONS & CONFERENCES

APS April Meeting

Spring 2025

- Delivered talk on dark matter subhalo populations and constraints from the Nancy Grace Roman Space Telescope

Galaxy Formation & Evolution in Southern California (GALfresca)

Fall 2025

- Presented poster on merger tree calibration to beyond-CDM dark matter models

Conference for Undergraduate Women in Physics (CUWiP), APS

Spring 2024

- Panelist representing USC — shared insights on academic research, leadership in physics organizations, and applying to graduate school

Out in STEM (oSTEM)

Spring 2024

- Presented poster on dark matter weak lensing constraints predicted for the Roman Space Telescope

Physics Departmental Conference, USC

Fall 2023

- Presented poster with preliminary results on dark matter weak lensing constraints for the Roman Space Telescope

Galaxy Formation & Evolution in Southern California Conference

Fall 2023

- Attended conference for scientists in Southern California working on galaxy formation and evolution physics

Conference for Undergraduate Women in Physics (CUWiP), APS

Spring 2019, 2020, 2021

- Presented new constraints on dark matter–electron interactions

Undergraduate Research Symposium, USC

Spring 2019

- Contributed to poster for Dr. Rhodes' research group on solar rotation data

AWARDS & HONORS

| | |
|--|------------------|
| Rockwell Dennis Hunt Scholastic Award (\$5,000) USC | 2025 |
| Galactic Leader Award <i>Cosmolab</i> | 2024 |
| USC Dornsife Graduate Fellowship (\$35,700) USC Dornsife College | 2023–2024 |
| Rockwell Dennis Hunt Scholastic Award, Honorable Mention (\$1,000) USC | 2023 |
| GSG Professional Development Fund Award (\$500/year) USC | 2021, 2022 |
| Continuing Student Scholarship — Goel Family Scholarship (\$5,000) USC | 2020–2021 |
| Summer Undergraduate Research Fund Award (\$3,000) USC | 2020 |
| Student Opportunity for Academic Research Award (\$1,000/year) USC | 2019, 2020, 2021 |
| Women in Science and Engineering Research Fellowship (\$500/semester) USC WiSE | 2018, 2019, 2020 |
| Dean's List USC Dornsife | 2017–2021 |

SKILLS

Technical: Python, C++, Git, LaTeX, High-Performance Computing (HPC), MCMC, Bayesian Analysis, Big Data, N-body simulations, Semi-analytic modelling

Communication: Science Communication, Public Outreach, Technical Writing, Event Planning, Conflict Mediation, Mentorship