SUREN GOURAPURA

Princeton University Department of Physics, Princeton, NJ 08544, USA

sureng@princeton.edu ◇ 0000-0002-8149-0632

EDUCATION

Princeton University 3.68 GPA

Ph.D. Candidate in Physics — Present

Masters in Physics — April 2021

The Ohio State University *summa cum laude*, 3.94 GPA, with Honors

Bachelor of Science Majors: Physics, Astronomy Minor: Mathematics — May 2019

AWARDS AND HONORS

- Antarctica Service Medal — 2022-2023
- Member of Phi Beta Kappa — 2019
- DAP Student Travel Award for APS April — 2019
- OSU Provost Scholarship — 2015-2019
- OSU Department of Physics Smith Senior Award — 2019
- OSU Department of Physics Smith Junior Award — 2018
- Department of Physics Undergraduate Research Scholarship for summer — 2017
- OSU Second-year Transformational Experience Program for summer — 2017
- OSU Department of Physics Helen Cowan Book Award — 2016
- OSU Family Scholarship — 2016
- OARDC Family Scholarship and James and Yvonne Brown scholarship — 2016

RESEARCH EXPERIENCE

(i) SPIDER Experiment: Jan 2020 - Present

Prof. William Jones and the SPIDER collaboration, Princeton:

Pointing Reconstruction for SPIDER-2:

- Generated a time-varying pointing model derived from CMB intensity fluctuations to improve the SPIDER-2 pointing solution
- Characterization of pointing errors using compact source statistics

SPIDER-2 low-level analysis:

- Development of data quality flags and statistics
- Determination of primary calibration and instrument parameters through CMB cross-correlation

SPIDER-2 integration and testing campaigns

- Winter 2022-23 deployment campaign of SPIDER-2 in McMurdo, Antarctica
- Summer 2021 integration campaign of SPIDER-2 in Palestine, TX
- Spring 2020 integration and operation of the cryostat in Princeton, NJ

Development of SPIDER-2 scan strategy:

- Tested various scanning box sizes, scan speeds, latitudes, and scan steps to find good pointing strategies

Development of spectral domain component separation pipeline

- Created unique divisions of the SPIDER sky and probed for correlations in existing cosmological data
- Generated likelihoods for dust parameters and published evidence of spatial variation

SPIDER-2 hardware development

- Implementation and calibration of cryogenic housekeeping instrumentation
- Mechanical design, testing, and assembly of flight photovoltaic arrays
- Development and implementation of flight data storage system
- Investigation of efficient, cryogenic filters for mitigation of RFI

(ii) Bayesian Cosmological Data Analysis Course Sept 2024

Cosmoglobe group, University of Oslo: 2 weeks

- Applied SPIDER-1 data at the map level to Commander 3, an end-to-end Bayesian parameter estimator that combines data from multiple experiments

(iii) High Energy Neutrino Astronomy: Oct 2016 - Jun 2019
Laboratory of Prof. Amy Connolly, The Ohio State University

- Sampling Unit for RF (SURF) Calibration with Genetic Algorithms project. Wrote a genetic algorithm to calibrate SURF data from Stanford Linear Accelerator Center (SLAC)
- Genetically Evolving NEuTrIno teleScopes (GENETIS) project. Wrote genetic algorithms to evolve wire antennas using gain and neutrino shower simulation software
- Development of Askaryan Radio Array (ARA) hardware, firmware, and integration
- ARA Hardware and Antenna Modeling Summer Internship. Wrote genetic algorithms to fit spherical harmonic coefficients, generating directional antenna gain patterns

(iv) Big Data Analytics Project: May 2018 - Aug 2018
Prof. Richard Hughes and Prof. Brian Winer, The Ohio State University

- Developed a new class, "Big Data" Analytics in Physics 6820, with three other students. Documented here: www.github.com/SummerBigData

(v) Salmonella Nanoparticle Vaccine Internship: May 2016 - Jul 2016
Laboratory of Prof. Ramesh Selvaraj, Dept. of Animal Sciences at Ohio Agricultural Research and Development Center

- Development of a nanoparticle-based subunit Salmonella oral vaccine to use in poultry to reduce colonization and shedding of Salmonella, with results published

PUBLICATIONS

Selected works

- Ade, et al. "Analysis of Polarized Dust Emission from the First Flight of the SPIDER Balloon-Borne Telescope" (2025) ApJ, arXiv 2407.20982
- Julie Rolla, et al. "Evolving Antennas for Ultra-High Energy Neutrino Detection" (2020). PoS, arXiv 2005.07772

- Simon Tartakovsky, et al. "Thermal architecture for a cryogenic super-pressure balloon payload: design and development of the Taurus flight cryostat" (2024). Proc. SPIE 13094, Ground-based and Airborne Telescopes X; 130944B, arXiv 2410.18150
- Jared L. May, et al. "Instrument Overview of Taurus: A Balloon-borne CMB and Dust Polarization Experiment" (2024). Proc. SPIE 13094, Ground-based and Airborne Telescopes X; 1309432, arXiv 2407.01438
- E. C. Shaw, et al. "In-flight performance of SPIDER's 280 GHz receivers" (2024). Proc. SPIE 13102, Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy XII; 1310204, arXiv 2408.10444
- Alexandre E. Adler, et al. "Modeling optical systematics for the Taurus CMB experiment" (2024). JCAP, arXiv 2406.11992
- Julie Rolla, et al. "Evolving Antennas for Ultra-High Energy Neutrino Detection" (2021). PoS, arXiv 2112.00197
- Sankar Renu, et al. "Surface engineered polyanhydride based oral Salmonella subunit nanovaccine for poultry" (2018). Int. J. Nanomed.

TALKS

- **Pan-Experiment Galactic Science Group**: Polarized Dust Emission with SPIDER Jan 2025
- **Astro Coffee at Princeton Astro Dept**: SPIDER and Polarized Dust Emission Aug 2024
- **SPIDER & Taurus Collaboration meeting**: Cross-spectra + Deprojection with Planck May 2024
- **Case Western Reserve University Cosmology Group**: Foregrounds with SPIDER: Examining Deviations in Dust Modeling Dec 2023
- **The Scientific Committee on Antarctic Research, Astronomy and Astrophysics from Antarctica**: Foregrounds with SPIDER: Examining Deviations in Dust Modeling Sept 2023
- **Princeton University Gravity Group**: r Error Budget for SPIDER's First Flight Apr 2021

- **American Physical Society, Denver CO**: Evolving Antennas for Ultra-High Energy Neutrino Detection (Abstract: R08.00005) Apr 2019

SERVICE AND OUTREACH

- Volunteered on the Grad Recruiting Equity Diversity Initiative in the Princeton Physics Dept. 2021-2022
- Helped develop and hired as an Ambassador in the Princeton Physics Dept's EDI program 2021-2022
- Volunteered and coordinated high school research opportunities for women 2018-2019
- Volunteered for Achieving in Science through Phys. Instr., Research, and Exploration Summer 2017

ADDITIONAL SKILLS

- Surface-mount soldering, cable making, machining with mill and lathe
- Experience designing with Fusion 360 and Solidworks
- Experience with C++, Python, Bash, Mathematica, and LaTeX
- Woodworking hobby; designed and built tables, stools, shoe racks, benches, a bedframe, and more
- Build my own desktop computers; knowledgeable about computer parts and assembly