

YIQI (ANDREW) LIU

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EDUCATION

Princeton University

Ph.D. in Physics

M.A. in Physics

- Research interests:

Cosmic Microwave Background · Component Separation Algorithm · Diffused Galactic Foreground
Statistical Inference · Monte Carlo Simulation · Large-scale Data Analysis · Harmonic-space Analysis

- Advisor: [Jo Dunkley](#)

Princeton, NJ

(Expected) June 2029

Jan 2025

Johns Hopkins University

B.S. in Applied Mathematics & Statistics, Physics, and Mathematics

- GPA: 3.99/4.00 (General Honors & Departmental Honors in all majors)

- Minor: Computer Science

Baltimore, MD

May 2023

SELECTED AWARDS

- 2023 Donald E. Kerr Memorial Award
JHU, top 2 graduating seniors majoring in physics
- 2023 Applied Math & Statistics Achievement Award
JHU, top 6 graduating seniors majoring in applied math & statistics
- 2022 ΣΠΣ Physics Honors Society
- 2022 Provost's Undergraduate Research Award
JHU, \$6,000 in funded research support
- 2020 - 2021 Bloomberg Distinguished Professor Research Fellowship ×2
JHU, \$10,000 in funded research support
- 2020 - 2022 Dean's List

SELECTED PUBLICATIONS

See [NASA ADS](#) and [Google Scholar](#) for full list of publications.

Yiqi Liu et al.

The Simons Observatory: Assessing the Impact of Dust Complexity on the Recovery of Primordial B-modes
Published *JCAP* (2025), DOI: [10.1088/1475-7516/2025/11/024](https://doi.org/10.1088/1475-7516/2025/11/024)

Yiqi Liu, Hsiang-Chih Hwang, Nadia L. Zakamska, John R. Thostensen

CSS1603+19: a low-mass polar at the cataclysmic variable period minimum
Published *MNRAS* (2023), DOI: [10.1093/mnras/stad1156](https://doi.org/10.1093/mnras/stad1156)

RESEARCH EXPERIENCES

Graduate Researcher | *Simons Observatory (SO)*

Princeton, NJ | 2023 – Present

Mentors: Jo Dunkley, Susanna Azzoni

- Developed per-scale regression-based component separation algorithms to extract weak cosmological signals from noisy high-dimensional data.
- Investigated non-Gaussian statistics for next-generation foreground cleaning.
- Demonstrated that dust complexity biases cosmological inference using MCMC and Bayesian analysis.
- Quantified robustness of SO pipelines under various foreground complexity scenarios.
- Implemented pipelines for SO×Planck cross-correlation to validate instrument performance.

Undergraduate Researcher | *Cosmology Large Angular Scale Surveyor* Baltimore, MD | 2019 – 2023
Mentors: Charles L. Bennett, Tobias A. Marriage, Ivan L. Padilla

- Implemented and optimized a minimum-variance estimator (Needlet Internal Linear Combination) for multi-frequency signal decomposition.
- Built polarization-based foreground masks and benchmarked estimator performance across frequency bands.
- Developed and tested point-source identification algorithms using Fourier-space filtering techniques.
- Created Python routines to detect temporal anomalies via rolling-dispersion diagnostics in time-series data.

Undergraduate Researcher | *Zakamska Astrophysics Group* Baltimore, MD | 2021 – 2023
Mentors: Nadia L. Zakamska, Hsiang-Chih Hwang

- First-authored a publication modeling complex binary star systems using spectral decomposition and time-series fitting.
- Automated a Python-based photometric/spectral analysis pipeline for feature extraction in both time and frequency domains.

SELECTED PRESENTATIONS

Invited Talks:

- 2025 Oct “The impact of dust complexity on the recovery of r ”
Pan-Experiment Galactic Science Group Los Angeles, CA
- 2025 July “From the Impact of Dust Complexity to Beyond”
2025 SO Collaboration Meeting Philadelphia, PA
- 2024 July “Understanding the impact of dust complexity on bias in r ”
2024 SO Collaboration Meeting Chicago, IL

Oral Presentations:

- 2026 Mar “Simons Observatory: Assessing and Modeling Foreground Complexity in CMB Analyses”
2026 American Physics Society Global Physics Summit Denver, CO
- 2025 June “[Understanding the impact of dust complexity on the recovery of the tensor-to-scalar ratio](#)”
246th Meeting of the American Astronomical Society Anchorage, AK

Posters:

- 2023 Mar “[CMB analysis using the global-NILC method](#)”
2023 American Physics Society March Meeting Las Vegas, NV
- 2023 Jan “[CSS1603+19: a low mass polar at the cataclysmic variable period minimum](#)”
241st Meeting of the American Astronomical Society Seattle, WA

TEACHING

- 2023 Spring Teaching Assistant, EN.553.430/630 Intro to Statistics (Ugrad/Grad, 82 students)
Graduate-level introductory statistics course covering stochastic convergence, point estimation, hypothesis testing and interval estimation.
- 2022 Fall Teaching Assistant, EN.553.633 Monte Carlo Method (Grad, 60 students)
Graduate-level course covering pseudo-random number generators and classic Monte Carlo simulation algorithms (e.g. Metropolis-Hastings).
- 2020/2022 Fall Teaching Assistant, AS.171.103 General Physics I (Ugrad, 23 students, 2 semesters)
Undergraduate-level introductory physics on classical mechanics.

SKILLS

Programming: Python, C++, C, SQL, Bash, Mathematica
Scientific Computing: MCMC Methods, Bayesian sampling, HPC (Slurm)
Machining: Tormach CNC Mill, Monarch Lathes, Bridgeport Mill
Languages: English (fluent), Mandarin (native)
Others: JupyterLab, L^AT_EX, Git, SolidWorks, Rowing, Alpine Skiing