Roohi Dalal

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Education

Princeton University

Ph.D., Astrophysical Sciences — *2024 (expected)*
Certificate in Science, Technology and Environmental Policy — *2024 (expected)*
M.A., Astrophysical Sciences — *2021*

Leiden University

Fulbright Research Scholar — *2018-19*

California Institute of Technology

B.S., Astrophysics and History (GPA 4.0/4.0) — *2018*

Research Interests

I study cosmology using data from large surveys of galaxies, particularly the Hyper Suprime-Cam (HSC) Subaru Strategic Program. I recently led the weak lensing cosmic shear analysis for the HSC Year 3 data release, and am now focused on improving our modeling of baryonic feedback, so that we can utilize our measurements at small scales. I am also interested in science policy, particularly space policy and the sustainable use of outer space. I am working with the IAU CPS to understand policy pathways for protecting the night sky from light pollution, and with the Princeton Science and Global Security program to develop technical standards for a destructive anti-satellite weapon testing ban.

Keywords: Cosmology, Weak Lensing, Large Scale Structure, Space Policy, Orbital Debris, Space Security

Publications

Lead Author:

- **Dalal, R.**, Li, X., Nicola, A., Zuntz, J. et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Power Spectra*, (2023) arXiv:2304.00701 (submitted to PRD)
- Li, X., Zhang, T., Sugiyama, S., **Dalal, R.** et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Two-point Correlation Functions*, (2023) arXiv:2304.00702 (submitted to PRD)
- Pobre, S., **Dalal, R.**, Strauss, M., Lin, Y-T., *Are Brightest Cluster Galaxies Special?*, RNAAS 19 (2023) 7 (*primary advisor*)
- Zhang, T., Li, X., **Dalal, R.**, Mandelbaum, R. et al., *A General Framework for Removing Point Spread Function Systematics in Cosmological Weak Lensing Analysis*, (2023, accepted by MNRAS)
- Rau, M. M., **Dalal, R.**, Zhang, T., Li, X. et al., *Weak Lensing Tomographic Redshift Distribution Inference for the Hyper Suprime-Cam Subaru Strategic Program three-year shape catalogue* (2023, accepted by MNRAS)
- Martinelli, M., **Dalal, R.**, Majidi, F., Akrami, Y. et al., *Ultralarge-scale approximations and galaxy clustering: Debiasing constraints on cosmological parameters*, MNRAS 510 (2022) 1964
- **Dalal, R.**, Strauss, M. A., Sunayama, T., Oguri, M. et al., *Brightest cluster galaxies are statistically special from z = 0.3 to z = 1*, MNRAS 507 (2021) 4016

Significant Contributions:

- Dark Energy Survey, Kilo-Degree Survey Collaboration, ..., **Dalal, R.** et al., *DES Y3 + KiDS-1000: Consistent cosmology combining cosmic shear surveys*, (2023) arXiv:2305.17173 (submitted to the Open Journal of Astrophysics)
- Madhavacheril, M., ..., **Dalal, R.** et al., *The Atacama Cosmology Telescope: DR6 Gravitational Lensing Map and Cosmological Parameters*, (2023) arXiv:2304.05203 (submitted to ApJ)
- Qu, F., ..., **Dalal, R.** et al., *The Atacama Cosmology Telescope: A Measurement of the DR6 CMB Lensing Power Spectrum and its Implications for Structure Growth*, (2023) arXiv:2304.05202 (submitted to ApJ)
- More, S., ..., **Dalal, R.** et al., *Hyper Suprime-Cam Year 3 Results: Measurements of Clustering of SDSS-BOSS Galaxies, Galaxy-Galaxy Lensing and Cosmic Shear*, (2023) arXiv:2304.00703 (submitted to PRD)

- Miyatake, H., ..., **Dalal, R.** et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Galaxy Clustering and Weak Lensing with HSC and SDSS using the Emulator Based Halo Model*, (2023) arXiv:2304.00704 (submitted to PRD)
- Sugiyama, S., ..., **Dalal, R.** et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Galaxy Clustering and Weak Lensing with HSC and SDSS using the Minimal Bias Model*, (2023) arXiv:2304.00705 (submitted to PRD)

Honors and Awards

2023	**Equity Award (Princeton Astrophysics)**, for many positive contributions to the department climate, working towards a more inclusive environment.
2023	**Next-Generation Fellowship**, Physicists Coalition for Nuclear Threat Reduction
2022	**Best of Access, Diversity, and Inclusion Award: Outstanding Programming (Princeton)**, for work done as President of the Princeton Women in STEM Leadership Council.
2018-23	**NSF Graduate Research Fellowship**
2018-19	**Fulbright Research Award**, Leiden University
2018	**Mabel Beckman Prize (Caltech)**, for academic and personal excellence, outstanding character and leadership.
2018	**Eleanor Searle Prize in Law, Politics and Institutions (Caltech)**, for senior thesis in History.
2017	**Deans' Cup (Caltech)**, for persistent efforts to improve the quality of undergraduate life.
2016-18	**Mellon Mays Undergraduate Fellowship (Caltech)**
2014-15	**Milton and Jane Mohr Scholarship (Caltech)**

Selected Talks

"Cosmology from Cosmic Shear Power Spectra with Hyper Suprime-Cam Year 3 Data"

June 2023	Midwest Cosmology Network Seminar*
May 2023	Institute for Nuclear and Particle Astrophysics Seminar, Lawrence Berkeley National Laboratory*
May 2023	Informal Seminar, UC Santa Cruz*
May 2023	KIPAC Tea Talk, Stanford University*
May 2023	Cosmology Seminar, Duke University*
April 2023	Dark Cosmos Seminar, Princeton University*
April 2023	Future Science with CMBxLSS Workshop, Kyoto University
April 2023	Astrophysics Seminar, Carnegie Mellon University*
Nov 2022	Tucson Astrophysics and Cosmology Seminar, University of Arizona*

"Space Debris and Nuclear Strategic Stability"

April 2023	Lichtenstein Institute on Self-Determination, Princeton University*
Oct 2022	Princeton School on Science and Global Security

"Brightest Cluster Galaxies are Statistically Special from $z = 0.3$ to $z = 1$"

Feb 2022	Galread, Princeton University*
Nov 2021	OPINAS Seminar, Max Planck Institute for Extraterrestrial Physics and Universitäts-Sternwarte München*

"Debiasing Ultra-Large Scale Cosmology"

May 2019	de Sitter Seminar, Leiden University

* = invited

Granted Observing Time

- Baade Telescope, Las Campanas Observatory: 2 nights (PI)
- Clay Telescope, Las Campanas Observatory: 1 night (PI)
- Gemini North and Gemini South: 97 hours (PI)

Teaching Experience

Spring 2023	**SPI353 - Science and Global Security**, Guest Lecturer	*Princeton*
Fall 2021	**AST255 - Life in the Universe**, Assistant in Instruction	*Princeton*
Spring 2021	**AST204 - Topics in Modern Astronomy**, Assistant in Instruction	*Princeton*
Spring 2017, 2018	**Ay1 - The Evolving Universe**, Teaching Assistant	*Caltech*
Winter 2018	**Ph2b -Quantum Mechanics**, Teaching Assistant	*Caltech*

Advising Experience

Jupiter Ding	Undergraduate Summer Research Program and Junior Paper (2022)
Savannah Pobre	Undergraduate Summer Research Program and Junior Paper (2021)

Leadership, Outreach and Service

I am passionate about improving equity and inclusion in STEM, facilitating better communication between scientists and policy makers, and scientific outreach. A selected list of my involvements in such activities follows.

2013-	**USA Astronomy and Astrophysics Olympiad**, President (2013-18, 2019-20), Founding member, Board of Directors (2013-), Team leader (2014, 2016)	
2023-	**AAS Committee for the Protection of Astronomy and the Space Environment**, Member	
2023-	**IAU Centre for the Protection of the Dark and Quiet Sky**, Policy Hub member	
2022-	**HSC+PFS+Rubin Discussions**, Organizer	*Princeton*
2019-	**Women in STEM Leadership Council**, President (2021-22), Council member (2019-)	*Princeton*
2023	**Princeton School on Science and Global Security**, Organizer	*Princeton*
2020-22	**Graduate Scholars Program**, Peer Mentor	*Princeton*
2019-22	**Women in Physics**, Executive board member	*Princeton*
2019-22	**Astrophysics Climate Committee**, Graduate student representative	*Princeton*
2019-22	**Astrophysics Graduate Student Committee**, Cohort Representative	*Princeton*
2020-21	**Committee on Equity in Astrophysics Graduate Admissions**, Graduate student representative	*Princeton*
2018-20	**Astronomy on Tap**, Organizer, Speaker	*Trenton, Leiden*
2020	**WFIRST Congressional Advocacy Day**, Participant	*Princeton*
2019	**Fulbright EU-NATO Seminar**, Representative from the Netherlands Fulbright Commission	*Luxembourg*
2015-18	**Title IX**, Undergraduate advisory board chair, Co-founder of Title IX Advocate Program	*Caltech*
2017-18	**Women in Physics, Math and Astronomy**, Co-founder, Organizing committee member	*Caltech*
2018	**American Astronomical Society Congressional Visit Day**, Participant	*Washington, DC*
2017	**Astrophysics Option Committee**, Co-chair (evaluated and revised the astrophysics major)	*Caltech*
2017-18	**Conduct Review Committee**, Elected representative	*Caltech*
2015-18	**Hixon Writing Center**, Peer tutor	*Caltech*
2014-18	**Caltech Y RISE Program**, Tutor, Advisory board member	*Caltech*

References

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