

Roohi Dalal

POSTDOCTORAL FELLOW IN SPACE SECURITY AND SUSTAINABILITY, OUTER SPACE INSTITUTE AND UNIVERSITY OF BRITISH COLUMBIA

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Appointments

Postdoctoral Fellow in Space Security and Sustainability

OUTER SPACE INSTITUTE AND UNIVERSITY OF BRITISH COLUMBIA

2024-

Fulbright Research Scholar

LEIDEN UNIVERSITY

2018-19

Education

Princeton University

PH.D., ASTROPHYSICAL SCIENCES

2024

CERTIFICATE IN SCIENCE, TECHNOLOGY AND ENVIRONMENTAL POLICY

2024

M.A., ASTROPHYSICAL SCIENCES

2021

California Institute of Technology

B.S., ASTROPHYSICS AND HISTORY (GPA 4.0/4.0)

2018

Research Interests

I am leveraging my interdisciplinary background as an astrophysicist with training in the humanities and science policy to advance the safe and sustainable use of outer space. I am leading policy efforts by the American Astronomical Society to preserve dark and quiet skies and mitigate interference by satellite constellations in astronomical research. I am also studying security threats posed by space debris, including modeling debris from low altitude anti-satellite and ballistic missile defense testing, and investigating the resilience of proliferated LEO architectures. Finally, I am working with a group of astronomers and atmospheric chemists to better understand the atmospheric chemistry changes induced by rocket launches and satellite re-entries, and their resulting impacts on global climate.

Honors and Awards

- 2024 **NSF Astronomy and Astrophysics Postdoctoral Fellowship** (declined)
- 2024 **Brinson Prize Fellowship in Observational Cosmology** (declined)
- 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**
- 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)**

Grants and Observing Time

- 2023-24 **LSST Discovery Alliance Inclusive Collaboration** "Code Tutorials to Enable Participation," \$12,000 (PI)
- 2022-24 **Clay Telescope, Las Campanas Observatory** 3 nights (PI)
- 2023 **Baade Telescope, Las Campanas Observatory** 2 nights (PI)
- 2022-23 **Gemini North and Gemini South** 97 hours (PI)

Advising Experience

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

Teaching Experience

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

Selected Talks

“Space Debris and Nuclear Strategic Stability”

Sept 2024	Advanced Maui Optical and Space Surveillance Technologies Conference
April 2024	Space Security Panel, Western University*
April 2023	Liechtenstein Institute on Self-Determination, Princeton University*
Oct 2022	Princeton School on Science and Global Security

“National Security Interests in Relation to Dark and Quiet Skies”

Oct 2023	IAU385 Symposium on Astronomy and Satellite Constellations
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“Cosmology from Cosmic Shear Power Spectra with Hyper Suprime-Cam Year 3 Data”

Sept 2023	UPenn Astro Seminar*
Aug 2023	UChicago/KICP Open Seminar*
Aug 2023	Rubin Observatory Project and Community Workshop
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*

“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
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* = invited

Languages

Fluent:	English, Hindi, Gujarati
Advanced:	Dutch
Intermediate:	Spanish
Basic:	Russian

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.

2023-	AAS Committee for the Protection of Astronomy and the Space Environment , Policy Vice-Chair (2024-), Member (2023-)
2023-	IAU Centre for the Protection of the Dark and Quiet Sky , Policy Hub member

2013-	USA Astronomy and Astrophysics Olympiad , President (2013-18, 2019-20), Founding member, Board of Directors (2013-), Team leader (2014, 2016)	
2022-24	Princeton Astrophysics Survey Science Discussions , Organizer	Princeton
2019-24	Women in STEM Leadership Council , President (2021-22), Council member (2019-24)	Princeton
2023	Princeton School on Science and Global Security , Organizer	Princeton
2023	ASCEND Session Organizer , Sustainable Use of Low Earth Orbit for Science and Society	Las Vegas
2023	Princeton Citizen Scientists , Congressional Visit Organizer	Washington, DC
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

Publications

Since the start of my PhD in September 2019, I have authored a total of 14 papers in peer-reviewed journals with a total of 679 citations (h-index of 10).

Lead Author (* indicates work led by a student I advised):

- **Dalal, R.**, *National Security Interests in Relation to Dark and Quiet Skies* (Proceedings of IAU Symposium 385, in press)
- *Ding, J., **Dalal, R.**, et al. *Miscentering of Optical Galaxy Clusters Based on Sunyaev-Zeldovich Counterparts* (in collaboration review)
- **Dalal, R.**, Li, X., Nicola, A., Zuntz, J. et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Power Spectra*, PRD 108, 123519 (2023)
- Li, X., Zhang, T., Sugiyama, S., **Dalal, R.** et al., *Hyper Suprime-Cam Year 3 Results: Cosmology from Cosmic Shear Two-point Correlation Functions*, PRD 108, 123518 (2023)
- *Pobre, S., **Dalal, R.**, Strauss, M., Lin, Y.-T., *Are Brightest Cluster Galaxies Special?*, RNAAS 7, 19 (2023)
- Zhang, T., Li, X., **Dalal, R.**, Mandelbaum, R. et al., *A General Framework for Removing Point Spread Function Systematics in Cosmological Weak Lensing Analysis*, MNRAS 525, 2441-2471 (2023)
- 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*, MNRAS 524, 5109-5131 (2023)
- Martinelli, M., **Dalal, R.**, Majidi, F., Akrami, Y. et al., *Ultralarge-scale approximations and galaxy clustering: Debiasing constraints on cosmological parameters*, MNRAS 510, 1964-1977 (2022)
- **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, 4016-4029 (2021)

Significant Contributions:

- Chen, T.-C., ..., **Dalal, R.** et al., *A Systematic Search of Distant Superclusters with the Subaru Hyper Suprime-Cam Survey*, (2024) arXiv:2401.10322 (submitted to ApJ)
- Sunayama, T., ..., **Dalal, R.** et al., *Optical Cluster Cosmology with SDSS redMaPPer clusters and HSC-Y3 lensing measurements*, (2023) arXiv:2309.13025 (submitted to MNRAS)
- Dark Energy Survey, Kilo-Degree Survey Collaboration, ..., **Dalal, R.** et al., *DES Y3 + KiDS-1000: Consistent cosmology combining cosmic shear surveys*, OJAP 6, 36 (2023)

- Madhavacheril, M., ..., **Dalal, R.** et al., *The Atacama Cosmology Telescope: DR6 Gravitational Lensing Map and Cosmological Parameters*, ApJ 962, 113 (2024)
- 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*, ApJ 962, 112 (2024)
- 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*, PRD 108, 123520 (2023)
- 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*, PRD 108, 123522 (2023)
- 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*, PRD 108, 123517 (2023)