# Niyati Desai

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## Education

2019 – 2024 **Ph.D. in Space Engineering**
California Institute of Technology, *GALCIT*
*Advisor:* Dimitri Mawet, Professor of Astronomy

2019 – 2020 **M.Sc. in Space Engineering**
California Institute of Technology, *GALCIT*

2015 – 2019 **B.Sc. in Physics**
Massachusetts Institute of Technology, *Physics Department*

**B.Sc. in Aerospace Engineering**
Massachusetts Institute of Technology, *Aero/Astro Department*

## Research, Teaching and Engineering Positions

Jul 2024 – Present **Jet Propulsion Laboratory,** *NASA Postdoctoral Fellow*
*Astrophysics Division:* High Contrast Direct Observations of Exoplanetary Systems

May – Jul 2024 **Caltech Astronomy,** *Postdoctoral Researcher*
*Exoplanet Technology Lab:* high contrast testbed experiments, vortex coronagraph design

Feb – May 2023 **Jet Propulsion Laboratory,** *Optics Intern*
*High Contrast Imaging Testbed Facility:* wavefront sensing and control experiments

2020 – 2024 **Caltech Astronomy,** *Graduate Research Assistant*
*Exoplanet Technology Lab:* high contrast testbed experiments, vortex coronagraph design

Mar – Jun 2022 **Caltech Astronomy,** *Graduate Teaching Assistant*
AY 105: Optical Astronomy Instrumentation Lab Class

Jun – Aug 2019 **Honeybee Robotics,** *Robotics Intern*
*System Engineering:* modular systems architecture for robotic motion control tasks

Jun – Aug 2018 **Jet Propulsion Laboratory,** *Flight Instruments Intern*
*Nancy Grace Roman Space Telescope:* EMCCD cosmic ray detection/removal algorithms

Jun – Aug 2017 **Northrop Grumman,** *Integration and Testing Intern*
*James Webb Space Telescope:* telemetry scripts for spacecraft command and data handling

Jan – Jun 2016 **Computer Science and Artificial Intelligence Laboratory,** *Undergraduate Researcher*
*Interactive Robotics Group:* human and autonomous agent communication models

## Scientific Publications

### Peer-Reviewed Journal Articles (first author)

1. **N. Desai**, D. Mawet, E. Serabyn, G. Ruane, A. Bertrou-Cantou, J. Llop-Sayson, and A. J. E. Riggs, "Benefits of adding radial phase dimples on scalar coronagraph phase masks," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 10, no. 1, p. 015 001, 2024. DOI: 10.1117/1.JATIS.10.1.015001.
2. **N. Desai**, A. Potier, S. F. Redmond, G. Ruane, P. K. Poon, A. J. E. Riggs, M. Noyes, and C. M. Prada, "Comparative laboratory study of electric field conjugation algorithms," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 10, no. 3, p. 035 001, 2024. DOI: 10.1117/1.JATIS.10.3.035001.
3. **N. Desai**, G. J. Ruane, J. D. Llop-Sayson, A. Betrou-Cantou, A. Potier, A. E. Riggs, E. Serabyn, and D. Mawet, "Laboratory demonstration of the wrapped staircase scalar vortex coronagraph," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 9, no. 2, p. 025 001, 2023. DOI: 10.1117/1.JATIS.9.2.025001.

### Conference Proceedings (first author)

1. **N. Desai**, A. Bertrou-Cantou, G. Ruane, J. Llop-Sayson, A. E. Riggs, E. Serabyn, and D. Mawet, "Achromatizing scalar vortex coronagraphs with radial phase mask dimples," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677224.

2. **N. Desai**, L. König, E. Por, R. Juanola-Parramond, R. Belikov, *et al.*, "Integrated photonic-based coronagraphic systems for future space telescopes," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677210.

3. **N. Desai**, A. Potier, G. Ruane, A. E. Riggs, P. K. Poon, M. Noyes, and C. Mejia Prada, "Experimental comparison of model-free and model-based dark hole algorithms for future space telescopes," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677040.

4. **N. Desai**, J. Llop-Sayson, A. Bertrou-Cantou, G. Ruane, A. E. Riggs, E. Serabyn, and D. Mawet, "Topological designs for scalar vortex coronagraphs," in *Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave*, vol. 12180, SPIE, 2022, 121805H. DOI: 10.1117/12.2630950.

5. **N. Desai**, J. Llop-Sayson, N. Jovanovic, G. Ruane, E. Serabyn, S. Martin, and D. Mawet, "High contrast demonstrations of novel scalar vortex coronagraph designs at the high contrast spectroscopy testbed," in *Techniques and Instrumentation for Detection of Exoplanets X*, SPIE, 2021. DOI: 10.1117/12.2603953.

### Other Co-authored Publications

1. J. Liberman, J. Llop-Sayson, A. Bertrou-Cantou, D. Mawet, A. J. E. Riggs, and **N. Desai**, "Implicit electric field conjugation through a single-mode fiber," submitted.

2. J. Fowler, S. Y. Haffert, M. A. M. van Kooten, *et al.*, "Visible extreme adaptive optics on extremely large telescopes: towards detecting oxygen in Proxima Centauri b and analogs," in *Techniques and Instrumentation for Detection of Exoplanets XI*, International Society for Optics and Photonics, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677503.

3. L. König, S. Palatnick, **N. Desai**, O. Absil, M. Millar-Blanchaer, and D. Mawet, "Metasurface-based scalar vortex phase mask design in pursuit of 1e-10 contrast," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2676174.

4. J. Liberman, J. Llop-Sayson, A. Bertrou-Cantou, D. Mawet, A. J. E. Riggs, and **N. Desai**, "Implicit electric field conjugation for improved starlight rejection through a single-mode fiber," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677532.

5. P. Morrissey, L. Harding, N. Bush, *et al.*, "Flight photon counting electron multiplying charge coupled device development for the Roman Space Telescope coronagraph instrument," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 9, no. 1, p. 016 003, Jan. 2023. DOI: 10.1117/1.JATIS.9.1.016003.

6. S. Palatnick, L. König, M. Millar-Blanchaer, J. K. Wallace, O. Absil, D. Mawet, **N. Desai**, D. Echeverri, D. John, and J. Schuller, "Prospects for metasurfaces in exoplanet direct imaging systems: From principles to design," in *Techniques and Instrumentation for Detection of Exoplanets XI*, vol. 12680, SPIE, 2023. DOI: 10.1117/12.2677834.

7. S. R. Vaughan, T. D. Gebhard, K. Bott, *et al.*, "Chasing rainbows and ocean glints: Inner working angle constraints for the Habitable Worlds Observatory," *Monthly Notices of the Royal Astronomical Society*, vol. 524, no. 4, pp. 5477–5485, Aug. 2023, ISSN: 0035-8711. DOI: 10.1093/mnras/stad2127.

## Awards and Fellowships

**SPIE Overall Best Paper**, Astronomical Telescopes + Instrumentation: Optical, Infrared, and Millimeter Wave *(2024)*

**NASA Postdocotral Program Fellow**, ORAU *(2024)*

**Amelia Earhart Fellow**, Zonta International *(2023)*

**Three Minute Thesis: 1st Place Winner**, Caltech Libraries *(2023)*

**Hummel-Gray Award**, Caltech Y *(2023)*

**KISS Affiliate**, Keck Institute for Space Studies *(2021)*

**Admiral Luis de Florez Award for Original Thinking or Ingenuity**, MIT Aero Astro *(2019)*

## Outreach

Caltech Astronomy Outreach Volunteer (2019-present)
Caltech Undergraduate Summer Research Seminar Day Session Chair (August 2024)
LA Astronomy on Tap Speaker (February 2024)
JPL Explore Day Exoplanet Guide (April 2023)
Caltech Women in GALCIT/Engineering and Applied Science Volunteer (2021-2024)
Caltech Space Challenge 2022 Organizer (2021-2022)
Pasadena Unified School District Innovation Expo Judge (2022-present)
Yucca Valley Hi-Desert Museum Outreach Talk (October 2022)
STEM Summer Camp Mentor (Summer 2023)

## Research Talks and Invited Workshops

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| Jun 2024 | SPIE Astronomical Telescopes + Instrumentation: Contributed Talk |
| Jan 2024 | Pasadena Astronomy on Tap Public Outreach Lecture |
| Oct 2023 | 2nd International Vortex Workshop: Scientific Organizing Committee |
| | 2nd International Vortex Workshop: Two Contributed Talks |
| Aug 2023 | SPIE Optics and Photonics: Session Chair: Coronagraph Testbeds and Results I |
| | SPIE Optics and Photonics: Contributed Talk |
| | SPIE Optics and Photonics: Two Poster Presentations |
| Jun 2023 | Adaptive Optics for Extremely Large Telescopes: Contributed Poster |
| | Group Seminar at Institut de Planetologie et d'Astrophysique de Grenoble |
| Feb 2023 | Lorentz Center Workshop: Optimal Exoplanet Imagers |
| Nov 2022 | Network of Young Researchers in Instrumentation for Astronomy (NYRIA) Workshop |
| | Planetary & Stellar systems Imaging Lab Group Seminar at Université de Liège |
| Sept 2022 | Caltech Associates Keynote Speaker |
| | Exoplanet Group Seminar at University of California Santa Barbara |
| Jul 2022 | SPIE Astronomical Telescopes + Instrumentation: Poster Presentation |
| Jun 2022 | Spirit of Lyot: Poster Presentation |
| | High Angular Resolution for Astrophysics Seminar at the Paris Observatory |
| Aug 2021 | SPIE Optics and Photonics: Contributed Talk |