Contact

Department of Physics & Astronomy, Johns Hopkins University

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PROFESSIONAL Positions

Postdoctoral fellow

Sep 2024 - current

Johns Hopkins University (JHU), Baltimore, MD

Incoming assistant professor

Jan 2026

The University of Texas at Austin, Department of Physics, Austin, TX

Member (postdoctoral fellow)

Sep 2021 - Aug 2024

Institute for Advanced Study (IAS), Princeton, NJ

**EDUCATION** 

New York University (NYU) — New York, NY

September 2021

Ph.D. (alongside MS & M.Phil in Astrophysics)

Indian Institute of Technology, Bombay (IITB)—Mumbai, India

May 2015

B.Tech (Bachelor of Technology) in Engineering Physics with Honors in Physics

- RESEARCH INTERESTS Compact objects: gravitational wave searches and progenitor inference
  - Machine learning: interpretablility and probabilistic inference
  - Cosmology with Sunyaev-Zeldovich (SZ) and galaxy spectroscopic surveys
  - Dark matter phenomenology from observations of dwarf galaxies

- Awards & Honors Membership, IAS, Princeton (2021 2024)
  - Weinberg Institute Postdoctoral Fellowship, UT Austin (declined)
  - Subrahmanyan Chandrasekhar postdoctoral fellowship, Perimeter Insitute (declined)
  - James Arthur Dissertation Fellowship, NYU (2020 2021)
    - awarded to one student across all science, humanities, social science programs at NYU.
  - James Arthur Graduate Fellowship, NYU (2019 2020)
  - Henry Mitchell McCracken Fellowship at NYU (2015 2019)
  - All India Rank 139 in IIT-JEE 2011 exam (99.97 percentile) among 485,000 candidates.
  - KVPY fellowship (Kishore Vaigynaik Protsahan Yojana) by the Govt. of India (declined)
  - NTSE fellowship (National Talent Search Scholarship) by the Govt. of India.
  - Travel grants: DAP travel award (600\$) & DGRAV travel award (300\$) for APS April Meeting 2019. DAP travel award (600\$) for APS April Meeting 2018

## Invited talks & COLLOQUIA

Physics seminar, UT Austin	February 2025
DGRAV-APS seminar (remote) [video]	October 2024
GWPAW conference, University of Birmingham	May 2024
Gravity, Astro and Particle Physics seminar, Penn state University	February 2024
CTC seminar, University of Maryland	February 2024
Astrophysics seminar, New York University	January 2024
BHI foundations seminar, Harvard [video]	November 2023
Lunch seminar, Carnegie observatories	November 2023
N3AS seminar, UC Berkeley (remote) [slides]	September 2023
Theoretical physics seminar, TIFR, India	September 2023
Astrophysics seminar, ICTS, India	August 2023
Astrophysics seminar, IAS, Princeton	February 2022
Astrophysics seminar, IIT Hyderabad, India [slides]	February 2022
Astrophysics seminar, TIFR, India	January 2022
SOTU seminar, TIFR, India	November 2021
RPM seminar, Lawrence Berkeley National Lab, CA [slides]	January 2021
CCA lunch talk, Center for computational astrophysics, NY	August 2020
Princeton/IAS Cosmology lunch talk , Princeton, NJ	December 2019

	Cosmology seminar, TIFR, Mumbai, India Cosmology seminar, UC Berkeley, CA [slides] Workshop on dynamics of LSS formation, MIAPP, Garching, Germany	December 2019 October 2019 July 2019
MENTORING	<ul> <li>Zihui Wang: NYU graduate student. Co-authored two papers.</li> <li>Ana Maria Delgado: Harvard graduate student. Co-authored a paper.</li> <li>Leander Thiele: Princeton graduate student. Co-authored three papers.</li> <li>Mark Cheung: JHU graduate student.</li> <li>Abby Mintz: Princeton graduate student.</li> <li>Konstantinos Kritos: JHU graduate student.</li> <li>Sophia Yi: JHU graduate student.</li> <li>Tibor Rothschild: Yale undergraduate student.</li> <li>Param Gogia: Vassar college undergraduate student.</li> </ul>	
PUBLICATIONS	The most-updated list and metrics are available in the ADS library. I have published over 25 papers, 1000+ citations, h-index 16 12 of them are first author papers, 450+ citations (library link)	
FIRST AUTHOR	12. New search pipeline for gravitational waves with higher-order modes using mode-by-mode filtering <b>D. Wadekar</b> , J. Roulet, T. Venumadhav, A. Mehta, B. Zackay, et al.	arXiv:2405.17400 PRD 2024
	11. New black hole mergers in the LIGO-Virgo O3 data from a gravitational wave search including higher-order harmonics <b>D. Wadekar</b> , J. Roulet, T. Venumadhav, A. Mehta, B. Zackay, et al.	arXiv:2312.06631 under review
	10. New approach to template banks of gravitational waves with higher harmonics: reducing matched-filtering cost by over an order of magnitude <b>D. Wadekar</b> , T. Venumadhav, A. Mehta, J. Roulet, et al.	arXiv:2310.15233 PRD 2024
	9. The SZ flux-mass $(Y - M)$ relation at low halo masses: improvements with symbolic regression and strong constraints on baryonic feedback $\textbf{\textit{D. Wadekar}}$ , $L.Thiele$ , $F.\ Villaescusa-Navarro$ , $J.\ C.\ Hill$ , $D.\ Spergel$ , et al.	arXiv:2209.02075 MNRAS 2023
	8. Augmenting astrophysical scaling relations with machine learning: application to reducing the SZ flux-mass scatter <b>D. Wadekar</b> , L.Thiele, F. Villaescusa-Navarro, J. C. Hill, D. Spergel, et al.	arXiv:2201.01305 PNAS 2023
	7. Strong constraints on decay and annihilation of dark matter from heating of gas-rich dwarf galaxies  **D. Wadekar**, Z. Wang**	arXiv:2111.08025 PRD 2022
	6. Modeling the neutral hydrogen assembly bias with machine learning and symbolic regression  D. Wadekar, F. Villaescusa-Navarro, S. Ho, L. Perreault-Levasseur	arXiv:2012.00111
	5. Cosmological constraints from BOSS with analytic covariance matrices <b>D. Wadekar</b> , M. Ivanov, R. Scoccimarro	arXiv:2009.00622 PRD 2020
	4. HInet: Generating neutral hydrogen from dark matter with neural networks <b>D. Wadekar</b> , F. Villaescusa-Navarro, S. Ho, L. Perreault-Levasseur	arXiv:2007.10340 ApJ 2021
	<ol> <li>Gas-rich dwarf galaxies as a new probe of dark matter interactions with ordinary matter</li> <li>Wadekar, G. Farrar</li> </ol>	arXiv:1903.12190 PRD 2021
	2. The Galaxy Power Spectrum Multipoles Covariance in Perturbation Theory <b>D. Wadekar</b> , R. Scoccimarro [Editors' suggestion]	arXiv:1910.02914 PRD 2020
	1. Zeldovich pancakes at redshift zero: the equilibration state and phase space prop <b>D. Wadekar</b> , S. Hansen [arXiv:1411.6627]	perties. MNRAS 2015

 $<sup>^{*}</sup>$  indicates alphabetical authorship

SECOND/
THIRD
AUTHOR

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Press

SERVICE

TEACHING EXPERIENCE

9. Significant increase in sensitive volume of a gravitational wave search upon including higher harmonics  A. Mehta, <b>D. Wadekar</b> , J. Roulet, I. Anantpurkar, T. Venumadhav, et al.	arXiv:2501.17939	
8. New binary black hole mergers in the LIGO-Virgo O3b data A. Mehta, S. Olsen, <b>D. Wadekar</b> , J. Roulet, T. Venumadhav, et al.	arXiv:2311.06061 PRD 2025	
7. Fast marginalization algorithm for optimizing gravitational wave detection, parameter estimation and sky localization  A. Mehta, S. Olsen, <b>D. Wadekar</b> , J. Roulet, T. Venumadhav, et al.	arXiv:2404.02435 PRD 2024	
6. In Pursuit of Love: First Templated Search for Compact Objects with Large Tidal Deformabilities in the LIGO-Virgo Data H. S. Chia*, T. Edwards*, D. Wadekar*, A. Zimmerman*, et al.	arXiv:2306.00050 PRD 2024	
5. Constraining axion and compact dark matter with interstellar medium heating <b>D.</b> Wadekar*, Z. Wang*	g arXiv:2211.07668 PRD 2023	
4. Percent-level constraints on baryonic feedback with CMB spectral distortions L. Thiele, <b>D. Wadekar</b> , J. C. Hill, N. Battaglia, J. Chluba, et al.	arXiv:2201.01663 PRD 2022	
3. Modeling the galaxy-halo connection with machine learning A. Delgado, <b>D. Wadekar</b> , B. Hadzhiyska, S. Bose, L. Hernquist, S. Ho	arXiv:2111.02422 MNRAS 2022	
2. Comment on "Calorimetric Dark Matter Detection with Galactic Center Gas Clouds"  G. Farrar, F. Lockman, N. McClure-Griffiths, D. Wadekar* [arXiv:1903.12191] PRL 2020		
<ol> <li>Variance Adaptation in Navigational Decision Making         R. Gepner, J. Wolk, D. Wadekar, S. Dvali, M. Gershow         * indicates alphabetical authorship     </li> </ol>	eLife 2018	
<ol> <li>Systematic biases from the exclusion of higher harmonics in parameter estimation on LISA binaries</li> <li>Yi, F. Iacovelli, S. Marsat, D. Wadekar, E. Berti</li> </ol>	arXiv:2502.12237	
3. The CAMELS project: public data release F. Villaescusa-Navarro et al. (incl. D. Wadekar)	arXiv:2201.01300	
2. The CAMELS Multifield Dataset: Learning the Universe's Fundamental Parameters with Artificial Intelligence F. Villaescusa-Navarro et al. (incl. <b>D. Wadekar</b> )	arXiv:2109.10915 ApJ 2022	
1. The CAMELS project: Cosmology and Astrophysics with Machine Learning Simulations F. Villaescusa-Navarro et al. (incl. <b>D. Wadekar</b> )	arXiv:2010.00619 ApJ 2021	
Phys.org, Cosmos magazine, Eurekalert, Science daily, Space Ref, Tech times, Scienmag, Tech explorist, IAS, CCA, UConn		
<ul> <li>Organizer of the ML×Astronomy meetings at JHU and STScI</li> <li>Organizer of the IAS astrophysics seminars</li> <li>Organizer of the Dark Cosmos seminar series at Princeton University</li> <li>Referee for MNRAS, Phys. Rev. D, Annalen der Physik.</li> <li>Author of the public CovaPT code for calculating analytic covariance matrice for galaxy spectroscopic surveys.</li> <li>Author of the public IAS-HM pipeline code for finding black hole mergers in public gravitational wave strain data.</li> </ul>	Fall 2024-current Fall 2023-2024 Fall 2022-2023 es	
<ul> <li>Teaching Assistant (TA) at NYU for Mathematical Physics (undergraduate)</li> <li>TA at NYU for Electricity &amp; Magnetism- I (undergraduate)</li> <li>TA at IITB for Electromagnetism- I (undergraduate)</li> </ul>	Spring 2018 Fall 2016 Spring 2015	

# Collaborations

IAS gravitational wave search pipeline

CAMELS collaboration

Member of the Dark Energy Spectroscopic Instrument (DESI)

2022-current
2022-current
2019-current

### OUTREACH

# • Outreach talks:

Before the pandemic started, I used to give  $\sim 5$  talks each year to high schools students in my hometown in India about the current cutting-edge research in science and ways of pursuing research as a career option. Here is an example

- Academic Mentorship:
  - Tutored academically weak students at IIT Bombay in complex analysis and differential equations. Mentored two students in the physics department and helped them in clearing their backlogs.
  - Mentoring a JHU astrophysics graduate student as a part of PhA mentoring program at JHU.
- Astronomy Club:

Gave talks on future of astronomy at IIT Bombay to a general audience. I also headed a project in collaboration with the club to build a Solar Radio Telescope from scratch.

• Completed science communication writing workshops at the NYU journalism institute and published a review on an upcoming popular science book [link].

#### References

Prof. Matias Zaldarriaga	matiasz@ias.edu
Prof. Roman Scoccimarro (PhD advisor)	rs123@nyu.edu
Prof. Glennys Farrar	gf25@nyu.edu
Prof. Emanuele Berti	berti@jhu.edu
Prof. David Spergel	dspergel@flatironinstitute.org
Prof. Shirley Ho	shirleyho@flatironinstitute.org
Prof. Colin Hill	jch2200@columbia.edu

# RECENT CONTRIBUTED TALKS

Froj. Coun Irui	Jen 2200@corumbia.edu
Gravitational wave group meeting, University of Cambridge, UK	May 2024
Cosmology journal club, University of Cambridge, UK	May 2024
April Meeting of the American Physical Society (APS), Sacramento, CA	v
Astrophysics talk, JHU	January 2024
GRITTS seminar, MIT	December 2023
Tea talk, Caltech	November 2023
BCCP journal club, UC Berkeley	November 2023
Theory group seminar, Northwestern University	October 2023
APS April Meeting, Minneapolis, MN	April 2023
L2G2 meeting, Columbia University	March 2023
APS April Meeting, New York, NY	April 2022
Princeton/IAS cosmology meeting, Princeton University	October 2021
Brown bag talk, NYU	March 2021
Particle and Astrophysics meeting, CCA	December 2020
Cosmology group meeting, University of Chicago	December 2020
Astrophysics seminar, University of Pennsylvania	December 2020
Cosmology seminar, Caltech/JPL	November 2020
Cosmology group meeting, CITA	November 2020
Cosmology seminar, Perimeter	November 2020
Dvorkin group meeting, Harvard	November 2020
Eisenstein group meeting, Harvard	October 2020
Hernquist group meeting, Harvard	October 2020
Lunch talk, MIT	October 2020
Cosmology at home conference [video]	August 2020
Euclid survey ML meeting, Zoom	July 2020
BCCP workshop: Spectroscopic surveys, UC Berkeley, CA	January 2020
APS April Meeting, Denver, CO	April 2019
APS April Meeting, Columbus, OH	April 2018