C.V DIGVIJAY (JAY) WADEKAR

Contact

Department of Physics & Astronomy, Johns Hopkins University
3400 N. Charles Street, Baltimore, MD, USA

Personal website
jayw@jhu.edu

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 — December 2019
Cosmology seminar, UC Berkeley, CA [slides] — October 2019
Workshop on dynamics of LSS formation, MIAPP, Garching, Germany — July 2019

Mentoring

- Zihui Wang: NYU graduate student. *Co-authored two papers.*
- Ana Maria Delgado: Harvard graduate student. *Co-authored a paper.*
- Leander Thiele: Princeton graduate student. *Co-authored three papers.*
- Mark Cheung: JHU graduate student.
- Abby Mintz: Princeton graduate student.
- Konstantinos Kritos: JHU graduate student.
- Sophia Yi: JHU graduate student.
- Tibor Rothschild: Yale undergraduate student.
- Param Gogia: Vassar college undergraduate student.

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 — arXiv:2405.17400, PRD 2024
***D. Wadekar**, J. Roulet, T. Venumadhav, A. Mehta, B. Zackay, et al.*

11. New black hole mergers in the LIGO-Virgo O3 data from a gravitational wave search including higher-order harmonics — arXiv:2312.06631, under review
***D. Wadekar**, J. Roulet, T. Venumadhav, A. Mehta, B. Zackay, et al.*

10. New approach to template banks of gravitational waves with higher harmonics: reducing matched-filtering cost by over an order of magnitude — arXiv:2310.15233, PRD 2024
***D. Wadekar**, T. Venumadhav, A. Mehta, J. Roulet, et al.*

9. The SZ flux-mass ($Y - M$) relation at low halo masses: improvements with symbolic regression and strong constraints on baryonic feedback — arXiv:2209.02075, MNRAS 2023
***D. Wadekar**, L.Thiele, F. Villaescusa-Navarro, J. C. Hill, D. Spergel, et al.*

8. Augmenting astrophysical scaling relations with machine learning: application to reducing the SZ flux-mass scatter — arXiv:2201.01305, PNAS 2023
***D. Wadekar**, L.Thiele, F. Villaescusa-Navarro, J. C. Hill, D. Spergel, et al.*

7. Strong constraints on decay and annihilation of dark matter from heating of gas-rich dwarf galaxies — arXiv:2111.08025, PRD 2022
D. Wadekar, Z. Wang**

6. Modeling the neutral hydrogen assembly bias with machine learning and symbolic regression — arXiv:2012.00111
***D. Wadekar**, F. Villaescusa-Navarro, S. Ho, L. Perreault-Levasseur*

5. Cosmological constraints from BOSS with analytic covariance matrices — arXiv:2009.00622, PRD 2020
***D. Wadekar**, M. Ivanov, R. Scoccimarro*

4. HInet: Generating neutral hydrogen from dark matter with neural networks — arXiv:2007.10340, ApJ 2021
***D. Wadekar**, F. Villaescusa-Navarro, S. Ho, L. Perreault-Levasseur*

3. Gas-rich dwarf galaxies as a new probe of dark matter interactions with ordinary matter — arXiv:1903.12190, PRD 2021
***D. Wadekar**, G. Farrar*

2. The Galaxy Power Spectrum Multipoles Covariance in Perturbation Theory — arXiv:1910.02914, PRD 2020
***D. Wadekar**, R. Scoccimarro* [Editors' suggestion]

1. Zeldovich pancakes at redshift zero: the equilibration state and phase space properties. — MNRAS 2015
***D. Wadekar**, S. Hansen* [arXiv:1411.6627]

* indicates alphabetical authorship

Second/ Third author

9. Significant increase in sensitive volume of a gravitational wave search upon including higher harmonics — arXiv:2501.17939
   *A. Mehta, **D. Wadekar**, J. Roulet, I. Anantpurkar, T. Venumadhav, et al.*
8. New binary black hole mergers in the LIGO-Virgo O3b data — arXiv:2311.06061, PRD 2025
   *A. Mehta, S. Olsen, **D. Wadekar**, J. Roulet, T. Venumadhav, et al.*
7. Fast marginalization algorithm for optimizing gravitational wave detection, parameter estimation and sky localization — arXiv:2404.02435, PRD 2024
   *A. Mehta, S. Olsen, **D. Wadekar**, J. Roulet, T. Venumadhav, et al.*
6. In Pursuit of Love: First Templated Search for Compact Objects with Large Tidal Deformabilities in the LIGO-Virgo Data — arXiv:2306.00050, PRD 2024
   H. S. Chia, T. Edwards*, **D. Wadekar***, A. Zimmerman*, et al.*
5. Constraining axion and compact dark matter with interstellar medium heating — arXiv:2211.07668, PRD 2023
   D. Wadekar, Z. Wang**
4. Percent-level constraints on baryonic feedback with CMB spectral distortions — arXiv:2201.01663, PRD 2022
   *L.Thiele, **D. Wadekar**, J. C. Hill, N. Battaglia, J. Chluba, et al.*
3. Modeling the galaxy-halo connection with machine learning — arXiv:2111.02422, MNRAS 2022
   *A. Delgado, **D. Wadekar**, B. Hadzhiyska, S. Bose, L. Hernquist, S. Ho*
2. Comment on "Calorimetric Dark Matter Detection with Galactic Center Gas Clouds" — PRL 2020
   *G. Farrar , F. Lockman, N. McClure-Griffiths, **D. Wadekar**** [arXiv:1903.12191]
1. Variance Adaptation in Navigational Decision Making — eLife 2018
   *R. Gepner, J. Wolk, **D. Wadekar**, S. Dvali, M. Gershow*

* indicates alphabetical authorship

Nth-author

4. Systematic biases from the exclusion of higher harmonics in parameter estimation on LISA binaries — arXiv:2502.12237
   *S. Yi, F. Iacovelli, S. Marsat, **D. Wadekar**, E. Berti*
3. The CAMELS project: public data release — arXiv:2201.01300
   *F. Villaescusa-Navarro et al. (incl. **D. Wadekar**)*
2. The CAMELS Multifield Dataset: Learning the Universe's Fundamental Parameters with Artificial Intelligence — arXiv:2109.10915, ApJ 2022
   *F. Villaescusa-Navarro et al. (incl. **D. Wadekar**)*
1. The CAMELS project: Cosmology and Astrophysics with Machine Learning Simulations — arXiv:2010.00619, ApJ 2021
   *F. Villaescusa-Navarro et al. (incl. **D. Wadekar**)*

Press

Phys.org, Cosmos magazine, Eurekalert, Science daily, Space Ref, Tech times, Scienmag, Tech explorist, IAS, CCA, UConn

Service

- Organizer of the ML×Astronomy meetings at JHU and STScI — Fall 2024-current
- Organizer of the IAS astrophysics seminars — Fall 2023-2024
- Organizer of the Dark Cosmos seminar series at Princeton University — Fall 2022-2023
- Referee for MNRAS, Phys. Rev. D, Annalen der Physik.
- Author of the public CovaPT code for calculating analytic covariance matrices for galaxy spectroscopic surveys.
- Author of the public IAS-HM pipeline code for finding black hole mergers in public gravitational wave strain data.

Teaching Experience

- Teaching Assistant (TA) at NYU for Mathematical Physics (undergraduate) — Spring 2018
- TA at NYU for Electricity & Magnetism- I (undergraduate) — Fall 2016
- TA at IITB for Electromagnetism- I (undergraduate) — Spring 2015

Collaborations

IAS gravitational wave search pipeline	2022-current
CAMELS collaboration	2022-current
Member of the Dark Energy Spectroscopic Instrument (DESI)	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

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	April 2024
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