# C.V DIGVIJAY (JAY) WADEKAR


**Contact**

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Citizenship: Indian

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**Professional Positions**

**Member (postdoctoral fellow)** — September 2021 - current
*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**

- Detection of gravitational waves with LIGO/Virgo/KAGRA data
- Application of interpretable machine learning techniques to Astrophysics
- Dark matter phenomenology from observations of dwarf galaxies
- Cosmology with Sunyaev-Zeldovich (SZ) and galaxy spectroscopic surveys

**Invited talks & colloquia**

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|---|---|
| Astro coffee, Princeton University | September 2022 |
| 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 |

**Awards & Honors**

- **Postdoctoral fellowship**, IAS (2021 - current)
- **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 Meething 2019. DAP travel award (600$) for APS April Meeting 2018

**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.*

**Service**

- Referee for MNRAS, Phys. Rev. D, Annalen der Physik.
- Co-organizer of the dark cosmos seminar series (Princeton University)
- Author of the CovaPT code for calculating analytic covariance matrices for upcoming galaxy spectroscopic surveys.

**Collaborations**

Member of the Dark Energy Spectroscopic Instrument (DESI) — 2019-current

**Teaching Experience**

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| - 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 |

## 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.
- *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].

## Technical Skills

- Programming: C/C++, Python, Mathematica, FORTRAN77
- Operating Systems: Linux, Windows, Mac
- Analysis Tools: Pytorch, scikit-learn

## References


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


## Publications

The most-updated list and metrics are available at ADS.
I have published 17 papers, 332+ citations, h-index 10
13 of them are first/second author papers, 220+ citations, h-index 9 (library)

(Primary /secondary author)

13. Constraining axion and compact dark matter with interstellar medium heating — arXiv:2211.07668
***D. Wadekar****, *Z. Wang* — PRD 2023

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

11. Percent-level constraints on baryonic feedback with CMB spectral distortions — arXiv:2201.01663
*L.Thiele,* ***D. Wadekar****, J. C. Hill, N. Battaglia, J. Chluba, et al.* — PRD 2022

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

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

8. Modeling the galaxy-halo connection with machine learning — arXiv:2111.02422
*A. Delgado,* ***D. Wadekar****, B. Hadzhiyska, S. Bose, L. Hernquist, S. Ho* — MNRAS 2022

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

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

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

4. Gas-rich dwarf galaxies as a new probe of dark matter interactions with ordinary matter — arXiv:1903.12190, PRD 2021
   ***D. Wadekar**, G. Farrar*
3. The Galaxy Power Spectrum Multipoles Covariance in Perturbation Theory — arXiv:1910.02914, PRD 2020
   ***D. Wadekar**, R. Scoccimarro* [Editors' suggestion]
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. Zeldovich pancakes at redshift zero: the equilibration state and phase space properties. — MNRAS 2015
   ***D. Wadekar**, S. Hansen* [arXiv:1411.6627]

* indicates alphabetical authorship

(Co-author)

4. The CAMELS project: public data release — arXiv:2201.01300
   *F. Villaescusa-Navarro et al. (incl.* ***D. Wadekar****)*
3. 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****)*
2. The CAMELS project: Cosmology and Astrophysics with Machine Learning Simulations — arXiv:2010.00619, ApJ 2021
   *F. Villaescusa-Navarro et al. (incl.* ***D. Wadekar****)*
1. Variance Adaptation in Navigational Decision Making — eLife 2018
   *R. Gepner, J. Wolk,* ***D. Wadekar****, S. Dvali, M. Gershow*

Recent contributed talks

| | |
|---|---|
| L2G2 meeting, Columbia University | March 2023 |
| 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 |
| April Meeting of the American Physical Society(APS), Denver, CO | April 2019 |
| April Meeting of the American Physical Society(APS), Columbus, OH | April 2018 |