Aditya Vijaykumar

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Employment

CITA Postdoctoral Fellow — Sep 2023 - *Present*
Canadian Institute for Theoretical Astrophysics (CITA), Toronto

Graduate Student — Aug 2018 - Aug 2023
International Centre for Theoretical Sciences (ICTS-TIFR), Bengaluru

Fulbright-Nehru Doctoral Research Fellow — Aug 2022 - Mar 2023
Department of Physics, The University of Chicago

Education

International Centre for Theoretical Sciences (ICTS-TIFR), Bengaluru — 2018 - 2023
PhD in Physics. Mentor: Prof. Ajith Parameswaran.
Thesis Title: *Exploring gravity, astrophysics, and cosmology with gravitational waves*

Birla Institute of Technology and Science (BITS), Pilani — 2013 - 2018
M.Sc. (Hons.) Physics and B.E. (Hons.) Mechanical Engineering

Grants and Awards

1. **Justice Oak Award for Outstanding thesis in Astronomy 2024**, Astronomical Society of India (ASI)
2. **V. V. Narlikar Best Thesis Award 2024**, Indian Association for General Relativity and Gravitation (IAGRG)
3. **Fulbright-Nehru Doctoral Research Fellowship 2022**, US Department of State and Government of India
4. **Co-PI, IndiaBioscience Outreach Grant 2022**, *Communicating Science Through Theatre*, (100,000 INR)
5. **Graduate Fellowship 2018-2023**, ICTS-TIFR
6. **S.N. Bhatt Memorial Excellence Fellowship 2018**, ICTS-TIFR
7. **Summer Research Fellowship 2016**, Indian Academy of Sciences
8. **INSPIRE-DST Scholarship for Higher Education 2013-2018**, Government of India

Publication Summary

- NASA-ADS Library
- **30 short-author list papers**, including **22 as first/second author**.
- **6 LIGO-Virgo-KAGRA Collaboration papers** with significant contributions, including **1 as chair of the paper writing team**

Talks Summary

- **10 invited conference talks**
- **23 seminars**
- **10 contributed talks**

Selected Service

LIGO-Virgo-KAGRA Collaboration

- Paper writing team chair for the GWTC-4.0 populations paper
- Parameter estimation study team lead for the GW231123 massive binary black hole
- Developer of `bilby` and `bilby_pipe` software packages
- Eccentric parameter estimation taskforce member
- Low-latency parameter estimation expert rota
- Elected postdoctoral member, LIGO Academic Advisory Committee (LAAC)

Journal Referee

• Nature • Physical Review D • Astrophysical Journal Letters • Astrophysical Journal • Machine Learning: Science and Technology • Journal of Cosmology and Astroparticle Physics

Invited Conference Talks

1. Canadian Association of Physicists Congress, Ottawa — June 2026
2. Gravitational Wave Physics and Astrophysics Workshop, Atlanta — December 2025
3. The Lifecycle of Stellar Black Holes, KITP, Santa Barbara — November 2025
4. Future of Gravitational Wave Astronomy, ICTS, Bengaluru — October 2025
5. European Physical Society Conference on High Energy Physics, Marseille (virtual) — July 2025
6. Scientific Machine Learning in Gravitational Wave Astronomy, ICERM, Providence — June 2025
7. Lyman Break Galaxies Workshop, Toronto — May 2025
8. PAX Meeting, London, UK (panelist) — July 2024
9. The Quest for Precision Gravitational-wave Cosmology, KICP, Chicago — September 2022
10. Second Chennai Symposium on Gravitation and Cosmology, Chennai (virtual) — February 2022

List of Seminars

1. Gravity Seminar (Online), University of Missisippi — April 2026
2. CCAPP Seminar, Ohio State University — February 2026
3. Weinberg Institute Seminar, UT Austin — November 2025
4. Strong Gravity Seminar, Perimeter Institute — November 2025
5. Astrophysics and Relativity Seminar, ICTS — July 2025
6. TAPIR Seminar, Caltech — March 2025
7. Seminar, UCLA — March 2025
8. IGC seminar, Penn State University — October 2024
9. Gravitational wave seminar, IUCAA — August 2024
10. Gravity Exploration Institute seminar, Cardiff University — July 2024
11. CIERA seminar, Northwestern University — June 2024
12. GRAPPA seminar, University of Amsterdam — May 2024
13. Strong seminar, Niels Bohr Institute — April 2024
14. CITA Seminar, University of Toronto — January 2024
15. TASTY Seminar, University of Toronto — January 2024
16. IUCAA gravitational wave seminar, Pune — July 2023
17. Physics seminar, IISER Pune — July 2023
18. Physics seminar, IIT Gandhinagar — June 2023
19. Gravitational wave seminar, Seoul National University (virtual) — October 2022
20. IGC seminar, Penn State University — August 2022
21. Lorentz Institute seminar, Leiden (virtual) — June 2020
22. IUCAA gravitational wave seminar, Pune — September 2019
23. Albert Einstein Institute seminar, Hannover — July 2019

Contributed Talks

1. APS Meeting, Anaheim, CA — March 2025
2. Midwest Relativity Meeting, Ann Arbor, MI — November 2024
3. CASCA Meeting, Toronto — June 2024
4. Gravitational waves: A new ear on the chemistry of galaxies, Leiden — April 2024
5. Globular Clusters and their Tidal Tails, Toronto — May 2024
6. Joint CITA-PI Gravitational waves meeting — October 2023
7. Pune-Mumbai Cosmology Meeting — August 2023
8. ICTS In-house Symposium, Bengaluru — February 2020
9. International Conference on Gravitation & Cosmology, Mohali — December 2019
10. GR22 and Amaldi13, Valencia — July 2019

Mentorship

1. Sarah Han (University of Toronto) — May 2025 - *Present*
2. Cissy Kuang (University of Toronto) — May 2025 - *Present*
3. Ben Stadel (University of Alberta) — May 2024 - *Present*
4. Neha Sharma (ICTS, Bengaluru) — Oct 2023 - *Present*
5. Avinash Tiwari (IUCAA, Pune) — May 2023 - *Present*

6. Kaustubh Gupta (IISER, Pune → Swinburne University) May 2022 - May 2023
7. Adhrit Ravichandran (IIT Roorkee → UMass Dartmouth) Sep 2021 - Aug 2022
8. Kruthi Krishna (IISc → Radboud University) Sep 2020 - Aug 2021
9. Harsh Narola (IISER, Tirupati → Utrecht University) Sep 2020 - Aug 2021

Teaching

- Instructor and organizer, **LIGO-Virgo Collaboration Gravitational-Wave Open Data Workshop #5 and #6** at ICTS.
- Tutor for the **Numerical Relativity** graduate course, ICTS, Jan-April 2022.
- Co-organizer and tutor, **ICTS Workshop on Parameter Estimation with bilby**, ICTS, Bengaluru, India, August 2020 (Online)
- Tutor, **Light and Beyond—Summer Course for Undergraduate Students by Prof. Rajaram Nityananda**, June 2020 (Online)
- Tutor, **LIGO-Virgo Collaboration Gravitational-Wave Open Data Workshop #3**, May 2020 (Online)
- Tutor for the following mini-courses, **ICTS Summer Schools on Gravitational Wave Astronomy**, ICTS, Bengaluru, India:
  1. *Compact binary evolution, rates and population modelling*, June 2022.
  2. *Astrophysical Stochastic GW Foreground*, July 2021.
  3. *Numerical Hydrodynamics*, May 2020.
  4. *Advanced General Relativity*, July 2019.

Outreach

- Interactive session with school students, The Academy School, Pune, August 2025.
- Talk on gravitational-wave astronomy, ASX Symposium, University of Toronto, March 2025.
- Talk on gravitational-wave astronomy, University of Toronto Undergraduate Astronomy Union Seminar, November 2024.
- Co-PI of the *IndiaBioscience Outreach Grant* to communicate science using stage theatre.
- Panelist at the *Bengaluru: The Astronomy City*, a Q&A event organized for **National Science Day**, February 2022.
- Mediator for the **Contagion Exhibition**, Science Gallery Bengaluru, April-July 2021.
- Moderated a discussion with Prof. Smitha Vishveshwara on her collaborative science theatre project *Quantum Voyages* as a part of **Cosmic Zoom Online Exhibition**, April 2021
- Articles on the **ICTS blog**:
  1. A Conversation with ICTS Scientists Studying the Indian Monsoon, November 2019
  2. Summer School on Gravitational Wave Astronomy, November 2019
- Talk titled *The Whats, Whys and Hows of Gravitational-wave Astronomy*, **BMS College of Engineering, Bengaluru**, November 2019
- Talk titled *Gravitational Waves - A New Tool for Cosmology!* at **Vigyan Samagam**, Visvesvaraya Industrial and Technological Museum, Bengaluru, India, August 2019
- Biweekly interactive outreach sessions in rural primary schools, 2019

References

1. Prof. Maya Fishbach, CITA, fishbach@cita.utoronto.ca
2. Prof. Parameswaran Ajith, ICTS-TIFR, ajith@icts.res.in
3. Prof. Daniel E. Holz, The University of Chicago, holz@uchicago.edu
4. Prof. Benjamin Farr, University of Oregon, bfarr@uoregon.edu
5. Prof. Shasvath J. Kapadia, IUCAA, shasvath.kapadia@iucaa.in

Papers (short authorlist)

* *denotes joint first-author papers,* † *denotes student supervised.*

30. †Neha Sharma, **Aditya Vijaykumar**, William E. East et al.
Rapid inference of gravitational-wave signals in the time domain using a heterodyned likelihood
Submitted to PRD, arXiv:2601.11239.

29. **Aditya Vijaykumar**, Amanda M. Farah, Maya Fishbach
The maximum mass ratio of hierarchical binary black hole mergers may cause the q-$\chi_{\rm eff}$ correlation
Submitted to ApJL, arXiv:2601.03457.

28. Amanda M. Farah, **Aditya Vijaykumar**, Maya Fishbach
The steep redshift evolution of the hierarchical binary black hole merger rate may cause the z-$\chi_{\rm eff}$ correlation
Submitted to ApJL, arXiv:2601.03456.

27. N.V. Krishnendu, Tamara Evstafyeva, ⋆**Aditya Vijaykumar**, William E. East et al.
Implications of GW241011 for rotating exotic compact objects
Submitted to PRL, arXiv:2511.17341.

26. Madison VanWyngarden, Maya Fishbach, **Aditya Vijaykumar**, Alexandra G. Guerrero, Daniel E. Holz
How Low Can You Go: Constraining the Effects of Catalog Incompleteness on Dark Siren Cosmology
Submitted to ApJ, arXiv:2511.04786.

25. Hui Tong et al. (including **Aditya Vijaykumar**)
Evidence of the pair instability gap in the distribution of black hole masses
Submitted to Nature, arXiv:2509.04151.

24. Colm Talbot et al. (including **Aditya Vijaykumar**)
Inference with finite time series II: the window strikes back
Submitted to CQG, arXiv:2508.11091.

23. Avinash Tiwari, Prolay Chanda, Shasvath J. Kapadia, Susmita Adhikari, **Aditya Vijaykumar**, Basudeb Dasgupta
Profiling Dark Matter Spikes with Gravitational Waves from Accelerated Binaries
Submitted to PRL, arXiv:2508.03803.

22. Andris Doroszmai, Isobel M. Romero-Shaw, **Aditya Vijaykumar**, Silvia Toonen, et al.
Hierarchical Triples vs. Globular Clusters: Binary black hole merger eccentricity distributions compete and evolve with redshift
Submitted to MNRAS, arXiv:2507.23212.

21. †Avinash Tiwari, **Aditya Vijaykumar**, Shasvath J. Kapadia, Shrobana Ghosh, Alex B. Nielsen
A pipeline to search for signatures of line-of-sight acceleration in gravitational wave signals produced by compact binary coalescences
Submitted to PRD, arXiv:2506.22272.

20. Kanchan Soni, **Aditya Vijaykumar**, Sanjit Mitra
Assessing the potential of LIGO-India in resolving the Hubble Tension
Submitted to CQG, arXiv:2409.11361.

19. †Avinash Tiwari, **Aditya Vijaykumar**, Shasvath J. Kapadia, Sourav Chatterjee, Giacomo Fragione
Profiling stellar environments of gravitational wave sources
Phys. Rev. D 112, 084034, arXiv:2407.15117.

18. Alexandra G. Hanselman, **Aditya Vijaykumar**, Maya Fishbach, Daniel E. Holz
Gravitational-wave dark siren cosmology systematics from galaxy weighting
ApJ 979 9, arXiv:2405.14818.

17. Sreejith Nair, ⋆**Aditya Vijaykumar**, Sudipta Sarkar
Bounds on the charge of the graviton using gravitational wave observations
JCAP 11 (2024) 004, arXiv:2405.05038.

16. ⋆**Aditya Vijaykumar**, Alexandra G. Hanselman, Michael Zevin
Consistent eccentricities for gravitational wave astronomy: Resolving discrepancies between astrophysical simulations and waveform models
ApJ 969 132, arXiv:2402.07892.

15. Mukesh Kumar Singh, Shasvath J. Kapadia **Aditya Vijaykumar**, Parameswaran Ajith
Impact of higher harmonics of gravitational radiation on the population inference of binary black holes
ApJ 971 23, arXiv:2312.07376.

14. †Kruthi Krishna, ⋆**Aditya Vijaykumar**, Apratim Ganguly, *et al*
Accelerated parameter estimation in Bilby with relative binning
arXiv:2312.06009.

13. **Aditya Vijaykumar**, Maya Fishbach, Susmita Adhikari, Daniel E. Holz
Inferring host galaxy properties of LIGO-Virgo-KAGRA's black holes
ApJ 972 157, arXiv:2312.03316.

12. Divyajyoti, N.V. Krishnendu, Muhammed Saleem, Marta Colleoni, **Aditya Vijaykumar**, K.G. Arun, Chandra Kant Mishra
Effect of double spin-precession and higher harmonics on spin-induced quadrupole moment measurements
Phys. Rev. D 109, 023016, arXiv:2311.05506.

11. †Avinash Tiwari, ⋆**Aditya Vijaykumar**, Shasvath J. Kapadia, Giacomo Fragione, Sourav Chatterjee
Accelerated binary black holes in globular clusters: forecasts and detectability in the era of space-based gravitational-wave detectors
MNRAS, 527, 8586, arXiv:2307.00930.

10. **Aditya Vijaykumar**, †Avinash Tiwari, Shasvath J. Kapadia, K.G. Arun, Parameswaran Ajith
Waltzing binaries: Probing line-of-sight acceleration of merging compact objects with gravitational waves
ApJ 954 105, arXiv:2302.09651.
In press: Astrobites

9. †Adhrit Ravichandran, **Aditya Vijaykumar**, Shasvath J. Kapadia, Prayush Kumar
Rapid Identification and Classification of Eccentric Gravitational Wave Inspirals with Machine Learning
Submitted to PRD, arXiv:2302.00666.

8. Srashti Goyal, **Aditya Vijaykumar**, Jose Maria Ezquiaga, Miguel Zumalacarregui
Probing lens-induced gravitational-wave birefringence as a test of general relativity
Phys. Rev. D 108, 024052, arXiv:2301.04826.
In press: Astrobites

7. Bikram Keshari Pradhan, **Aditya Vijaykumar**, Debarati Chatterjee
Impact of updated Multipole Love and f-Love Universal Relations in context of Binary Neutron Stars
Phys. Rev. D 107, 023010, arXiv:2210.09425.

6. **Aditya Vijaykumar**, Shasvath J. Kapadia, Parameswaran Ajith
Can a binary neutron star merger in the vicinity of a supermassive black hole enable a detection of a post-merger gravitational wave signal?
MNRAS, 513, 3577, arXiv:2202.08673.

5. **Aditya Vijaykumar**, Ajit Kumar Mehta, Apratim Ganguly
Detection and parameter estimation challenges of Type-II lensed binary black hole signals
Phys. Rev. D 108, 043036, arXiv:2202.06334.

4. Sumit Kumar, **Aditya Vijaykumar**, Alexander H. Nitz
Detecting Baryon Acoustic Oscillations with third generation gravitational wave observatories,
ApJ 930 113, arXiv:2110.06152.

3. M. Saleem, Javed Rana, V. Gayathri, ⋆**Aditya Vijaykumar** et al.
The Science Case for LIGO-India
Class. Quantum Grav. 39 025004, arXiv:2105.01716.

2. **Aditya Vijaykumar**, M. V. S. Saketh, Sumit Kumar, Parameswaran Ajith, Tirthankar Roy Choudhury
Probing the large scale structure using gravitational wave observations of binary black holes,
Phys. Rev. D 108, 103017, arXiv:2005.01111.
In press: Astrobites.

1. **Aditya Vijaykumar**, Shasvath J. Kapadia, Parameswaran Ajith
Constraints on the time variation of the gravitational constant using gravitational wave observations of binary neutron stars,
Phys. Rev. Lett. 126, 141104, arXiv:2003.12832.
In press: phys.org.

Papers (long authorlist, with substantial contribution)

9. Abac et al. (LIGO Scientific, Virgo, and KAGRA Collaborations)
GW241011 and GW241110: Exploring Binary Formation and Fundamental Physics with Asymmetric, High-spin Black Hole Coalescences,
ApJL, arXiv:2510.26931.
8. Abac et al. (LIGO Scientific, Virgo, and KAGRA Collaborations)
Upper Limits on the Isotropic Gravitational-Wave Background from the first part of LIGO, Virgo, and KAGRA's fourth Observing Run,
arXiv:2508.20721.
7. Abac et al. (LIGO Scientific, Virgo, and KAGRA Collaborations) [**Paper Writing Team Lead**]
GWTC-4.0: Population Properties of Merging Compact Binaries,
arXiv:2508.18083.
6. Abac et al. (LIGO Scientific, Virgo, and KAGRA Collaborations)
GWTC-4.0: Updating the Gravitational-Wave Transient Catalog with Observations from the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run,
arXiv:2508.18082.
5. Abac et al. (LIGO Scientific, Virgo, and KAGRA Collaborations)
GW231123: a Binary Black Hole Merger with Total Mass 190-265 $M_\odot$,
arXiv:2507.08219.
4. Abbott et al. (LIGO Scientific and Virgo Collaborations)
Tests of General Relativity with GWTC-3,
Accepted to *Physical Review D*, arXiv:2112.06861.
3. Abbott et al. (LIGO Scientific and Virgo Collaborations)
Tests of General Relativity with Binary Black Holes from the second LIGO-Virgo Gravitational-Wave Transient Catalog,
Phys. Rev. D 103 (2021) 12, 122002, arXiv:2010.14529.
2. Abbott et al. (LIGO Scientific and Virgo Collaborations)
GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run,
Phys. Rev. X 11 (2021) 021053, arXiv:2010.14527.
1. P. Virtanen *et al.* (including **Aditya Vijaykumar** as *SciPy 1.0 Contributor*)
SciPy 1.0–Fundamental Algorithms for Scientific Computing in Python,
Nat Methods 17, 261–272 (2020), arXiv:1907.10121.