Aditya Vijaykumar

aditya@utoronto.ca • Canadian Institute for Theoretical Astrophysics (CITA) • Website • NASA ADS

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 • NASA-ADS Library

Summary

- 25 short-author list papers, including 18 as first/second author.
- 6 LIGO-Virgo-KAGRA Collaboration papers with significant contributions, including 1 as chair of the paper writing team

TALKS

• 9 invited conference talks

SUMMARY

- 20 seminars
- 10 contributed talks

SELECTED

LIGO-Virgo-KAGRA Collaboration

SERVICE

- 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

LIST OF 1. Weinberg Institute Seminar, UT Austin November 2025	Invited Conference Talks	 Gravitational Wave Physics and Astrophysics Workshop, Atlanta The Lifecycle of Stellar Black Holes, KITP, Santa Barbara Future of Gravitational Wave Astronomy, ICTS, Bengaluru European Physical Society Conference on High Energy Physics, Marseille (virtual) Scientific Machine Learning in Gravitational Wave Astronomy, ICERM, Providence Lyman Break Galaxies Workshop, Toronto PAX Meeting, London, UK (panelist) The Quest for Precision Gravitational-wave Cosmology, KICP, Chicago Second Chennai Symposium on Gravitation and Cosmology, Chennai (virtual) 	December 2025 November 2025 October 2025 July 2025 June 2025 May 2025 July 2024 September 2022 February 2022
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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:
 - I. 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 *India Bioscience 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
- 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**:
 - I. 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

- I. 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)

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.

 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*

Submitted to PRD, 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.

II. 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 et al. (including Aditya Vijaykumar)

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.

I. 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)

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) GW_{231123} : 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.

I. 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.