Gaurav Waratkar

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I am a Post-Doctoral Fellow at Caltech where I am a part of two groups: Space Radiation Lab & Caltech Optical Observatories. I am developing next-generation X-ray detectors for future space missions & building a new infrared telescope Cryoscope to be deployed at Antarctica. My work focuses on designing space hardware and building next-generation instruments.

Education

- **California Institute of Technology** — **USA**
  Post-Doctoral Fellow (Space Radiation Lab & Caltech Optical Observatories) — 2025 – Present
  Host: Fiona Harrison & Mansi Kasliwal
  Topics: Developing next-generation X-ray detectors & building infrared telescope 'Cryoscope'

- **Indian Institute of Technology Bombay** — **India**
  Ph.D. in Astrophysics — 2020 – 2025
  Advisor: Prof. Varun Bhalerao
  Thesis: High Energy Transients: AstroSat-CZTI data analysis & Daksha instrument development

- **Indian Institute of Technology Bombay** — **India**
  B.Tech. in Mechanical Engineering — 2015 – 2019

Awards & Fellowships

- 2026 Keck Institute of Space Studies (KISS) Affiliate, nominated by Caltech faculty
- 2024 LIGO Science Collaboration Fellow; on-site commissioning at LIGO Livingston

Publications & Press Releases

A complete list of all of my publications is — here on NASA-ADS.
You can find a list of published articles on the last page of this document.

Selected Media Coverage

- 2025 IIT Bombay-led Daksha mission, *Times of India, WION, India Today*
- 2025 Searching for cosmic bangs and whispers, *Research Matters*
- 2024 Low-latency data products for gravitational wave mergers, *Phys.org*
- 2023 India's Astrosat captures 600th mega explosion, Media coverage across India
- 2022 India's AstroSat witnesses black hole birth for the 500th time, Media coverage across India

Selected Talks and Conferences

- 2025 Low-latency data performance and RAVEN for LVK, ASI 2025, NITR, India
- 2025 X-ray counterparts of FRBs, Young Astronomers' Meet, TIFR, India
- 2024 LVK low-latency data, LIGO Livingston Observatory Seminar, USA
- 2024 High-energy transients with AstroSat and Daksha, Caltech TDA, USA
- 2024 Low-latency data products and MMA coincidences, Caltech LIGO, USA
- 2024 Daksha mission overview, UC Berkeley Space Sciences Laboratory, USA
- 2024 Daksha: High-energy transient alerts, LSU Astrophysics, USA

- 2024 Rapid searches for fast transients using AstroSat-CZTI, Transients 2024, IIT Bombay, India
- 2023 X-ray counterparts to LVK triggers, APRIM 2023, Japan
- 2023 EM counterparts to LVK triggers, Amaldi 15, Online
- 2023 Implications of LIGO-India for EMGW, LIGO-India Science Meeting, IUCAA, India
- 2022 CIFT pipeline for LIGO-Virgo triggers, Young Astronomers' Meet, ARIES Nainital, India
- 2021 Fast transient searches with AstroSat-CZTI, 39th ASI Meeting, Online

Observing Experience

- 2024 200+ hours with the LIGO–Virgo–KAGRA Rapid Response Team
- 2024 ToO observations of BNS candidate 'S240422ed' with 2.5m PRL Telescope
- 2023 Chandra ToO observations of GRB 230812B (jet physics in extremely bright GRBs)
- 2022 AstroSat ToO observations of GRB 220408A (candidate nearby GRB)
- 2019 Several weeks on operations of GROWTH-India telescope
- 2018 Several days on radio observing campaigns with uGMRT

Teaching & Mentoring

Mentored 28+ undergraduate and master's students on research projects (atleast semester long) in space instrumentation, transient astrophysics, and data analysis.

- 2025-2026 Abhinav: *Gamma Ray Bursts: Search, Analysis and Localisation*
- 2024-2025 Suryansh: *CIFT2 development for AstroSat-CZTI*
- 2024-2025 Atreyi: *Automated T90 and triggered searches for CIFT2*
- 2022-2025 Meghna: *FRB searches, CIFT1.5 automation*
- 2023-2024 Dhananjay: *Daksha self-localization and IPN with Moonbeam*
- 2023-2024 Puja: *Joint GW-GRB searches with CZTI & RAVEN*
- 2022-2024 Ashwin: *CZTI FAR estimates and TGF searches*
- 2023-2024 Rohan: *Energy-dependent searches in CZTI*
- 2023-2024 Abhishek: *Daksha design branding through IDC*
- 2023-2024 Pal: *Daksha data simulator*
- 2023-2024 Ananya: *Triggered searches in CIFT1.5*
- 2023-2024 Vedagya: *Blind searches for CIFT1.5*
- 2024 Tamojeet: *GIT-EMGW galaxy tiles searches*
- 2022-2023 Arhaan: *Automated Kafka GCN stream DB & searches*
- 2023 Bhuvanambiga: *CIFT1.5 triggered searches*
- 2022-2023 Amrutha: *Daksha thermal analysis*
- 2022-2023 Harsh: *GIT-EMGW galaxy tiled searches*
- 2021-2022 Aswin: *CIFT1.5 blind search automation, injections*
- 2022 Hrushikesh: *Daksha MEP manufacturing & vibration tests*
- 2022 Aaditya: *Daksha vibration tests & assembly procedures*
- 2022 Jayant: *Daksha vibration tests & assembly procedures*
- 2020-2021 Srividya: *Daksha baseplate optimization*

- 2020 Aditi: *Daksha structural analysis & vibration tests*
- 2020 Sriharsha: *Daksha thermal simulations through python*
- 2020 Avish: *Daksha thermal simulations through python*
- 2020 Manav: *Daksha thermal analytical estimates through python*
- 2020 Miloni: *Daksha thermal analytical estimates through python*
- 2020-2021 Drishika: *CIFT1 GRB searches*
- 2020 Bhavini: *Daksha thermal analytical estimates*
- 2020 Pranav: *Daksha thermal analytical estimates*
- 2020 Rikin: *Daksha thermal analytical estimates*

Workshops & Teaching

- 2025 SOC, *Young Astronomer's Meet, TIFR Mumbai, India*
- 2023-2025 Mentor, *Setup of an amateur observatory on the IIT Bombay campus*
- 2024 Mentor, *Offline Study Hub (30 students), LVK Gravitational Wave Open Data Workshop*
- 2024 Section Lead, *Hands-on tutorial on Daksha mock data, ASI Workshop*
- 2023 Mentor, *Offline Study Hub (30 students), LVK Gravitational Wave Open Data Workshop*
- 2020 Session Lead, *EMGW Workshop (30 students), Techfest IIT Bombay*
- 2018 Tutor, *GROWTH Winter School*
- 2022-2024 Teaching Assistant, *PH 119 – Physics Laboratory (5 semesters)*
- 2020-2021 Teaching Assistant, *PH 556 – Astrophysics (2 semesters)*

Volunteering

- 2025 Volunteer, *California Dark Sky Festival, Caltech Astro Outreach*
- 2025 Lead, *Sitaron Mein Safar: Interactions with space industry leaders in India*
- 2025 Speaker, *Engineering behind Astrophysics, Physics X Mechanical Journal Club, IIT Bombay*
- 2025 Panelist, *Careers in Astronomy, Krittika - IIT Bombay*
- 2019-2025 Mentor, *Krittika - The Astronomy Club of IIT Bombay*
- 2022–2025 Social Media Lead, *Daksha Mission Outreach (Instagram, X, Facebook)*
- 2022–2024 Booth Coordinator, *Daksha – TechConnect, TechFest IIT Bombay*
- 2017–2024 Outreach, *LIGO-India, TechFest IIT Bombay*
- 2018 LOC, *Transients 2024 Conference, IIT Bombay*
- 2023–2024 Booth Coordinator, *LIGO-India Outreach, Technovanza (VJTI Mumbai)*
- 2024 Panelist, *Careers in Astronomy, Krittika - IIT Bombay*
- 2024 Invited Talk, *Astrophysics Adventures: AstroSat, LIGO-India and Beyond, ZetaGravity X-Space*
- 2023 Invited Talk, *Cosmic Exotic Marvels, Pawar International School, Mumbai*
- 2022–2023 Convener, *Astro-Cosmo-Gravity Journal Club, IIT Bombay*
- 2021–2022 Institute Coordinator, *Codetantra (B2B EdTech SaaS), IIT Bombay*
- 2022 Local Organizing Committee Member, *Astronomers for Planet Earth International Symposium*
- 2021 Climate Reality Leader, *Climate Reality Project*
- 2020 Speaker, *Basics of Astronomical Telescopes, Krittika Lecture Series*

- 2018 Speaker, *Pulsars and Radio Detection Techniques, Krittika Lecture Series*
- 2018 LOC, *GROWTH Annual Conference & Winter School*
- 2016–2018 Manager and Convener, *Krittika – The Astronomy Club of IIT Bombay*

Refereed Papers

The following is the list of the papers that I have co-authored (including the ones in-review / pre-print).

1. Eappachen, D., Balasubramanian, A., Swain, V., Anupama, G. C., et al. (2026), Monthly Notices of the Royal Astronomical Society, *Characterizing EP241107a: multiwavelength observations of an Einstein Probe-detected fast X-ray transient*, 545, staf2062.

2. Swain, V., Bhalerao, V., Kumar, H., Goyal, M., et al. (2025), arXiv e-prints, *GRB 230204B: GIT Discovery of a Fast Fading Afterglow Associated with an Energetic GRB from a Massive-Star Progenitor*, arXiv:2512.03136.

3. Abac, A. G., Abouelfettouh, I., Acernese, F., Ackley, K., et al. (2025), The Astrophysical Journal Letters, *GWTC-4.0: An Introduction to Version 4.0 of the Gravitational-Wave Transient Catalog*, 995, L18.

4. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Search for planetary-mass ultra-compact binaries using data from the first part of the LIGO–Virgo–KAGRA fourth observing run*, arXiv:2511.19911.

5. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *All-sky search for continuous gravitational-wave signals from unknown neutron stars in binary systems in the first part of the fourth LIGO-Virgo-KAGRA observing run*, arXiv:2511.16863.

6. Abac, A. G., Abouelfettouh, I., Acernese, F., Ackley, K., et al. (2025), Physical Review D, *All-sky search for short gravitational-wave bursts in the first part of the fourth LIGO-Virgo-KAGRA observing run*, 112, 102005.

7. Arya, A., Bilkhu, H. S., Vishwakarma, S., Belatikar, H., et al. (2025), Journal of Astrophysics and Astronomy, *Development of a Compton imager setup*, 46, 84.

8. Abac, A. G., Abouelfettouh, I., Acernese, F., Ackley, K., et al. (2025), The Astrophysical Journal Letters, *GW231123: A Binary Black Hole Merger with Total Mass 190265 $M_\odot$*, 993, L25.

9. Abac, A. G., Abouelfettouh, I., Acernese, F., Ackley, K., et al. (2025), The Astrophysical Journal Letters, *GW241011 and GW241110: Exploring Binary Formation and Fundamental Physics with Asymmetric, High-spin Black Hole Coalescences*, 993, L21.

10. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Direct multi-model dark-matter search with gravitational-wave interferometers using data from the first part of the fourth LIGO-Virgo-KAGRA observing run*, arXiv:2510.27022.

11. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Cosmological and High Energy Physics implications from gravitational-wave background searches in LIGO-Virgo-KAGRA's O1-O4a runs*, arXiv:2510.26848.

12. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Directional Search for Persistent Gravitational Waves: Results from the First Part of LIGO-Virgo-KAGRA's Fourth Observing Run*, arXiv:2510.17487.

13. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Directed searches for gravitational waves from ultralight vector boson clouds around merger remnant and galactic black holes during the first part of the fourth LIGO-Virgo-KAGRA observing run*, arXiv:2509.07352.

14. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *GWTC-4.0: Constraints on the Cosmic Expansion Rate and Modified Gravitational-wave Propagation*, arXiv:2509.04348.

15. Abac, A. G., Abouelfettouh, I., Acernese, F., Ackley, K., et al. (2025), Physical Review Letters, *GW250114: Testing Hawking's Area Law and the Kerr Nature of Black Holes*, 135, 111403.

16. Roychowdhury, T., Choudhary, H., Bhalerao, V., Cook, D. O., et al. (2025), Journal of Astrophysics and Astronomy, *Efficacy of galaxy catalogues for following up gravitational wave events*, 46, 68.

17. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Upper Limits on the Isotropic Gravitational-Wave Background from the first part of LIGO, Virgo, and KAGRA's fourth Observing Run*, arXiv:2508.20721.

18. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *GWTC-4.0: Population Properties of Merging Compact Binaries*, arXiv:2508.18083.

19. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *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.

20. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *GWTC-4.0: Methods for Identifying and Characterizing Gravitational-wave Transients*, arXiv:2508.18081.

21. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *Open Data from LIGO, Virgo, and KAGRA through the First Part of the Fourth Observing Run*, arXiv:2508.18079.

22. Waratkar, G., Dixit, M., Tendulkar, S. P., Bhalerao, V., et al. (2025), Journal of Astrophysics and Astronomy, *AstroSat-CZTI searches for hard X-ray prompt emission from fast radio bursts*, 46, 59.

23. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration, Abac, A. G., et al. (2025), arXiv e-prints, *All-sky search for long-duration gravitational-wave transients in the first part of the fourth LIGO-Virgo-KAGRA Observing run*, arXiv:2507.12282.

24. Saraogi, D., Bala, S., Joshi, J., Iyyani, S., et al. (2025), Journal of Astrophysics and Astronomy, *Investigating polarization characteristics of GRB 200503A and GRB 201009A*, 46, 38.

25. Abac, A. G., Abbott, R., Abouelfettouh, I., Acernese, F., et al. (2025), The Astrophysical Journal, *Search for Gravitational Waves Emitted from SN 2023ixf*, 985, 183.

26. Afroz, S., Agarwalla, S. K., Bhattacharya, D., Bhattacharya, S., et al. (2025), arXiv e-prints, *A White Paper on The Multi-Messenger Science Landscape in India*, arXiv:2505.24408.

27. Abac, A. G., Abbott, R., Abouelfettouh, I., Acernese, F., et al. (2025), The Astrophysical Journal, *Search for Continuous Gravitational Waves from Known Pulsars in the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run*, 983, 99.

28. Srinivasaragavan, G. P., Perley, D. A., Ho, A. Y. Q., O'Connor, B., et al. (2025), Monthly Notices of the Royal Astronomical Society, *Multiwavelength analysis of AT 2023sva: a luminous orphan afterglow with evidence for a structured jet*, 538, 351.

29. Perley, D. A., Ho, A. Y. Q., Fausnaugh, M., Lamb, G. P., et al. (2025), Monthly Notices of the Royal Astronomical Society, *The luminous, slow-rising orphan afterglow AT2019pim as a candidate moderately relativistic outflow*, 537, 2362.

30. Burns, E., Fryer, C. L., Agullo, I., Andrews, J., et al. (2025), arXiv e-prints, *Multidisciplinary Science in the Multimessenger Era*, arXiv:2502.03577.

31. Raman, G., Ronchini, S., Delaunay, J., Tohuvavohu, A., et al. (2025), The Astrophysical Journal, *Swift-BAT GUANO Follow-up of Gravitational-wave Triggers in the Third LIGO–Virgo–KAGRA Observing Run*, 980, 207.

32. Abac, A. G., Abbott, R., Abouelfettouh, I., Acernese, F., et al. (2024), The Astrophysical Journal, *A Search Using GEO600 for Gravitational Waves Coincident with Fast Radio Bursts from SGR 1935+2154*, 977, 255.

33. Ahumada, T., Anand, S., Coughlin, M. W., Gupta, V., et al. (2024), , *Searching for Gravitational Wave Optical Counterparts with the Zwicky Transient Facility: Summary of O4a*, 136, 114201.

34. Waratkar, G., Bhalerao, V., & Bhattacharya, D. (2024), The Astrophysical Journal, *Bright in the Black: Searching for Electromagnetic Counterparts to Gravitational-wave Candidates in LIGO-Virgo-KAGRA Observation Runs with AstroSat-CZTI*, 976, 123.

35. Abac, A. G., Abbott, R., Abe, H., Abouelfettouh, I., et al. (2024), Physical Review D, *Ultralight vector dark matter search using data from the KAGRA O3GK run*, 110, 042001.

36. Abac, A. G., Abbott, R., Abouelfettouh, I., Acernese, F., et al. (2024), The Astrophysical Journal Letters, *Observation of Gravitational Waves from the Coalescence of a 2.5–4.5 $M_\odot$ Compact Object and a Neutron Star*, 970, L34.

37. Bhalerao, V., Vadawale, S., Tendulkar, S., Bhattacharya, D., et al. (2024), Experimental Astronomy, *Daksha: on alert for high energy transients*, 57, 24.

38. Bhalerao, V., Sawant, D., Pai, A., Tendulkar, S., et al. (2024), Experimental Astronomy, *Science with the Daksha high energy transients mission*, 57, 23.

39. Saraogi, D., Aditya, J. V., Bhalerao, V., Bala, S., et al. (2024), Monthly Notices of the Royal Astronomical Society, *Localization of gamma-ray bursts using AstroSat Mass Model*, 530, 1386.

40. Chaudhary, S. S., Toivonen, A., Waratkar, G., Mo, G., et al. (2024), Proceedings of the National Academy of Science, *Low-latency gravitational wave alert products and their performance at the time of the fourth LIGO-Virgo-KAGRA observing run*, 121, e2316474121.

41. Bhattacharjee, S., Banerjee, S., Bhalerao, V., Beniamini, P., et al. (2024), Monthly Notices of the Royal Astronomical Society, *Joint gravitational wave-short GRB detection of binary neutron star mergers with existing and future facilities*, 528, 4255.

42. Ewing, B., Huxford, R., Singh, D., Tsukada, L., et al. (2024), Physical Review D, *Performance of the low-latency GstLAL inspiral search towards LIGO, Virgo, and KAGRA's fourth observing run*, 109, 042008.

43. Bala, S., Mate, S., Mehla, A., Sastry, P., et al. (2023), Journal of Astronomical Telescopes, Instruments, and Systems, *Prospects of measuring gamma-ray burst polarization with the Daksha mission*, 9, 048002.

44. Wagner, S. M., Mingo, B., Majidi, F. Z., Gokus, A., et al. (2023), Nature Astronomy, *A more sustainable future for astronomy*, 7, 244.

45. Singhal, A., Palit, S., Bala, S., Waratkar, G., et al. (2022), Journal of Astrophysics and Astronomy, *Gravitational waves and electromagnetic transients*, 43, 53.

46. Kumar, H., Bhalerao, V., Anupama, G. C., Barway, S., et al. (2022), Monthly Notices of the Royal Astronomical Society, *GROWTH on S190426c II: GROWTH-India Telescope search for an optical counterpart with a custom image reduction and candidate vetting pipeline*, 516, 4517.

47. Kumar, H., Bhalerao, V., Anupama, G. C., Barway, S., et al. (2022), The Astronomical Journal, *India's First Robotic Eye for Time-domain Astrophysics: The GROWTH-India Telescope*, 164, 90.

48. Sharma, Y., Marathe, A., Bhalerao, V., Shenoy, V., et al. (2021), Journal of Astrophysics and Astronomy, *The search for fast transients with CZTI*, 42, 73.

49. Kasliwal, M. M., Anand, S., Ahumada, T., Stein, R., et al. (2020), The Astrophysical Journal, *Kilonova Luminosity Function Constraints Based on Zwicky Transient Facility Searches for 13 Neutron Star Merger Triggers during O3*, 905, 145.

50. Coughlin, M. W., Ahumada, T., Anand, S., De, K., et al. (2019), The Astrophysical Journal Letters, *GROWTH on S190425z: Searching Thousands of Square Degrees to Identify an Optical or Infrared Counterpart to a Binary Neutron Star Merger with the Zwicky Transient Facility and Palomar Gattini-IR*, 885, L19.