

Gaurav Waratkar

Department of Physics, IIT Bombay - Mumbai - India

☎ +91-9405971764 • ✉ gauravwaratkar@iitb.ac.in
🌐 homepages.iitb.ac.in/~gauravwaratkar

I am primarily interested in studying relativistic fast-transients like Gamma-Ray Bursts (GRBs), Fast Radio Bursts (FRBs) & Gravitational Wave (GW) sources and building instruments to study these sources better.

Education

- Indian Institute of Technology Bombay** **Mumbai, MH**
 - Graduate Student at STAR Lab, Department of Physics 2020 - Present
 - Guide:** Varun Bhalerao
 - Topics:** Daksha Mechanical Instrumentation, EM Follow-up of Fast Transients using AstroSat-CZTI
Low-latency RAVEN searches of joint GW-GRB events.
- Indian Institute of Technology Bombay** **Mumbai, MH**
 - Bachelor's in Technology, Mechanical Engineering 2015 - 2019

Talks, Conferences and Schools

- LIGO Livingston Observatory Seminar** **LLO, Louisiana, USA**
 - Talk: Chasing Counterparts: LVK Low-Latency data products, coincidences, and future Oct 2024
- TDAMM 2024: The Third Time-Domain and Multi-Messenger workshop** **LSU, Louisiana, USA**
 - Poster: Daksha: On alert for high-energy transients Sep 2024
- TDA Group - Cahill Center for Astronomy and Astrophysics** **Caltech, California, USA**
 - Talk: Chasing high-energy transients with AstroSat & Daksha Sep 2024
- Caltech PMA LIGO Laboratory Seminar** **Caltech, California, USA**
 - Talk: Chasing Counterparts: Low-Latency data products, coincidences, and future Sep 2024
- University of California Berkeley - Space Sciences Lab Seminar** **UCB-SSL, California, USA**
 - Talk: Chasing High-Energy Transients with Daksha Sep 2024
- Louisiana State University - Astrophysics Lunch Seminar** **LSU, Louisiana, USA**
 - Talk: Daksha: On alert for high-energy transients Sep 2024
- Transients 2024** **IIT Bombay, India**
 - Talk: Rapid searches for fast-transients using AstroSat-CZTI Apr 2024
- SymPhy 2024: 11th Annual Symposium of Department of Physics** **IIT Bombay, India**
 - Poster: Sifting for EM counterparts to LVK GW triggers using AstroSat-CZTI Mar 2024
- 42nd meeting of the Astronomical Society of India** **IISc & ISRO Bangalore, India**
 - Poster: Sifting for EM counterparts to LVK GW triggers using AstroSat-CZTI Feb 2024
- GW-EM-Nu-2023: Role of India in Multi-Messenger Astrophysics** **TIFR Mumbai, India**
 - Poster: Sifting for counterparts to LIGO-Virgo-KAGRA GW triggers using AstroSat-CZTI Nov 2023
- Asia-Pacific Regional IAU Meeting (APRIM 2023)** **Koriyama, Japan**
 - Talk: Sifting for EM counterparts to LIGO-Virgo-KAGRA GW triggers using AstroSat-CZTI Jul 2023
- 15th Edoardo Amaldi Conference on Gravitational Waves** **Online**
 - Talk: Sifting for EM counterparts to LIGO-Virgo-KAGRA GW triggers using AstroSat-CZTI Jul 2023

<ul style="list-style-type: none"> ○ LIGO-India Science Meeting ○ <i>Talk: Implications of LIGO-India on EM Follow-up: Indian & International EM community</i> 	IUCAA Pune, India May 2023
<ul style="list-style-type: none"> ○ Young Astronomers' Meet 2022 ○ <i>Talk: CIFTing for LIGO-Virgo triggers in AstroSat CZTI</i> 	ARIES Nainital, India Nov 2022
<ul style="list-style-type: none"> ○ 40th meeting of the Astronomical Society of India ○ <i>Poster: Daksha: Structural design and simulations of the payload</i> 	IIT Roorkee, India Mar 2022
<ul style="list-style-type: none"> ○ 39th meeting of the Astronomical Society of India ○ <i>Talk: The Search for Fast Transients with AstroSat-CZTI</i> 	Online Feb 2021
<ul style="list-style-type: none"> ○ Conference on 5 years of AstroSat ○ <i>Poster: Searching for Transients using AstroSat CZTI</i> 	ISRO Bangalore, India Jan 2021
<ul style="list-style-type: none"> ○ GROWTH Annual Conference 2018 ○ <i>Poster: Satellite visibility orbital simulator</i> 	IIT Bombay, India Dec 2018

Refereed Publications & Press Releases

Check out my publications of refereed journal papers — [here on ADS](#).

25. **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.
24. Saraogi, D., Bala, S., Joshi, J., ..., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *Investigating Polarization characteristics of GRB200503A and GRB201009A*, arXiv:2411.00410.
23. Ahumada, T., Anand, S., Coughlin, M. W., ..., **Waratkar, G.**, ..., et al. (2024), *Publications of the Astronomical Society of the Pacific*, *Searching for Gravitational Wave Optical Counterparts with the Zwicky Transient Facility: Summary of O4a*, 136, 114201.
22. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration..., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *Search for gravitational waves emitted from SN 2023ixf*, arXiv:2410.16565.
21. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration..., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *A search using GEO600 for gravitational waves coincident with fast radio bursts from SGR 1935+2154*, arXiv:2410.09151.
20. Arya, A., Singh Bilkhu, H., Vishwakarma, S., ..., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *Development of a Compton Imager Setup*, arXiv:2409.08822.
19. Abac, A. G., Abbott, R., Abe, H., ..., **Waratkar, G.**, ..., et al. (2024), *Physical Review D*, *Ultralight vector dark matter search using data from the KAGRA O3GK run*, 110, 042001.
18. Abac, A. G., Abbott, R., Abouelfettouh, I., ..., **Waratkar, G.**, ..., et al. (2024), *The Astrophysical Journal*, *Observation of Gravitational Waves from the Coalescence of a 2.5–4.5 M_{\odot} Compact Object and a Neutron Star*, 970, L34.
17. Raman, G., Ronchini, S., Delaunay, J., ..., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *Swift-BAT GUANO follow-up of gravitational-wave triggers in the third LIGO-Virgo-KAGRA observing run*, arXiv:2407.12867.
16. Bhalerao, V., Vadawale, S., Tendulkar, S., ..., **Waratkar, G.**, ..., et al. (2024), *Experimental Astronomy*, *Daksha: on alert for high energy transients*, 57, 24.
15. Bhalerao, V., Sawant, D., Pai, A., ..., **Waratkar, G.**, ..., et al. (2024), *Experimental Astronomy*, *Science with the Daksha high energy transients mission*, 57, 23.
14. Saraogi, D., Aditya, J. V., Bhalerao, V., ..., **Waratkar, G.**, ..., et al. (2024), *Monthly Notices of the Royal Astronomical Society*, *Localization of gamma-ray bursts using AstroSat Mass Model*, 530, 1386.

13. Chaudhary, S. S., Toivonen, A., Waratkar, 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.
12. Bhattacharjee, S., Banerjee, S., Bhalerao, V...., **Waratkar, G.**, ..., 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.
11. Ewing, B., Huxford, R., Singh, D...., **Waratkar, G.**, ..., 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.
10. Perley, D. A., Ho, A. Y. Q., Fausnaugh, M...., **Waratkar, G.**, ..., et al. (2024), arXiv e-prints, *AT2019pim: A Luminous Orphan Afterglow from a Moderately Relativistic Outflow*, arXiv:2401.16470.
9. Bala, S., Mate, S., Mehla, A...., **Waratkar, G.**, ..., et al. (2023), Journal of Astronomical Telescopes, Instruments, and Systems, *Prospects of measuring gamma-ray burst polarization with the Daksha mission*, 9, 048002.
8. Wagner, S. M., Mingo, B., Majidi, F. Z...., **Waratkar, G.**, ..., et al. (2023), Nature Astronomy, *A more sustainable future for astronomy*, 7, 244.
7. Singhal, A., Palit, S., Bala, S...., **Waratkar, G.**, ..., et al. (2022), Journal of Astrophysics and Astronomy, *Gravitational waves and electromagnetic transients*, 43, 53.
6. Kumar, H., Bhalerao, V., Anupama, G. C...., **Waratkar, G.**, ..., 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.
5. Kumar, H., Bhalerao, V., Anupama, G. C...., **Waratkar, G.**, ..., et al. (2022), The Astronomical Journal, *India's First Robotic Eye for Time-domain Astrophysics: The GROWTH-India Telescope*, 164, 90.
4. Kasliwal, M. M., Anand, S., Ahumada, T...., **Waratkar, G.**, ..., et al. (2022), VizieR Online Data Catalog, *VizieR Online Data Catalog: ZTF candidate counterparts to 13 GW follow-up (Kasliwal+, 2020)*, 190, J/ApJ/905/145.
3. Sharma, Y., Marathe, A., Bhalerao, V...., **Waratkar, G.**, ..., et al. (2021), Journal of Astrophysics and Astronomy, *The search for fast transients with CZTI*, 42, 73.
2. Kasliwal, M. M., Anand, S., Ahumada, T...., **Waratkar, G.**, ..., 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.
1. Coughlin, M. W., Ahumada, T., Anand, S...., **Waratkar, G.**, ..., et al. (2019), The Astrophysical Journal, *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.

Non-Refereed.....

The entire list of my non-refereed publications including ~ 275 GCNs, Atels, TNS circulars — [here on ADS](#).

Press Releases.....

- Researchers advance detection of gravitational waves to study collisions of black holes**
 ○ *Low-Latency data products of gravitational wave mergers*

Apr 2024
- India's Astrosat captures 600th mega explosion that rocked the universe**
 ○ *AstroSat-CZTI's detection of 600th Gamma-Ray Burst*

Nov 2023
- India's AstroSat witnesses black hole birth for the 500th time**
 ○ *AstroSat-CZTI's detection of 500th Gamma-Ray Burst*

May 2022

Teaching and Mentoring

Mentoring roles:

- o Mentored research projects of over **36 Undergraduate Students**
- o Mentoring the setting up of an amateur observatory inside IIT Bombay campus
- o **7th Gravitational Wave Open Data workshop 2024**
o *Mentor: Offline Study hub at IIT Bombay for 30 students* May 2024
- o **Daksha Workshop at 42nd Meeting of ASI**
o *Section lead: Hands-on tutorial on creating Daksha mock data and detecting GRBs* Feb 2024
- o **6th Gravitational Wave Open Data workshop 2023**
o *Mentor: Offline Study hub at IIT Bombay for 30 students* May 2023
- o **GROWTH Winter school 2018**
o *Tutor, module testing & organizing the winter school* Dec 2018

Teaching roles:

- o Teaching Assistant - PH 119 (Physics Lab) - Spring 2024
- o Teaching Assistant - PH 119 (Physics Lab) - Autumn 2023
- o Teaching Assistant - PH 119 (Physics Lab) - Spring 2023
- o Teaching Assistant - PH 119 (Physics Lab) - Autumn 2022
- o Teaching Assistant - PH 556 (Astrophysics) - Spring 2021
- o Teaching Assistant - PH 556 (Astrophysics) - Spring 2020

Experience

- o **LIGO Livingston Observatory** Louisiana, USA
o *LSC Fellow* Jul 2024 - Oct 2024
Project title: Joint GW-GRB searches with RAVEN & building, testing seismometers for seismic isolation
Advisor: Brian O'Reilly, Huyen Pham, LIGO Livingston Observatory
- o **Department of Physics, IIT Bombay** Mumbai, MH
o *Project Research Assistant* May 2019 - Dec 2019
Project title: Mechanical design and testing of Daksha - proposed mission to ISRO.
Advisors: Varun Bhalariao, Salil Kulkarni, Deepak Marla, PJ Guruprasad, Rakesh Mote
- o **National Centre for Radio Astrophysics** Pune, MH
o *Visiting Students Research Program* May 2018 - Oct 2019
Project title: PuGMark: Blind pulsar searches with uGMRT
Advisor: Yashwant Gupta, Director, NCRA-TIFR

Position of Responsibility

- o **Club Convener, Astro-Cosmo-Gravity Journal Club**
o *Physics Department* 2022-2023
- o **Institute coordinator, Codetantra IIT Bombay**
o *Codetantra: B2B (SaaS) EduTech StartUp* 2021-2022
- o **Manager & Convener**
o *Krittika – The Astronomy Club of IIT Bombay* 2016 - 2018

Outreach

- o **Daksha Socials: Instagram, X (Formerly Twitter), Facebook**
o *Social Media Lead* 2022-2025

- **Panel Member - Careers in Astro**
Krittika - The Astronomy Club of IIT Bombay Sep 2024
- **Techfest - Daksha: Indian Eyes on Transient Skies**
Booth Coordinator: TechConnect at TechFest IIT Bombay 2022 - 2024
- **Techfest - LIGO-India and LIGO GW Detectors**
Booth: TechConnect at TechFest IIT Bombay 2017 - 2024
- **Technovanza - LIGO-India and GW Detectors**
Booth Coordinator: Technovanza at VJTI Mumbai 2023 - 2024
- **Invited talk: Astrophysics Adventures - AstroSat, LIGO-India & Beyond**
ZetaGravity's X-Space Mar 2024
- **Cosmic Exotic Marvels - A journey to the heaviest objects in the universe**
Invited Guest Talk: Pawar International School, Mumbai Oct 2023
- **Astronomers for Planet Earth Symposium 2022**
LOC Team Member as a part of A4E Dec 2022
- **TechFest - Krittika Astrophysics Workshop**
Module and Session lead Dec 2020
- **Basics of Astronomical Telescopes**
Krittika - Lecture Series on Observational Astronomy Sept 2020
- **Talk on Basics of Pulsars & their detection in radio data**
Krittika Lecture Series Oct 2018

Undergraduate Research and Technical Projects

- **EMGW Follow-up using GROWTH-India Telescope**
Advisor: Varun Bhalerao, Physics Department, IIT Bombay Jan 2019 - July 2019
- **Transient visibility from a satellite - A python simulator**
Advisor: Varun Bhalerao, Physics Department, IIT Bombay July 2017 - April 2018
- **Simulations on Core vs Cusp density problem of Dark Matter**
Advisor: D Narasimha, Department of Astronomy and Astrophysics, TIFR Summers 2017
- **IIT Bombay Racing (Powertrain Subsystem)**
Junior Design Engineer, Mechanical Department, IIT Bombay Sept 2016 - April 2017

Scholastic Achievements

- Secured an **AP grade** in Machine Design course for exceptional performance | Given to 2 out of 160 students
- Qualified **IUCAA's** PhD entrance exam INAT's written test by being in **Top 38** out of over 800 candidates
- Secured a **National Rank of 89** in JEST, Physics PhD entrance exam organised by TIFR, Mumbai
- Secured a **99.75 percentile** in JEE Mains 2015 in over 1.3 million students
- Qualified for the **Indian National Astronomy Olympiad** for being in **top 300 in the country**
- Awarded the National Talent Search (NTS) Scholarship given by NCERT Delhi, **Government of India**
- Awarded '**Best Outgoing Student**' from 122 students for being best overall performer over 10 years

Extracurricular Activities

- Climate change activities - Powai Lake clean-up, publicizing the COP26 global efforts in Mumbai
- Awarded 'Best Cadet' in National Cadet Corps (NCC) - Air Wing among 400 cadets
- Represented Hostel 7 in Volleyball in General Championships 2015, secured 2nd Place among 14 hostels
- Participated in multiple Kho-Kho and Roller-Skating Tournaments, intra-hostel Football League