

# Md Arif Shaikh

Assistant Professor

Gravitational wave astrophysicist working on various aspects of gravitational wave physics, including waveform modeling, data analysis, and tests of general relativity using gravitational wave observations.

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## Positions

<b>Assistant Professor</b>	November 2023 – Present
Department of Physics, <i>Vivekananda Satavarshiki Mahavidyalaya</i> Manikpara, West Bengal, 721513, India	
<b>Postdoctoral Fellow</b>	July 2022 – November 2023
Department of Physics and Astronomy, <i>Seoul National University</i> 1 Gwanak-ro, Gwanak-gu, Seoul 08826, Korea <i>Advisor: Hyung Mok Lee</i>	
<b>Postdoctoral Fellow</b>	July 2019 – June 2022
Astrophysical Relativity, International Centre for Theoretical Sciences Hesaraghata Hobli, Karnataka, 560089, India <i>Advisor: Parameswaran Ajith</i>	

## Education

<b>Doctor of Philosophy (PhD)</b>	July 2014 – June 2019
Harish-Chandra Research Institute Chhatnag Road, Jhunsi, Prayagraj, 211019, Uttar Pradesh, India Cosmology & High Energy Astrophysics <i>Advisor: Tapas Kumar Das (tapas@hri.res.in)</i>	
<b>Master of Science (MSc)</b>	July 2012 – June 2014
Harish-Chandra Research Institute Chhatnag Road, Jhunsi, Prayagraj, 211019, Uttar Pradesh, India Cosmology & High Energy Astrophysics <i>Advisor: Tapas Kumar Das (tapas@hri.res.in)</i>	
<b>Bachelor of Science (BSc)</b>	July 2009 – June 2012
Jadavpur University 188, Raja S.C. Mallick Rd, Kolkata 700032, India Faculty of Physics	

## Publications

### Short author publications

19. Nee, P. J., Ravichandran, A., Field, S. E., Islam, T., Pfeiffer, H. P., Varma, V., Boyle, M., Ceja, A., Ghadiri, N., Kidder, L. E., Kumar, P., Maurya, A., Morales, M., Ramos-Buades, A., Ravishankar, A., Rink, K., Rüter, H. R., Scheel, M. A., Shaikh, M. A., Tellez, D. "Eccentric binary black holes: A new framework for numerical relativity waveform surrogates.", 2025, [arXiv:2510.00106](https://arxiv.org/abs/2510.00106)
18. Tiwari, A., Bhat, S. A., Shaikh, M. A., Kapadia, S. J. "Testing the nature of GW200105 by probing the frequency evolution of eccentricity." *Astrophys. J.*, **995**, 1, 2025, [arXiv:2509.26152](https://arxiv.org/abs/2509.26152)
17. Bhat, S. A., Tiwari, A., Shaikh, M. A., Kapadia, S. J. "Eccentricity evolution consistency test to distinguish eccentric gravitational-wave signals from eccentricity mimickers." *Phys. Rev. D*,

16. Shaikh, M. A., Varma, V., Ramos-Buades, A., Pfeiffer, H. P., Boyle, M., Kidder, L. E., Scheel, M. A. "Defining eccentricity for spin-precessing binaries." *Class. Quant. Grav.*, **42**, 2025, arXiv:2507.08345
15. Chartier, N., Shaikh, M. A., Lee, H. M., Kim, J. "Comparison between best-fit eccentricity definitions and the standardized definition of eccentricity." *Phys. Rev. D*, **112**, 2, 2025, arXiv:2503.19538
14. Deka, U., Prabhu, G., Shaikh, M. A., Kapadia, S. J., Varma, V., Field, S. E. "Surrogate modeling of gravitational waves microlensed by spherically symmetric potentials." *Phys. Rev. D*, **111**, 10, 2025, arXiv:2501.02974
13. Deka, U., Chakraborty, S., Kapadia, S. J., Shaikh, M. A., Ajith, P. "Probing the charge of compact objects with gravitational microlensing of gravitational waves." *Phys. Rev. D*, **111**, 6, 2025, arXiv:2401.06553
12. Shaikh, M. A., Bhat, S. A., Kapadia, S. J. "A study of the inspiral-merger-ringdown consistency test with gravitational-wave signals from compact binaries in eccentric orbits." *Phys. Rev. D*, **110**, 2, 2024, arXiv:2402.15110
11. Shaikh, M. A., Varma, V., Pfeiffer, H. P., Ramos-Buades, A., van de Meent, M. "Defining eccentricity for gravitational wave astronomy." *Phys. Rev. D*, **108**, 10, 2023, arXiv:2302.11257
10. Singh, M. K., Divyajyoti, D., Kapadia, S. J., Shaikh, M. A., Ajith, P. "Improved early-warning estimates of luminosity distance and orbital inclination of compact binary mergers using higher modes of gravitational radiation." *Mon. Not. Roy. Astron. Soc.*, **513**, 3, 2022, arXiv:2202.05802
9. Maity, S., Shaikh, M. A., Tarafdar, P., Das, T. K. "Carter-Penrose diagrams for emergent space-time in axisymmetrically accreting black hole systems." *Phys. Rev. D*, **106**, 4, 2022, arXiv:2106.07598
8. Wei, W., Huerta, E. A., Yun, M., Loutrel, N., Shaikh, M. A., Kumar, P., Haas, R., Kindratenko, V. "Deep Learning with Quantized Neural Networks for Gravitational-wave Forecasting of Eccentric Compact Binary Coalescence." *Astrophys. J.*, **919**, 2, 2021, arXiv:2012.03963
7. Singh, M. K., Kapadia, S. J., Shaikh, M. A., Chatterjee, D., Ajith, P. "Improved early warning of compact binary mergers using higher modes of gravitational radiation: A population study." *Mon. Not. Roy. Astron. Soc.*, **502**, 2, 2021, arXiv:2010.12407
6. Kapadia, S. J., Singh, M. K., Shaikh, M. A., Chatterjee, D., Ajith, P. "Of Harbingers and Higher Modes: Improved gravitational-wave early-warning of compact binary mergers." *Astrophys. J. Lett.*, **898**, 2, 2020, arXiv:2005.08830
5. Shaikh, M. A., Maity, S., Nag, S., Das, T. K. "Effective sound speed in relativistic accretion discs around Schwarzschild black holes." *New Astron.*, **69**, 2019, arXiv:1806.04084
4. Shaikh, M. A., Das, T. K. "Linear perturbations of low angular momentum accretion flow in the Kerr metric and the corresponding emergent gravity phenomena." *Phys. Rev. D*, **98**, 12, 2018, arXiv:1803.09896
3. Shaikh, M. A.. "Relativistic sonic geometry for isothermal accretion in the Kerr metric." *Class. Quant. Grav.*, **35**, 5, 2018, arXiv:1705.04918
2. Datta, S., Shaikh, M. A., Das, T. K. "Acoustic geometry obtained through the perturbation of the Bernoulli's constant." *New Astron.*, **63**, 2018, arXiv:1612.07954
1. Shaikh, M. A., Firdousi, I., Das, T. K. "Relativistic sonic geometry for isothermal accretion in the Schwarzschild metric." *Class. Quant. Grav.*, **34**, 15, 2017, arXiv:1612.07963

## SXS Collaboration

1. Scheel, M. A., others. "The SXS Collaboration's third catalog of binary black hole simulations.", 2025, arXiv:2505.13378

## LVK Collaboration

34. Abac, A. G., others. "Directional Search for Persistent Gravitational Waves: Results from the First Part of LIGO-Virgo-KAGRA's Fourth Observing Run.", 2025, [arXiv:2510.17487](#)
33. Abac, A. G., others. "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.", 2025, [arXiv:2509.07352](#)
32. Abac, A. G., others. "GW250114: Testing Hawking's Area Law and the Kerr Nature of Black Holes." *Phys. Rev. Lett.*, **135**, 11, 2025, [arXiv:2509.08054](#)
31. Abac, A. G., others. "GWTC-4.0: Constraints on the Cosmic Expansion Rate and Modified Gravitational-wave Propagation.", 2025, [arXiv:2509.04348](#)
30. Abac, A. G., others. "Upper Limits on the Isotropic Gravitational-Wave Background from the first part of LIGO, Virgo, and KAGRA's fourth Observing Run.", 2025, [arXiv:2508.20721](#)
29. Abac, A. G., others. "Open Data from LIGO, Virgo, and KAGRA through the First Part of the Fourth Observing Run.", 2025, [arXiv:2508.18079](#)
28. Abac, A. G., others. "GWTC-4.0: Updating the Gravitational-Wave Transient Catalog with Observations from the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run.", 2025, [arXiv:2508.18082](#)
27. Abac, A. G., others. "GWTC-4.0: Population Properties of Merging Compact Binaries.", 2025, [arXiv:2508.18083](#)
26. Abac, A. G., others. "GWTC-4.0: Methods for Identifying and Characterizing Gravitational-wave Transients.", 2025, [arXiv:2508.18081](#)
25. Abac, A. G., others. "GWTC-4.0: An Introduction to Version 4.0 of the Gravitational-Wave Transient Catalog.", 2025, [arXiv:2508.18080](#)
24. Abac, A. G., others. "All-sky search for long-duration gravitational-wave transients in the first part of the fourth LIGO-Virgo-KAGRA Observing run.", 2025, [arXiv:2507.12282](#)
23. Abac, A. G., others. "All-sky search for short gravitational-wave bursts in the first part of the fourth LIGO-Virgo-KAGRA observing run.", 2025, [arXiv:2507.12374](#)
22. Abac, A. G., others. "GW231123: a Binary Black Hole Merger with Total Mass 190-265  $M_\odot$ .", 2025, [arXiv:2507.08219](#)
21. Abac, A. G., others. "Search for Continuous Gravitational Waves from Known Pulsars in the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run." *Astrophys. J.*, **983**, 2, 2025, [arXiv:2501.01495](#)
20. Abac, A. G., others. "Search for Gravitational Waves Emitted from SN 2023ixf." *Astrophys. J.*, **985**, 2, 2025, [arXiv:2410.16565](#)
19. Abac, A. G., others. "A Search Using GEO600 for Gravitational Waves Coincident with Fast Radio Bursts from SGR 1935+2154." *Astrophys. J.*, **977**, 2, 2024, [arXiv:2410.09151](#)
18. Raman, G., others. "Swift-BAT GUANO Follow-up of Gravitational-wave Triggers in the Third LIGO-Virgo-KAGRA Observing Run." *Astrophys. J.*, **980**, 2, 2025, [arXiv:2407.12867](#)
17. Abac, A. G., others. "Observation of Gravitational Waves from the Coalescence of a 2.5-4.5  $M_\odot$  Compact Object and a Neutron Star." *Astrophys. J. Lett.*, **970**, 2, 2024, [arXiv:2404.04248](#)
16. Abac, A. G., others. "Ultralight vector dark matter search using data from the KAGRA O3GK run." *Phys. Rev. D*, **110**, 4, 2024, [arXiv:2403.03004](#)
15. Fletcher, C., others. "A Joint Fermi-GBM and Swift-BAT Analysis of Gravitational-wave Candidates from the Third Gravitational-wave Observing Run." *Astrophys. J.*, **964**, 2, 2024, [arXiv:2308.13666](#)

14. Abac, A. G., others. "Search for Eccentric Black Hole Coalescences during the Third Observing Run of LIGO and Virgo." *Astrophys. J.*, **973**, 2, 2024, [arXiv:2308.03822](#)
13. Abbott, R., others. "Search for Gravitational-lensing Signatures in the Full Third Observing Run of the LIGO-Virgo Network." *Astrophys. J.*, **970**, 2, 2024, [arXiv:2304.08393](#)
12. Abbott, R., others. "Open Data from the Third Observing Run of LIGO, Virgo, KAGRA, and GEO." *Astrophys. J. Suppl.*, **267**, 2, 2023, [arXiv:2302.03676](#)
11. Abbott, R., others. "Search for subsolar-mass black hole binaries in the second part of Advanced LIGO's and Advanced Virgo's third observing run." *Mon. Not. Roy. Astron. Soc.*, **524**, 4, 2023, [arXiv:2212.01477](#)
10. Abbott, R., others. "Search for Gravitational-wave Transients Associated with Magnetar Bursts in Advanced LIGO and Advanced Virgo Data from the Third Observing Run." *Astrophys. J.*, **966**, 1, 2024, [arXiv:2210.10931](#)
9. Abbott, R., others. "Model-based Cross-correlation Search for Gravitational Waves from the Low-mass X-Ray Binary Scorpius X-1 in LIGO O3 Data." *Astrophys. J. Lett.*, **941**, 2, 2022, [arXiv:2209.02863](#)
8. Abbott, R., others. "Search for continuous gravitational wave emission from the Milky Way center in O3 LIGO-Virgo data." *Phys. Rev. D*, **106**, 4, 2022, [arXiv:2204.04523](#)
7. Abbott, R., others. "First joint observation by the underground gravitational-wave detector KAGRA with GEO 600." *PTEP*, **2022**, 6, 2022, [arXiv:2203.01270](#)
6. Abbott, R., others. "Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data." *Phys. Rev. D*, **106**, 6, 2022, [arXiv:2201.10104](#)
5. Abbott, R., others. "All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data." *Phys. Rev. D*, **106**, 10, 2022, [arXiv:2201.00697](#)
4. Abbott, R., others. "Tests of General Relativity with GWTC-3.", 2021, [arXiv:2112.06861](#)
3. Abbott, R., others. "All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data." *Phys. Rev. D*, **105**, 10, 2022, [arXiv:2111.15507](#)
2. Abbott, R., others. "Searches for Gravitational Waves from Known Pulsars at Two Harmonics in the Second and Third LIGO-Virgo Observing Runs." *Astrophys. J.*, **935**, 1, 2022, [arXiv:2111.13106](#)
1. Abbott, R., others. "Constraints on the Cosmic Expansion History from GWTC-3." *Astrophys. J.*, **949**, 2, 2023, [arXiv:2111.03604](#)

## Research Visits

20. [Chunglee Kim, Ewha Womans University](#), Seoul, Korea, October 20, 2025 – October 21, 2025
19. Hyung Mok Lee, [Seoul National University](#), Seoul, Korea, October 15, 2025 – October 25, 2025
18. [Prayush Kumar, ICTS-TIFR](#), Bangalore, India, August 4, 2025 – August 10, 2025
17. [Shasvath Kapadia, IUCAA](#), Pune, India, June 16, 2025 – June 22, 2025
16. Hyung Mok Lee, [Seoul National University](#), Seoul, Korea, October 10, 2024 – October 20, 2024
15. Hyung Won Lee, [Inje University](#), Gimhae, Korea, November 2, 2023 – November 3, 2023
14. [Shasvath Kapadia, IUCAA](#), Pune, India, June 18, 2023 – June 21, 2023
13. [Prayush Kumar, ICTS-TIFR](#), Bangalore, India, June 15, 2023 – June 18, 2023
12. Zhoujian Cao, [BNU](#), Beijing, China, May 9, 2023 – May 11, 2023
11. [Arman Shafieloo, KASI](#), Daejeon, Korea, April 19, 2023 – April 20, 2023

10. Young Bok Bae, [IBS](#), Daejeon, Korea, April 18, 2023 – April 19, 2023
9. [Junichi Yokoyama](#), [UoT](#), Tokyo, Japan, November 17, 2022 – November 19, 2022
8. [Hisa-aki Shinkai](#), [OIT](#), Osaka, Japan, November 15, 2022 – November 17, 2022
7. [Kunihiro Ioka](#), [YITP](#), Kyoto, Japan, November 13, 2022 – November 15, 2022
6. [Frank Ohme](#), [AEI](#), Hannover, Germany, April 20, 2022 – April 24, 2022
5. [Harald Pfeiffer](#), [AEI](#), Potsdam, Germany, March 20, 2022 – April 20, 2022
4. [Tapas Kumar Das](#), [HRI](#), Allahabad, India, November 15, 2019 – November 25, 2019
3. [P Ajith](#), [ICTS-TIFR](#), Bangalore, India, March 25, 2019 – April 6, 2019
2. [P Ajith](#), [ICTS-TIFR](#), Bangalore, India, September 27, 2017 – October 11, 2017
1. Tarun Souradeep, [IUCAA](#), Pune, India, September 6, 2014 – October 20, 2014