

Md Arif Shaikh

Assistant Professor

Department of Physics, Vivekananda Satavarshiki Mahavidyalaya

Manikpara, West Bengal, 721513, India

Email: arifshaikh.astro@gmail.com, Web page: <https://mdarifshaikh.com>

Positions

- **Assistant Professor** 2023–current
Department of Physics, Vivekananda Satavarshiki Mahavidyalaya
Manikpara, West Bengal, 721513, India
- **Postdoctoral Fellow** 2022–2023
Department of Physics and Astronomy, Seoul National University
1 Gwanak-ro, Gwanak-gu, Seoul 08826, Korea
Mentors: Hyung Mok Lee
- **Visitor** 2022–2022
Astrophysical and Cosmological Relativity, Max Planck Institute for Gravitational Physics (Albert Einstein Institute)
Potsdam Science Park, Am Mühlenberg 1, D-14476, Potsdam, Germany
Mentors: Harald Pfeiffer, Vijay Varma
- **Postdoctoral Fellow** 2019–2022
Astrophysical Relativity, International Centre for Theoretical Sciences
Hesaraghatta Hobli, Karnataka, 560089, India
Mentors: Parameswaran Ajith, Prayush Kumar (unofficial)

Education

- **Doctor of Philosophy (PhD)** 2014–2019
Cosmology & High Energy Astrophysics, Harish-Chandra Research Institute
Chhatnag Road, Jhansi, Prayagraj, 211019, Uttar Pradesh, India
Advisor: Tapas Kumar Das
- **Master of Science (MSc)** 2012–2014
Cosmology & High Energy Astrophysics, Harish-Chandra Research Institute
Chhatnag Road, Jhansi, Prayagraj, 211019, Uttar Pradesh, India
Advisor: Tapas Kumar Das
- **Bachelor of Science (BSc)** 2009–2012
Faculty of Physics, Jadavpur University
188, Raja S.C. Mallick Rd, Kolkata 700032, India

Publications

Short author

Preprints

1. U. Deka, S. Chakraborty, S. J. Kapadia, M. A. Shaikh & P. Ajith, “Probing black hole charge with gravitational microlensing of gravitational waves”, (2024), [arXiv:2401.06553 \[gr-qc\]](https://arxiv.org/abs/2401.06553), cited by 2 (iNSPIRE HEP) 2 (NASA/ADS)

Peer reviewed publications

1. [M. A. Shaikh](#), S. A. Bhat & S. J. Kapadia, “A study of the inspiral-merger-ringdown consistency test with gravitational-wave signals from compact binaries in eccentric orbits”, *Phys. Rev. D*, **110**, 024030, (2024), [arXiv:2402.15110 \[gr-qc\]](#), cited by 3 (iNSPIRE HEP) 3 (NASA/ADS)
2. [M. A. Shaikh](#), V. Varma, H. P. Pfeiffer, A. Ramos-Buades & M. van de Meent, “Defining eccentricity for gravitational wave astronomy”, *Phys. Rev. D*, **108**, 104007, (2023), [arXiv:2302.11257 \[gr-qc\]](#), cited by 27 (iNSPIRE HEP) 23 (NASA/ADS)
3. M. K. Singh, D. Divyajyoti, S. J. Kapadia, [M. A. Shaikh](#) & P. Ajith, “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**, 3798–3809, (2022), [arXiv:2202.05802 \[astro-ph.HE\]](#), cited by 3 (iNSPIRE HEP) 3 (NASA/ADS)
4. S. Maity, [M. A. Shaikh](#), P. Tarafdar & T. K. Das, “Carter-Penrose diagrams for emergent spacetime in axisymmetrically accreting black hole systems”, *Phys. Rev. D*, **106**, 044062, (2022), [arXiv:2106.07598 \[gr-qc\]](#), cited by 1 (iNSPIRE HEP) 0 (NASA/ADS)
5. W. Wei, E. A. Huerta, M. Yun, N. Loutrel, [M. A. Shaikh](#), P. Kumar, R. Haas & V. Kindratenko, “Deep Learning with Quantized Neural Networks for Gravitational-wave Forecasting of Eccentric Compact Binary Coalescence”, *Astrophys. J.*, **919**, 82, (2021), [arXiv:2012.03963 \[gr-qc\]](#), cited by 23 (iNSPIRE HEP) 20 (NASA/ADS)
6. M. K. Singh, S. J. Kapadia, [M. A. Shaikh](#), D. Chatterjee & P. Ajith, “Improved early warning of compact binary mergers using higher modes of gravitational radiation: A population study”, *Mon. Not. Roy. Astron. Soc.*, **502**, 1612–1622, (2021), [arXiv:2010.12407 \[astro-ph.HE\]](#), cited by 10 (iNSPIRE HEP) 10 (NASA/ADS)
7. S. J. Kapadia, M. K. Singh, [M. A. Shaikh](#), D. Chatterjee & P. Ajith, “Of Harbingers and Higher Modes: Improved gravitational-wave early-warning of compact binary mergers”, *Astrophys. J. Lett.*, **898**, L39, (2020), [arXiv:2005.08830 \[astro-ph.HE\]](#), cited by 16 (iNSPIRE HEP) 14 (NASA/ADS)
8. [M. A. Shaikh](#), S. Maity, S. Nag & T. K. Das, “Effective sound speed in relativistic accretion discs around Schwarzschild black holes”, *New Astron.*, **69**, 48–57, (2019), [arXiv:1806.04084 \[astro-ph.HE\]](#), cited by 4 (iNSPIRE HEP) 1 (NASA/ADS)
9. [M. A. Shaikh](#) & T. K. Das, “Linear perturbations of low angular momentum accretion flow in the Kerr metric and the corresponding emergent gravity phenomena”, *Phys. Rev. D*, **98**, 123022, (2018), [arXiv:1803.09896 \[astro-ph.HE\]](#), cited by 8 (iNSPIRE HEP) 2 (NASA/ADS)
10. [M. A. Shaikh](#), “Relativistic sonic geometry for isothermal accretion in the Kerr metric”, *Class. Quant. Grav.*, **35**, 055002, (2018), [arXiv:1705.04918 \[gr-qc\]](#), cited by 11 (iNSPIRE HEP) 11 (NASA/ADS)
11. S. Datta, [M. A. Shaikh](#) & T. K. Das, “Acoustic geometry obtained through the perturbation of the Bernoulli’s constant”, *New Astron.*, **63**, 65–74, (2018), [arXiv:1612.07954 \[gr-qc\]](#), cited by 12 (iNSPIRE HEP) 5 (NASA/ADS)
12. [M. A. Shaikh](#), I. Firdousi & T. K. Das, “Relativistic sonic geometry for isothermal accretion in the Schwarzschild metric”, *Class. Quant. Grav.*, **34**, 155008, (2017), [arXiv:1612.07963 \[gr-qc\]](#), cited by 13 (iNSPIRE HEP) 14 (NASA/ADS)

Collaboration

Peer reviewed publications

1. LIGO Scientific, Virgo, KAGRA, “Constraints on the Cosmic Expansion History from GWTC–3”, *Astrophys. J.*, **949**, 76, (2023), [arXiv:2111.03604 \[astro-ph.CO\]](#), cited by 226 (iNSPIRE HEP) 200 (NASA/ADS)
2. KAGRA, VIRGO, LIGO Scientific, “Open Data from the Third Observing Run of LIGO, Virgo, KAGRA, and GEO”, *Astrophys. J. Suppl.*, **267**, 29, (2023), [arXiv:2302.03676 \[gr-qc\]](#), cited by 163 (iNSPIRE HEP) 149 (NASA/ADS)
3. LIGO Scientific, KAGRA, VIRGO, “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**, L30, (2022), [arXiv:2209.02863 \[astro-ph.HE\]](#), cited by 22 (iNSPIRE HEP) 16 (NASA/ADS)

4. KAGRA, LIGO Scientific, VIRGO, “Search for continuous gravitational wave emission from the Milky Way center in O3 LIGO-Virgo data”, *Phys. Rev. D*, **106**, 042003, (2022), [arXiv:2204.04523 \[astro-ph.HE\]](#), cited by 46 (INSPIRE HEP) 36 (NASA/ADS)
5. KAGRA, VIRGO, LIGO Scientific, “First joint observation by the underground gravitational-wave detector KAGRA with GEO 600”, *PTEP*, **2022**, 063F01, (2022), [arXiv:2203.01270 \[gr-qc\]](#), cited by 49 (INSPIRE HEP) 39 (NASA/ADS)
6. KAGRA, VIRGO, LIGO Scientific, “Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data”, *Phys. Rev. D*, **106**, 062002, (2022), [arXiv:2201.10104 \[gr-qc\]](#), cited by 26 (INSPIRE HEP) 21 (NASA/ADS)
7. KAGRA, LIGO Scientific, VIRGO, “All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data”, *Phys. Rev. D*, **106**, 102008, (2022), [arXiv:2201.00697 \[gr-qc\]](#), cited by 91 (INSPIRE HEP) 73 (NASA/ADS)
8. KAGRA, VIRGO, LIGO Scientific, “All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data”, *Phys. Rev. D*, **105**, 102001, (2022), [arXiv:2111.15507 \[astro-ph.HE\]](#), cited by 79 (INSPIRE HEP) 68 (NASA/ADS)
9. LIGO Scientific, VIRGO, KAGRA, “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 \[astro-ph.HE\]](#), cited by 66 (INSPIRE HEP) 76 (NASA/ADS)

Presentations

Conference Talks

1. “A study of IMRCT on eccentric GW signal”, [GW Universe Workshop 8, Gravitational Wave Universe](#), Seoul, Korea, December 26–27, 2023
2. “Comparing eccentric waveforms for gravitational wave data analysis”, [2nd H.S. Yun Astronomy Workshop](#), Seoul, Korea, August 29–30, 2023
3. “Defining eccentricity for gravitational wave astronomy”, [ICGAC15](#), Gyeongju, Korea, July 3–7, 2023
4. “Defining eccentricity for gravitational wave astronomy”, [APSWG](#), Hangzhou, China, May 14–22, 2023
5. “Defining eccentricity for gravitational wave astronomy”, [GWPAW](#), Melbourne, Australia, December 4–9, 2022
6. “Probing the evolution history of compact binaries from higher modes of gravitation waves”, [ICTS In-house symposium](#), Bangalore, India, February 17–18, 2020
7. “Relativistic acoustic geometry in general relativistic accretion disc around Kerr black holes”, [Exploring the Universe: Near Earth Space Science to Extra-Galactic Astronomy](#), Kolkata, India, November 14–17, 2018
8. “Emergence of curved sonic manifold for isothermal accretion in black hole metric”, [Young Astronomers Meet](#), Pune, India, September 11–15, 2017

Conference Posters

1. “Surrogate and hybrid models of eccentric waveforms using numerical relativity”, [765. WE-Heraeus-Seminar: Gravitational Wave and Multimessenger Astronomy](#), Physikzentrum Bad Honnef, Germany, April 25–28, 2022
2. “Probing the evolution of compact binaries using higher modes of gravitational waves”, [39th meeting of ASI](#), Online, India, February 18–23, 2021
3. “Probing evolution history of compact binaries using higher modes of gravitational waves”, [LVK September Meeting](#), Online, LIGO, September 14–17, 2020

4. “Relativistic sonic geometry for isothermal accretion in Kerr metric”, [29th meeting of IAGRG](#), Guwahati, India, May 18–20, 2017
5. “Emergence of relativistic sonic geometry through perturbation of matter in black hole metric”, [35th meeting of ASI](#), Jaipur, India, March 6–10, 2017

Seminars

1. “gw_eccentricity: a Python package to measure orbital eccentricity from gravitational waveforms”, [Inje University](#), Gimhae, Korea, November 03, 2023
2. “gw_eccentricity: a Python package to measure orbital eccentricity from gravitational waveforms”, [IUCAA](#), Pune, India, June 19, 2023
3. “gw_eccentricity: a Python package to measure orbital eccentricity from gravitational waveforms”, [ICTS-TIFR](#), Bangalore, India, June 15, 2023
4. “Measuring Eccentricity from Gravitational Waveform”, [ITP](#), Beijing, China, May 11, 2023
5. “Measuring Eccentricity from Gravitational Waveform”, [BNU](#), Beijing, China, May 10, 2023
6. “Defining eccentricity for gravitational wave astronomy”, [KASI](#), Daejeon, Korea, April 20, 2023
7. “Standardizing the definition of eccentricity for gravitational wave astronomy”, [IBS](#), Daejeon, Korea, April 18, 2023
8. “Defining eccentricity for gravitational wave astronomy”, [ICTS-TIFR](#), Bangalore (online), India, December 01, 2022
9. “Defining eccentricity for gravitational wave astronomy”, [RESCEU](#), Tokyo, Japan, November 18, 2022
10. “Defining eccentricity for gravitational wave astronomy”, [OIT](#), Osaka, Japan, November 16, 2022
11. “Defining eccentricity for gravitational wave astronomy”, [YITP](#), Kyoto, Japan, November 14, 2022
12. “On the emergent sonic geometry through the linear perturbation of relativistic black hole accretion”, [HRI](#), Allahabad, India, November 18, 2019

Participation in conference & workshops

1. [GW Universe Workshop 8, Gravitational Wave Universe](#), Seoul, Korea, December 26–27, 2023
2. [KAS 2023 Fall Meeting, Korean Astronomical Society](#), RABADA PLAZA, JEJU, Korea, October 18–20, 2023
3. [LVK 2023 September Meeting, LVK Collaboration](#), Toyama, Japan, September 11–15, 2023
4. [2nd H.S. Yun Astronomy Workshop](#), Seoul, Korea, August 29–30, 2023
5. [ICGAC15](#), Gyeongju, Korea, July 3–7, 2023
6. [GW Universe Workshop 7, Gravitational Wave Universe](#), Seoul, Korea, June 12, 2023
7. [APSWG](#), Hangzhou, China, May 14–22, 2023
8. [KAS 2023 Spring Meeting, Korean Astronomical Society](#), LAHANHOTEL, JEONJU, Korea, April 12–14, 2023
9. [68th Workshop on Gravitational Waves and Numerical Relativity](#), [APCTP](#), Pohang, Korea, March 15–16, 2023
10. [LVK 2023 March Meeting, Center for Interdisciplinary Exploration and Research in Astrophysics \(CIERA\)](#), (remote participation), Evanston, USA, March 13–16, 2023
11. [GW Universe Winter Workshop 2023, Gravitational Wave Universe](#), Yongpyong Ski Resort, Gwangwon, Korea, February 26–March 1, 2023

12. [GWPAW](#), Melbourne, Australia, December 4–9, 2022
13. [GW Universe Workshop6](#), Gravitational Wave Universe, Seoul, Korea, November 24–25, 2022
14. [67th Workshop on Gravitational Waves and Numerical Relativity](#), APCTP, Pohang, Korea, October 26–27, 2022
15. [765. WE-Heraeus-Seminar: Gravitational Wave and Multimessenger Astronomy](#), Physikzentrum Bad Honnef, Germany, April 25–28, 2022
16. [Summer School on Gravitational-Wave Astronomy](#), ICTS-TIFR, Bangalore, India, July 5–16, 2021
17. [39th meeting of ASI](#), Online, India, February 18–23, 2021
18. [LVK September Meeting](#), Online, LIGO, September 14–17, 2020
19. [ICERM Fall 2020 Workshop 1: Advances and Challenges in Computational Relativity](#), ICERM, Brown University, Online, USA, September 14–18, 2020
20. [ICTS workshop on parameter estimation with bilby](#), ICTS-TIFR, Bangalore, India, August 27–28, 2020
21. [Test of General Relativity using Gravitational Waves](#), IACS, Kolkata & IIT Gandhinagar, Online, India, August 13–14, 2020
22. [PyCBC Inference Online Workshop 2020](#), AEI, Hannover, Online, Germany, June 25–26, 2020
23. [Gravitational-Wave Open Data Workshop #3](#), LIGO-Virgo Collaboration, Online, USA, May 26–28, 2020
24. [Summer School on Gravitational-Wave Astronomy](#), ICTS-TIFR, Online, India, May 18–23, 2020
25. [ICTS In-house symposium](#), Bangalore, India, February 17–18, 2020
26. [Astrophysics of Supermassive Black Holes](#), ICTS-TIFR, Bangalore, India, December 17–19, 2019
27. [Newton Bhabha-Open Data workshop](#), IUCAA, Pune, India, December 4–6, 2019
28. [The Future of Gravitational-Wave Astronomy](#), ICTS, Bangalore, India, August 19–22, 2019
29. [Summer School on Gravitational-Wave Astronomy](#), ICTS-TIFR, Bangalore, India, July 25–26, 2019
30. [Theoretical Aspects of Astroparticle Physics, Cosmology and Gravitation](#), Galileo Galilei Institute for Theoretical Physics, Florence, Italy, March 11–22, 2019
31. [Exploring the Universe: Near Earth Space Science to Extra-Galactic Astronomy](#), Kolkata, India, November 14–17, 2018
32. [Black Holes: From Classical to Quantum Gravity](#), IIT, Gandhinagar, India, December 15–19, 2017
33. [Young Astronomers Meet](#), Pune, India, September 11–15, 2017
34. [Summer School on Gravitational-Wave Astronomy](#), ICTS-TIFR, Bangalore, India, July 17–28, 2017
35. [29th meeting of IAGRG](#), Guwahati, India, May 18–20, 2017
36. [35th meeting of ASI](#), Jaipur, India, March 6–10, 2017

Teaching

1. *Tutored “Stochastic gravitational wave background from early universe”, Summer School on Gravitational Wave Astronomy, ICTS-TIFR, Bangalore, India, July 05–16, 2021*
Instructor: Shi Pi, KIPMU, Tokyo, Japan
2. *Tutored “Introduction to General Relativity”, Graduate semester course, ICTS-TIFR, Bangalore, India, August 01–December 31, 2020*
Instructor: Bala Iyer, ICTS-TIFR, Bangalore, India
3. *Tutored “Parameter estimation with bilby”, ICTS workshop, ICTS-TIFR, Bangalore, India, August 27–28, 2020*
Instructor: Gregory Ashton, Royal Holloway, University of London, London, UK
4. *Tutored “Numerical Hydrodynamics”, Summer School on Gravitational Wave Astronomy, ICTS-TIFR, Bangalore, India, May 18–June 05, 2020*
Instructor: Ian Hawke, University of Southampton, Southampton, UK
5. *Tutored “An Introduction to GW Physics & Astronomy”, Graduate semester course, ICTS-TIFR, Bangalore, India, January 01–April 30, 2020*
Instructor: P. Ajith & Bala Iyer, ICTS-TIFR, Bangalore, India
6. *Tutored “Advanced General Relativity”, Summer School on Gravitational Wave Astronomy, ICTS-TIFR, Bangalore, India, July 15–26, 2021*
Instructor: Sudipta Sarkar, IIT, Gandhinagar, India
7. *Tutored “Statistical Physics”, Graduate semester course, HRI, Allahabad, India, August 01–December 31, 2017*
Instructor: G. V. Pai, HRI, Allahabad, India

Refereeing

1. [Classical and Quantum Gravity](#) (4)
2. [The European Physical Journal C](#) (1)
3. [Journal of Physics A: Mathematical and Theoretical](#) (1)

Achievements

- Offer for National Postdoctoral Fellowship (NPDF), [Science and Engineering Research Board \(SERB\), Government of India.](#), 2024
- Membership, [Korean Astronomical Society](#), 2023–
- Membership, [Simulating eXtreme Spacetime \(SXS\)](#), 2021–
- Membership, [LIGO Scientific Collaboration](#), 2020–
- Senior Research Fellowship, [Department of Atomic Energy, Government of India](#), 2014–2018
- Junior Research Fellowship, [Department of Atomic Energy, Government of India](#), 2012–2014
- Offer for Phd in Physics starting from 2014, [IUCAA, pune](#), 2012
- Offer for Integrated Phd in Physics, [NCRA-TIFR, Pune](#), 2012
- Offer for Integrated Phd in Physics, [IISc, Bangalore](#), 2012
- Offer for MSc in Physics, [IIT Bombay](#), 2012

- AIR 41 in Joint Entrance Screening Test (JEST), [JEST](#), 2012
- AIR 43 in Joint Admission Test for M.Sc (JAM), [IIT Bombay](#), 2012
- INSPIRE Fellowship, [Department of Science and Technology, Government of India](#), 2009–2012
- Ranked within top 20 in higher secondary examination, [West Bengal Council of Higher Secondary Education](#), 2009
- First rank in secondary examination, [West Bengal Board of Secondary Education](#), 2007

Visits

- [Hyung Mok Lee](#), [Seoul National University](#), Seoul, Korea, October 5–19, 2024
- [Hyung Won Lee](#), [Inje University](#), Gimhae, Korea, November 2–3, 2023
- [Shasvath Kapadia](#), [IUCAA](#), Pune, India, June 18–21, 2023
- [Prayush Kumar](#), [ICTS-TIFR](#), Bangalore, India, June 15–18, 2023
- [Zhoujian Cao](#), [BNU](#), Beijing, China, May 09–11, 2023
- [Arman Shafieloo](#), [KASI](#), Daejeon, Korea, April 19–20, 2023
- [Young Bok Bae](#), [IBS](#), Daejeon, Korea, April 18–19, 2023
- [Junichi Yokoyama](#), [UoT](#), Tokyo, Japan, November 17–19, 2022
- [Hisaki Shinkai](#), [OIT](#), Osaka, Japan, November 15–17, 2022
- [Kunihito Ioka](#), [YITP](#), Kyoto, Japan, November 13–15, 2022
- [Frank Ohme](#), [AEI](#), Hannover, Germany, April 20–24, 2022
- [Harald Pfeiffer](#), [AEI](#), Potsdam, Germany, March 20–April 20, 2022
- [Tapas Kumar Das](#), [HRI](#), Allahabad, India, November 15–25, 2019
- [P Ajith](#), [ICTS-TIFR](#), Bangalore, India, March 25–April 6, 2019
- [P Ajith](#), [ICTS-TIFR](#), Bangalore, India, September 27–October 11, 2017
- [Tarun Souradeep](#), [IUCAA](#), Pune, India, September 6–October 20, 2014

References

- **Tapas Kumar Das**, (Phd Advisor)
Professor, [Harish-Chandra Research Institute](#)
Chhatnag Road, Jhansi, Prayagraj, 211019, Uttar Pradesh, India
Email: tapas@hri.res.in, Phone: +91 5322274321
- **Parameswaran Ajith**, (Postdoc mentor)
Professor, [International Centre for Theoretical Sciences](#)
Hesaraghatta Hobli, Karnataka, 560089, India
Email: ajith@icts.res.in, Phone: +91 8046536210
- **Hyung Mok Lee**, (Postdoc mentor)
Professor, [Seoul National University](#)
1 Gwanak-ro, Gwanak-gu, Seoul 08826, Korea
Email: hmlee@astro.snu.ac.kr, Phone: 82-2-880-6625

- **Prayush Kumar**
Reader, [International Centre for Theoretical Sciences](#)
Hesaraghatta Hobli, Karnataka, 560089, India
Email: prayush@icts.res.in, Phone: +91 8046536390
- **Shasvath Kapadia**
Assistant Professor, [Inter-University Centre for Astronomy and Astrophysics](#)
Post Bag 4, Ganeshkhind, Pune, Maharashtra 411007, India
Email: shasvath.kapadia@iucaa.in
- **Vijay Varma**
Assistant Professor, [University of Massachusetts](#)
Dartmouth, USA
Email: vijay.varma392@gmail.com