Shaon Ghosh

Curriculum Vitae

Personal details

Name **Shaon Ghosh**.
Nationality **Indian**.
email **ghoshs@montclair.edu**.

Academic Positions

2020-Present **Montclair State University, Montclair, NJ**, *Assistant Professor of Physics*.
2016-2020 **University of Wisconsin, Milwaukee**, *Postdoctoral Research Associate*.
2013-2016 **Radboud University, Nijmegen, the Netherlands**, *Postdoctoral Researcher*.

Education

2007–2013 **Ph.D. in Physics**, *Washington State University*, Pullman.
2004–2006 **M.Sc. in Physics**, *Indian Institute of Technology*, Kharagpur.
2001–2004 **B.Sc. Physics(honors)**, *University of Calcutta*, Calcutta.

Ph.D. thesis

Title *Improving the detectability of gravitational wave counterparts of short-hard gamma ray bursts.*
Supervisor Professor Sukanta Bose
Link to the thesis `https://gwic.ligo.org/assets/docs/theses/ghosh_thesis.pdf`

International Collaborations

- LIGO scientific collaboration (former member of the Virgo Collaboration)
- BlackGEM team - Radboud, KU Leuven, NOVA

Department of Physics and Astronomy, Montclair State University
Montclair, New Jersey, United States
(001) 920 757 3945 • ☎ (001) 973 655 7797
ghoshs@montclair.edu
https://msuweb.montclair.edu/ ghoshs/profile/

Work experience

2020-present **Assistant Professor of Physics**, *Montclair State University*, Montclair NJ, United States.

- Continuing to serve as co-chair of the LIGO-Virgo's low-latency group.
- Low-latency system architecture development.
- Development of the GWXtreme package for neutron star equation of state model selection.
- Large scale LIGO-Virgo injection campaign for preparation to the fourth observing run.
- Measurement of Hubble constant using gravitational waves events with electromagnetic counterpart candidates.
- Teaching physics and astronomy to undergraduate students.
- Mentoring undergraduate students in gravitational wave physics, and data analysis.
- Alternate chair of internal grant proposal review committee for College of Science and Mathematics at Montclair State University
- Serving member of Physics and Astronomy curriculum committee, Department elections/voting committee, scholarship committee, and faculty search committee.
- Outreach activity, popularizing research in astrophysics, especially topics on gravitational wave research to general public.

2016-2020 **Post-doctoral Research Associate**, *University of Wisconsin*, Milwaukee, United States.

- Co-Chair (with Erik Katsavounidis) of the LIGO-Virgo's low-latency group.
- Design and implementation of EM-Bright pipeline. Integration into LIGO and Virgo's low-latency data analysis infrastructure.
- Development of neutron star equation of state model selection method.
- Development of optimal tiling and observing strategy of gravitational wave and Fermi GRB triggers for the Zwicky Transient Facility.
- Development of generic optimal tiling strategy for radio telescopes like ASKAP.
- Zwicky Transient Facility (ZTF) simulation. Gravitational wave sky-localization and optical counterpart study using LIGO and virgo data.
- Development of EM follow-up schedular for the BlackGEM telescope.
- Full scenario study (including parameter estimation) of compact binary coalescing systems.
- Rapid parameter estimation of coalescing compact binaries.

2013-2016 **Post-doctoral Researcher**, *Radboud University*, Nijmegen, The Netherlands.

- Large scale scenario study for neutron star-black hole binary systems.
- Sky-localization study for highly precessing compact binary coalescing systems.
- Participation in the parameter estimation efforts of the first binary black hole detection GW150914.
- EM follow-up advocate during LIGO-Virgo's first observing run (O1)
- Analysis of raw data from GW150914 to give a "simple proof" that the observed trigger was indeed from a binary black hole coalescence. This argument went into the Sec. II of the detection paper.
- Developing infrastructure (software) and observing strategies for optical follow-up of gravitational wave candidates for the BlackGEM telescope array.
- Parameter estimation of gravitational wave triggers in presence of waveform mismatch.
- Working in the EM-follow-up and parameter estimation sub-groups of the compact binary coalescence group as a member of Virgo scientific collaboration.

2007-2013 **Research Assistant**, *Washington State University*, Pullman, United States.

- Construction of detection pipeline for targeted gravitational wave search.
- Development of hierarchical coherent search pipeline for gravitational waves.
- Worked in the Compact Binary Coalescence (CBC) group as a member of LIGO scientific collaboration (LSC).
- Studied interplanetary network (IPN) detected GRBs with large sky position error and their feasibility of detection using CBC search pipeline.
- Light curve study for identification of the short duration gamma ray bursts and their onsource time window for search for gravitational waves from Swift and Fermi GRB triggers.
- Worked in the external trigger subgroup of the CBC group for the analysis of 6th LIGO scientific data run.
- Participated in the fifth LIGO science run for high mass binary black hole systems.

Selected Publications

1. **S. Ghosh**, X. Liu, J. Creighton, I. M. Hernandez, W. Kastaun, G. Pratten, "Rapid model comparison of equations of state from gravitational wave observation of binary neutron star coalescences," Phys. Rev. D 104, 083003 (2021) 1, L5, DOI: 10.1103/PhysRevD.104.083003

2. R. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Observation of Gravitational Waves from Two Neutron Star–Black Hole Coalescences," Astrophys.J.Lett. 915 (2021) 1, L5, DOI: 10.3847/2041-8213/ac082e

3. R. Magee, [et al., including **S. Ghosh**], "First demonstration of early warning gravitational wave alerts," Astrophys. J. Lett 910 (2021) 2, L21, DOI: 10.3847/2041-8213/abed54

4. E. Cuoco, [et al., including **S. Ghosh**], "Enhancing Gravitational-Wave Science with Machine Learning," Mach.Learn.Sci.Tech. 2 (2021) 1, 011002, DOI: 10.1088/2632-2153/abb93a

5. D. Chatterjee, **S. Ghosh**, P. R. Brady, S. J. Kapadia, A. L. Miller, S. Nissanke, and F. Pannarale, "A Machine Learning Based Source Property Inference for Compact Binary Mergers," Astrophys.J. 896 (2020) 1, 54, DOI: 10.3847/1538-4357/ab8dbe

6. M. M. Kasliwal, [et al., including **S. Ghosh**], "Kilonova Luminosity Function Constraints Based on Zwicky Transient Facility Searches for 13 Neutron Star Merger Triggers during O3," Astrophys.J. 905 (2020) 2, 145, DOI: 10.3847/1538-4357/abc335

7. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Model comparison from LIGO–Virgo data on GW170817's binary components and consequences for the merger remnant," Class.Quant.Grav. 37 (2020) 4, 045006, DOI: 10.1088/1361-6382/ab5f7c

8. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Low-latency Gravitational-wave Alerts for Multimessenger Astronomy during the Second Advanced LIGO and Virgo Observing Run," Astrophys. J. 875, 161 (2019), DOI: 10.3847/1538-4357/ab0e8f

9. M. W. Coughlin, [et al., including **S. Ghosh**], "2900 Square Degree Search for the Optical Counterpart of Short Gamma-Ray Burst GRB 180523B with the Zwicky Transient Facility,"

Publications of the Astronomical Society of the Pacific, 131, 998 (2019), DOI: 10.1088/1538-3873/aaff99

10. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170817: Measurements of Neutron Star Radii and Equation of State," Phys. Rev. Lett. 121, 161101 (2018), DOI: 10.1103/PhysRevLett.121.161101

11. M.W. Coughlin, [et al., including **S. Ghosh**], "Optimizing searches for electromagnetic counterparts of gravitational wave triggers," Monthly Notices of the Royal Astronomical Society, Volume 478 (2018), DOI: 10.1093/mnras/sty1066

12. M. M. Kasliwal, [et al., including **S. Ghosh**], "Illuminating gravitational waves: A concordant picture of photons from a neutron star merger," Science Vol. 358, Issue 6370 (2017), DOI: 10.1126/science.aap9455

13. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "A gravitational-wave standard siren measurement of the Hubble constant," Nature 551, 85-88 (2017), DOI: 10.1038/nature24471

14. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral," Phys. Rev. Lett. 119, 161101 (2017), DOI: 10.1103/PhysRevLett.119.161101

15. B. Abbott [et al., including **S. Ghosh**] (Estimating the Contribution of Dynamical Ejecta in the Kilonova Associated with GW170817," Astrophys. J. Lett. 850, L39 (2017), DOI: 10.3847/2041-8213/aa9478

16. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence," Phys. Rev. Lett. 119, 141101 (2017), DOI: 10.1103/PhysRevLett.119.141101

17. **S. Ghosh**, D. Chatterjee, D. Kaplan, P. Brady and A. Sistine, "Hunting electromagnetic counterparts of gravitational-wave events using the Zwicky Transient Facility," Publications of the Astronomical Society of the Pacific, Volume 129, Number 981 (2017), DOI: 10.1088/1538-3873/aa884f

18. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2," Phys. Rev. Lett. 118, 221101 (2017), DOI: 10.1103/PhysRevLett.118.221101

19. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Prospects for Observing and Localizing Gravitational-Wave Transients with Advanced LIGO and Advanced Virgo," Living Rev Relativ (2016) 19, 1, DOI: 10.1007/lrr-2016-1

20. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "The basic physics of the binary black hole merger GW150914," Annalen Der Physik (2016). 1-17,

DOI: 10.1002/andp.201600209

21. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Observation of Gravitational Waves from a Binary Black Hole Merger," Phys. Rev. Lett. 116, 061102 (2016), DOI: 10.1103/PhysRevLett.116.061102

22. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Properties of the Binary Black Hole Merger GW150914," Phys. Rev. Lett. 116, 241102 (2016), DOI: 10.1103/PhysRevLett.116.241102

23. **S. Ghosh**, S. Bloemen, G. Nelemans, P. Groot and L. Price, "Tiling strategies for single facility optical follow-up of gravitational wave triggers," A&A. 592 (2016) A82, DOI: 10.1051/0004-6361/201527712

24. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Tests of General Relativity with GW15091," Phys. Rev. Lett. 116, 221101 (2016), DOI: 10.1103/PhysRevLett.116.221101

25. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW150914: Implications for the Stochastic Gravitational-Wave Background from Binary Black Holes," Phys. Rev. Lett. 116, 131102 (2016), DOI: 10.1103/PhysRevLett.116.131102

26. B. P. Abbott, [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Astrophysical implications of the binary black hole merger GW150914," Astrophys. J. Lett. 818, L22 (2016), DOI:10.3847/2041-8205/818/2/L22

27. **S. Ghosh** and G. Nelemans, "Localizing gravitational wave sources with optical telescopes and combining electromagnetic and gravitational wave data," Astrophys.Space Sci.Proc., 40:51-58 (2015), DOI:10.1007/978-3-319-10488-1_5

28. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Improved Upper Limits on the Stochastic Gravitational-Wave Background from 2009-2010 LIGO and Virgo Data," Phys. Rev. Lett. 113, 231101 (2014), 10.1103/PhysRevLett.113.231101

29. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for Gravitational Waves Associated with γ-ray Bursts Detected by the Interplanetary Network," Phys. Rev. Lett. 113, 011102 (2014), DOI:10.1103/PhysRevLett.113.011102

30. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Constraints on Cosmic Strings from the LIGO-Virgo Gravitational-Wave Detectors," 2014 Phys. Rev. Lett. 112, 131101 (2014), 10.1103/PhysRevLett.112.131101

31. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Enhanced sensitivity of the LIGO gravitational wave detector by using squeezed states of light," Nature Photonics volume 7, pages 613-619 (2013), 10.1038/nphoton.2013.177

32. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "A gravitational wave observatory operating beyond the quantum shot-noise limit," Nature Physics 7, 962 (2011), 10.1038/nphys2083

33. S. Bose, T. Dayanga, **S. Ghosh** and D. Talukder, "A blind hierarchical coherent search for gravitational-wave signals from coalescing compact binaries in a network of interferometric detectors," Classical and Quantum Gravity 28, 134009 (2011), 10.1088/0264-9381/28/13/134009

34. S. Bose, **S. Ghosh** and P. Ajith, "Systematic errors in measuring parameters of non-spinning compact binary coalescences with post-Newtonian templates," Class. Quantum Grav. 27, 114001 (2010), 10.1088/0264-9381/27/11/114001

Other Publications

1. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Narrowband Searches for Continuous and Long-duration Transient Gravitational Waves from Known Pulsars in the LIGO-Virgo Third Observing Run," The Astrophys. J., 932, 2 (2022), DOI: 10.3847/1538-4357/ac6ad0

2. T. Ahumada [et al., including **S. Ghosh**], "In Search of Short Gamma-Ray Burst Optical Counterparts with the Zwicky Transient Facility," Astrophys. J. 932, 1 (2022), DOI: 10.3847/1538-4357/ac6c29

3. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search of the early O3 LIGO data for continuous gravitational waves from the Cassiopeia A and Vela Jr. supernova remnants," Phys. Rev. D 105, 082005 (2022), DOI: 10.1103/PhysRevD.105.082005

4. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "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), DOI: 10.1103/PhysRevD.105.102001

5. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Narrowband Searches for Continuous and Long-duration Transient Gravitational Waves from Known Pulsars in the LIGO-Virgo Third Observing Run," The Astrophys. J., 932, 2 (2022), DOI: 10.3847/1538-4357/ac6ad0

6. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky, all-frequency directional search for persistent gravitational waves from Advanced LIGO's and Advanced Virgo's first three observing runs," Phys. Rev. D 105, 122001 (2022), DOI: 10.1103/PhysRevD.105.122001

7. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for continuous gravitational waves from 20 accreting millisecond x-ray pulsars in O3 LIGO data," Phys. Rev. D 105, 022002 (2022), DOI: 10.1103/PhysRevD.105.022002

8. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration),

"All-sky search for long-duration gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run," Phys. Rev. D 104, 102001 (2021), DOI: 10.1103/PhysRevD.104.102001

9. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for short gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run," Phys. Rev. D 104, 122004 (2021), DOI: 10.1103/PhysRevD.104.122004

10. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for continuous gravitational waves from isolated neutron stars in the early O3 LIGO data," Phys. Rev. D 104, 082004 (2021), DOI: 10.1103/PhysRevD.104.082004

11. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for intermediate-mass black hole binaries in the third observing run of Advanced LIGO and Advanced Virgo," A&A 659, A84 (2022), DOI: 10.1051/0004-6361/202141452

12. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for continuous gravitational waves from isolated neutron stars in the early O3 LIGO data," Phys. Rev. D 104, 082004 (2021), DOI: 10.1103/PhysRevD.104.082004

13. R. Abbott [et al., including **S. Ghosh**] (Constraints on dark photon dark matter using data from LIGO's and Virgo's third observing run," Phys. Rev. D 105, 063030 (2021), DOI: 10.1103/PhysRevD.105.063030

14. R. Abbott [et al., including **S. Ghosh**] (Search for Lensing Signatures in the Gravitational-Wave Observations from the First Half of LIGO–Virgo's Third Observing Run," Astrophys. J., Volume 923, Number 1 (2021), DOI: 10.3847/1538-4357/ac23db

15. R. Abbott [et al., including **S. Ghosh**] (Constraints from LIGO O3 Data on Gravitational-wave Emission Due to R-modes in the Glitching Pulsar PSR J0537–6910," Astrophys. J., Volume 922, Number 1 (2021), DOI: 10.3847/1538-4357/ac0d52

16. R. Abbott [et al., including **S. Ghosh**] (Searches for Continuous Gravitational Waves from Young Supernova Remnants in the Early Third Observing Run of Advanced LIGO and Virgo," Astrophys. J., Volume 921, Number 1 (2021), DOI: 10.3847/1538-4357/ac17ea

17. R. Abbott [et al., including **S. Ghosh**] (Search for anisotropic gravitational-wave backgrounds using data from Advanced LIGO and Advanced Virgo's first three observing runs," Phys. Rev. D 104, 022005 (2021), DOI: 10.1103/PhysRevD.104.022005

18. R. Abbott [et al., including **S. Ghosh**] (Constraints on Cosmic Strings Using Data from the Third Advanced LIGO–Virgo Observing Run," Phys. Rev. Lett. 126, 241102 (2021), DOI: 10.1103/PhysRevLett.126.241102

19. R. Abbott [et al., including **S. Ghosh**] (Upper limits on the isotropic gravitational-wave background from Advanced LIGO and Advanced Virgo's third observing run," Phys. Rev. D 104, 022004 (2021), DOI: 10.1103/PhysRevD.104.022004

20. R. Abbott [et al., including **S. Ghosh**] (Diving below the Spin-down Limit: Constraints on Gravitational Waves from the Energetic Young Pulsar PSR J0537-6910," Astrophys. J., Volume 913, Number 2 (2021), DOI: 10.3847/2041-8213/abffcd

21. R. Abbott [et al., including **S. Ghosh**] (All-sky search in early O3 LIGO data for continuous gravitational-wave signals from unknown neutron stars in binary systems," Phys. Rev. D 103, 064017 (2021), DOI: 10.1103/PhysRevD.103.064017

22. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "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, DOI: 10.1103/PhysRevX.11.021053

23. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Tests of general relativity with binary black holes from the second LIGO-Virgo gravitational-wave transient catalog," Phys. Rev. D 103, 122002, DOI: 10.1103/PhysRevD.103.122002

24. R. Abbott [et al., including **S. Ghosh**] (Population Properties of Compact Objects from the Second LIGO–Virgo Gravitational-Wave Transient Catalog," Astrophys. J. Lett. Volume 913, Number 1 (2021), DOI: 10.3847/2041-8213/abe949

25. R. Abbott [et al., including **S. Ghosh**] (Search for Gravitational Waves Associated with Gamma-Ray Bursts Detected by Fermi and Swift during the LIGO–Virgo Run O3a," Astrophys. J. 915, 86 (2021), DOI: 10.3847/1538-4357/abee15

26. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW190521: A Binary Black Hole Merger with a Total Mass of $150M_{\odot}$," Phys.Rev.Lett. 125 (2020) 10, 101102, DOI: 10.1103/PhysRevLett.125.101102

27. R. Abbott [et al., including **S. Ghosh**] (Gravitational-wave Constraints on the Equatorial Ellipticity of Millisecond Pulsars," Astrophys. J. Lett. Volume 902, Number 1 (2021), DOI: 10.3847/2041-8213/abb655

28. R. Abbott [et al., including **S. Ghosh**] (Properties and Astrophysical Implications of the 150 $M_{\odot}$ Binary Black Hole Merger GW190521," Astrophys. J. Lett. Volume 900, Number 1 (2021), DOI: 10.3847/2041-8213/aba493

29. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object," Astrophys.J.Lett. 896 (2020) 2, L44, DOI: 10.3847/2041-8213/ab960f

30. R. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW190412: Observation of a Binary-Black-Hole Coalescence with Asymmetric Masses," Phys.Rev.D 102 (2020) 4, 043015, DOI: 10.1103/PhysRevD.102.043015

31. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW190425: Observation of a Compact Binary Coalescence with Total Mass $\sim 3.4 M_{\odot}$," Astrophys.J.Lett. 892 (2020) 1, L3, DOI: 10.3847/2041-8213/ab75f5

32. B. Abbott [et al., including **S. Ghosh**] (A Gravitational-wave Measurement of the Hubble Constant Following the Second Observing Run of Advanced LIGO and Virgo," Astrophys. J. 909, 218 (2021), DOI: 10.3847/1538-4357/abdcb7

33. R. Hamburg [et al., including **S. Ghosh**] (A Joint Fermi-GBM and LIGO/Virgo Analysis of Compact Binary Mergers from the First and Second Gravitational-wave Observing Runs," Astrophys. J. 893, 2 (2021), DOI: 10.3847/1538-4357/ab7d3e

34. B. Abbott [et al., including **S. Ghosh**] (Open data from the first and second observing runs of Advanced LIGO and Advanced Virgo," SoftwareX 13, 100658 (2021), DOI: 10.1016/j.softx.2021.100658

35. B. Abbott [et al., including **S. Ghosh**] (A guide to LIGO–Virgo detector noise and extraction of transient gravitational-wave signals," Classical and Quantum Gravity 37, 055002 (2020), DOI: 10.1088/1361-6382/ab685e

36. B. Abbott [et al., including **S. Ghosh**] (Optically targeted search for gravitational waves emitted by core-collapse supernovae during the first and second observing runs of advanced LIGO and advanced Virgo," Phys. Rev. D 101, 084002 (2020), DOI: 10.1103/PhysRevD.101.084002

37. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for eccentric binary black hole mergers with Advanced LIGO and Advanced Virgo during their first and second observing runs," Astrophys. J. 883, 149 (2019), DOI: 10.3847/1538-4357/ab3c2d

38. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for intermediate mass black hole binaries in the first and second observing runs of the Advanced LIGO and Virgo network," Phys. Rev. D 100, 064064 (2019), DOI: 10.1103/PhysRevD.100.064064

39. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for short gravitational-wave bursts in the second Advanced LIGO and Advanced Virgo run," Phys. Rev. D 100, 024017 (2019), DOI: 10.1103/PhysRevD.100.024017

40. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for subsolar mass ultracompact binaries in Advanced LIGO's second observing run," Phys. Rev. Lett. 123, 161102 (2019), DOI: 10.1103/PhysRevLett.123.161102

41. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for long-duration gravitational wave transients in the second Advanced LIGO observing run," Phys. Rev. D 99, 104033 (2019), DOI: 10.1103/PhysRevD.99.104033

42. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration),

"Directional limits on persistent gravitational waves using data from Advanced LIGO's first two observing runs," Phys. Rev. D 100, 062001 (2019), DOI: 10.1103/PhysRevD.100.062001

43. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for the isotropic stochastic background using data from Advanced LIGO's second observing run," Phys. Rev. D 100, 061101(R) (2019), DOI: 10.1103/PhysRevD.100.061101

44. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO O2 data," Phys. Rev. D 100, 024004 (2019), DOI: 10.1103/PhysRevD.100.024004

45. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Narrow-band search for gravitational waves from known pulsars using the second LIGO observing run," Phys. Rev. D 99, 122002 (2019), DOI: 10.1103/PhysRevD.99.122002

46. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Searches for gravitational waves from known pulsars at two harmonics in 2015-2017 LIGO data," Astrophys. J. 879, 10 (2019), DOI: 10.3847/1538-4357/ab20cb

47. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for transient gravitational wave signals associated with magnetar bursts during Advanced LIGO's second observing run," Astrophys. J. 874, 163 (2019), DOI: 10.3847/1538-4357/ab0e15

48. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for long-duration gravitational wave transients in the second Advanced LIGO observing run," Astrophys. J. 879, 1 (2019), DOI: 10.1088/1361-6382/aaab76

49. A. Albert [et al., including **S. Ghosh**], "Search for Multimessenger Sources of Gravitational Waves and High-energy Neutrinos with Advanced LIGO during Its First Observing Run, ANTARES, and IceCube," Astrophys. J. 870, 134 (2019), DOI: 10.3847/1538-4357/aaf21d

50. E. Burns [et al., including **S. Ghosh**], "A Fermi Gamma-Ray Burst Monitor Search for Electromagnetic Signals Coincident with Gravitational-wave Candidates in Advanced LIGO's First Observing Run," Astrophys. J. 871, 90 (2019), DOI: 10.3847/1538-4357/aaf726

51. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Constraining the p-Mode-g-Mode Tidal Instability with GW170817," Phys. Rev. Lett. 122, 061104 (2019), DOI: 10.1103/PhysRevLett.122.061104

52. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for Subsolar-Mass Ultracompact Binaries in Advanced LIGO's First Observing Run," Phys. Rev. Lett. 121, 231103 (2019), DOI: 10.1103/PhysRevLett.121.231103

53. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Properties of the Binary Neutron Star Merger GW170817," Phys. Rev. X 9, 011001 (2019), DOI: 10.1103/PhysRevX.9.011001

54. K. Chakravarti, [et al., including **S. Ghosh**], "Systematic effects from black hole-neutron star waveform model uncertainties on the neutron star equation of state," Phys. Rev. D 99, 024049 (2019), DOI: 10.1103/PhysRevD.99.024049

55. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for Tensor, Vector, and Scalar Polarizations in the Stochastic Gravitational-Wave Background," Phys. Rev. Lett. 120, 201102 (2018), DOI: 10.1103/PhysRevLett.120.201102

56. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Full band all-sky search for periodic gravitational waves in the O1 LIGO data," Phys. Rev. D 97, 102003 (2018), DOI: 10.1103/PhysRevD.97.102003

57. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Constraints on cosmic strings using data from the first Advanced LIGO observing run," Phys. Rev. D 97, 102002 (2018), DOI: 10.1103/PhysRevD.97.102002

58. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences," Phys. Rev. Lett. 120, 091101 (2018), DOI: 10.1103/PhysRevLett.120.091101

59. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Effects of data quality vetoes on a search for compact binary coalescences in Advanced LIGO's first observing run," Classical and Quantum Gravity 35, 065010 (2018), DOI: 10.1088/1361-6382/aaaafa

60. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Gravitational Waves and Gamma-Rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A," Astrophys. J. Lett. 848, L13 (2017), DOI: 10.3847/2041-8213/aa920c

61. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW170608: Observation of a 19 Solar-mass Binary Black Hole Coalescence," Astrophys. J. Lett. 851, L35 (2017), DOI: 10.3847/2041-8213/aa9f0c

62. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for Post-merger Gravitational Waves from the Remnant of the Binary Neutron Star Merger GW170817," Astrophys. J. Lett. 851, L16 (2017), DOI: 10.3847/2041-8213/aa9a35

63. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Multi-messenger Observations of a Binary Neutron Star Merger," Astrophys. J. Lett. 848, L12 (2017), DOI: 10.3847/2041-8213/aa91c9

64. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "On the Progenitor of Binary Neutron Star Merger GW170817," Astrophys. J. Lett. 850, L40 (2017), DOI: 10.3847/2041-8213/aa93fc

65. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for High-energy Neutrinos from Binary Neutron Star Merger GW170817 with ANTARES, IceCube, and the Pierre Auger Observatory," Astrophys. J. Lett. 850, L35 (2017), DOI: 10.3847/2041-8213/aa9aed

66. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First narrow-band search for continuous gravitational waves from known pulsars in advanced detector data," Phys. Rev. D 96, 122006 (2017), DOI: 10.1103/PhysRevD.96.122006

67. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First Search for Nontensorial Gravitational Waves from Known Pulsars," Phys. Rev. Lett. 120, 031104 (2017), DOI: 10.1103/PhysRevLett.120.031104

68. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for periodic gravitational waves in the O1 LIGO data," Phys. Rev. D 96, 062002 (2017), DOI: 10.1103/PhysRevD.96.062002

69. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First low-frequency Einstein@Home all-sky search for continuous gravitational waves in Advanced LIGO data," Phys. Rev. D 96, 122004 (2017), DOI: 10.1103/PhysRevD.96.122004

70. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Upper Limits on Gravitational Waves from Scorpius X-1 from a Model-based Cross-correlation Search in Advanced LIGO Data," Astrophys. J. 847, 47 (2017), DOI: 10.3847/1538-4357/aa86f0

71. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO," Phys. Rev. D 96, 022001 (2017), DOI: 10.1103/PhysRevD.96.022001

72. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from Scorpius X-1 in the first Advanced LIGO observing run with a hidden Markov model," Phys. Rev. D 95, 122003 (2017), DOI: 10.1103/PhysRevD.95.122003

73. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for high-energy neutrinos from gravitational wave event GW151226 and candidate LVT151012 with ANTARES and IceCube," Phys. Rev. D 96, 022005 (2017), DOI: 10.1103/PhysRevD.96.022005

74. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First Search for Gravitational Waves from Known Pulsars with Advanced LIGO," Astrophys. J. 839, 12 (2017), DOI: 10.3847/1538-4357/aa677f

75. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Upper Limits on the Stochastic Gravitational-Wave Background from Advanced LIGO's First Observing Run," Phys. Rev. Lett. 118, 121101 (2017), DOI: 10.1103/PhysRevLett.118.121101

76. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration),

"Directional Limits on Persistent Gravitational Waves from Advanced LIGO's First Observing Run," Phys. Rev. Lett. 118, 121102 (2017), DOI: 10.1103/PhysRevLett.118.121102

77. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for Gravitational Waves Associated with Gamma-Ray Bursts during the First Advanced LIGO Observing Run and Implications for the Origin of GRB 150906B, "Classical and Quantum Gravity 34, 104002 (2017), DOI: 10.3847/1538-4357/aa6c47

78. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Effects of waveform model systematics on the interpretation of GW150914,"Classical and Quantum Gravity 34, 104002 (2017), DOI: 10.1088/1361-6382/aa6854

79. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for continuous gravitational waves from neutron stars in globular cluster NGC 6544," Phys. Rev. D 95, 082005 (2017), DOI: 10.1103/PhysRevD.95.082005

80. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Upper limits on the rates of binary neutron star and neutron star-black hole mergers from advanced LIGO's first observing run," Astrophys. J. Lett. 832, L21 (2016), DOI: 10.3847/2041-8205/832/2/L21

81. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Results of the deepest all-sky survey for continuous gravitational waves on LIGO S6 data running on the Einstein@Home volunteer distributed computing project," Phys. Rev. D 94, 102002 (2016), DOI: 10.1103/PhysRevD.94.102002

82. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence," Phys. Rev. Lett. 116, 241103 (2016), DOI: 10.1103/PhysRevLett.116.241103

83. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Binary Black Hole Mergers in the First Advanced LIGO Observing Run," Phys. Rev. X 6, 041015 (2016), DOI: 10.1103/PhysRevX.6.041015

84. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Improved Analysis of GW150914 Using a Fully Spin-Precessing Waveform Model," Phys. Rev. X 6, 041014 (2016), DOI: 10.1103/PhysRevX.6.041014

85. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence," Phys. Rev. D 94, 064035 (2016), DOI: 10.1103/PhysRevD.94.064035

86. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Comprehensive all-sky search for periodic gravitational waves in the sixth science run LIGO data," Phys. Rev. D 94, 042002 (2016), DOI: 10.1103/PhysRevD.94.042002

87. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for transient gravitational waves in coincidence with short-duration radio transients during 2007-2013," Phys. Rev. D 93, 122008 (2016), DOI: 10.1103/PhysRevD.93.122008

88. B. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First targeted search for gravitational-wave bursts from core-collapse supernovae in data of first-generation laser interferometer detectors," Phys. Rev. D 94, 102001 (2016), DOI: 10.1103/PhysRevD.94.102001

89. S. Adrián-Martínez [et al., including **S. Ghosh**], "High-energy neutrino follow-up search of gravitational wave event GW150914 with ANTARES and IceCube," Phys. Rev. D 93, 122010 (2016), DOI:10.1103/PhysRevD.93.122010

90. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), Supplement: "Localization and broadband follow-up of the gravitational-wave transient GW150914," Astrophys. J. Lett. 826, L13 (2016), DOI:10.3847/0067-0049/225/1/8

91. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Localization and broadband follow-up of the gravitational-wave transient GW150914," Astrophys. J. Lett. 826, L13 (2016), DOI:10.3847/2041-8205/826/1/L13

92. J. Aasi et al., "First search for optical counterparts to gravitational-wave candidate events," Astrophys. J. Supp. 211, 7 (2014), DOI:10.1088/0067-0049/211/1/7

93. J. Aasi et al., "Parameter estimation for compact binary coalescence signals with the first generation gravitational-wave detector network," Phys. Rev. D 88, 062001 (2013), DOI:10.1103/PhysRevD.88.062001

94. J. Abadie et al., "Search for gravitational waves from low mass compact binary coalescence in LIGO's sixth science run and Virgo's science run 2 and 3," Phys. Rev. D 85, 082002 (2012), DOI:10.1103/PhysRevD.85.082002

95. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW150914: The Advanced LIGO Detectors in the Era of First Discoveries," Phys. Rev. Lett. 116, 131103 (2016), DOI: 10.1103/PhysRevLett.116.131103

96. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "GW150914: First results from the search for binary black hole coalescence with Advanced LIGO," Phys. Rev. D 93, 122003 (2016), DOI: 10.1103/PhysRevD.93.122003

97. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "The rate of binary black hole mergers inferred from advanced LIGO observations surrounding GW150914," Astrophys. J. Lett. 833, L1 (2016), DOI: 10.3847/2041-8205/833/1/L1

98. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Observing gravitational-wave transient GW150914 with minimal assumptions," Phys. Rev. D 93, 122004 (2016), DOI: 10.1103/PhysRevD.93.122004

99. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914," 2016 Classical and Quantum Gravity 33, 134001 (2016), DOI: 10.1088/0264-9381/33/13/134001

100. B. P. Abbott [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for long-duration gravitational wave transients with initial LIGO," Phys. Rev. D 93, 042005 (2016), DOI: 10.1103/PhysRevD.93.042005

101. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search of the Orion spur for continuous gravitational waves using a loosely coherent algorithm on data from LIGO interferometers," Phys. Rev. D 93, 042006 (2016), DOI: 10.1103/PhysRevD.93.042006

102. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First low frequency all-sky search for continuous gravitational wave signals," Phys. Rev. D 93, 042007 (2016), DOI: 10.1103/PhysRevD.93.042007

103. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Searches for continuous gravitational waves from nine young supernova remnants," 2015 Astrophys. J. 813, 39 (2015), DOI: 10.1088/0004-637X/813/1/39

104. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Directed search for gravitational waves from Scorpius X-1 with initial LIGO data," Phys. Rev. D 91, 062008 (2015), DOI: 10.1103/PhysRevD.91.062008

105. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Narrow-band search of continuous gravitational-wave signals from Crab and Vela pulsars in Virgo VSR4 data," Phys. Rev. D 91, 022004 (2015) DOI: 10.1103/PhysRevD.91.022004

106. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Characterization of the LIGO detectors during their sixth science run," Classical and Quantum Gravity 32, 115012 (2015), DOI: 10.1088/0264-9381/32/11/115012

107. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Searching for stochastic gravitational waves using data from the two colocated LIGO Hanford detectors," Phys. Rev. D 91, 022003 (2015), DOI: 10.1103/PhysRevD.91.022003

108. M. G. Aartsen [et al., including **S. Ghosh**], "Multimessenger search for sources of gravitational waves and high-energy neutrinos: Initial results for LIGO-Virgo and IceCube," Phys. Rev. D 90, 102002 (2014), DOI: 10.1103/PhysRevD.90.102002

109. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First all-sky search for continuous gravitational waves from unknown sources in binary systems," Phys. Rev. D 90, 062010 (2014), DOI: 10.1103/PhysRevD.90.062010

110. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration),

"Methods and results of a search for gravitational waves associated with gamma-ray bursts using the GEO 600, LIGO, and Virgo detectors," Phys. Rev. D 89, 122004 (2014) DOI: 10.1103/PhysRevD.89.122004

111. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational radiation from intermediate mass black hole binaries in data from the second LIGO-Virgo joint science run," Phys. Rev. D 89, 122003 (2014), DOI: 10.1103/PhysRevD.89.122003

112. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational wave ringdowns from perturbed intermediate mass black holes in LIGO-Virgo data from 2005-2010," Phys. Rev. D 89, 102006 (2014), DOI: 10.1103/PhysRevD.89.102006

113. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Implementation of an $\mathcal{F}$-statistic all-sky search for continuous gravitational waves in Virgo VSR1 data," Classical and Quantum Gravity 31, 165014 (2014), DOI: 10.1088/0264-9381/31/16/165014

114. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "The NINJA-2 project: detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations," Classical and Quantum Gravity 31, 115004 (2014), DOI: 10.1088/0264-9381/31/11/115004

115. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Gravitational waves from known pulsars: results from the initial detector era," Astrophys. J. 785, 119 (2014), DOI: 10.1088/0004-637X/785/2/119

116. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Application of a Hough search for continuous gravitational waves on data from the fifth LIGO science run," Classical and Quantum Gravity 31, 085014 (2014), DOI: 10.1088/0264-9381/31/8/085014

117. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First searches for optical counterparts to gravitational-wave candidate events," Astrophys. J. Supp. 211, 7 (2014), DOI: 10.1088/0067-0049/211/1/7

118. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for long-lived gravitational-wave transients coincident with long gamma-ray bursts," Phys. Rev. D 88, 122004 (2013), DOI: 10.1103/PhysRevD.88.122004

119. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Directed search for continuous gravitational waves from the Galactic center," Phys. Rev. D 88, 102002 (2013), DOI: 10.1103/PhysRevD.88.102002

120. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Parameter estimation for compact binary coalescence signals with the first generation gravitational-wave detector network," Phys. Rev. D 88, 062001 (2013), DOI: 10.1103/PhysRevD.88.062001

121. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from binary black hole inspiral, merger, and ringdown in LIGO-Virgo data from 2009-2010," Phys. Rev. D 87, 042001 (2013) DOI: 10.1103/PhysRevD.87.022002

122. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Einstein@Home all-sky search for periodic gravitational waves in LIGO S5 data," 2013 Phys. Rev. D 87, 042001 (2013) DOI: 10.1103/PhysRevD.87.042001

123. S. Adrián-Martínez [et al., including **S. Ghosh**], "A first search for coincident gravitational waves and high energy neutrinos using LIGO, Virgo and ANTARES data from 2007," Journal of Cosmology and Astroparticle Physics, Volume 2013, (2013) DOI: 10.1088/1475-7516/2013/06/008/meta

124. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves associated with gamma-ray bursts during LIGO science run 6 and Virgo science runs 2 and 3," The Astrophysical Journal, Volume 760, Number 1 (2012), DOI: 10.1088/0004-637X/760/1/12/meta

125. P. A. Evans [et al., including **S. Ghosh**], "*Swift* follow-up observations of candidate gravitational-wave transient events," Astrophys. J. Supp. 203, 28 (2012) DOI: 10.1088/0067-0049/203/2/28/meta

126. J. Aasi [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "The characterization of Virgo data and its impact on gravitational-wave searches," Classical and Quantum Gravity, Volume 29, Number 15 (2012), DOI: 10.1088/0264-9381/29/15/155002/meta

127. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for gravitational-wave bursts in the second joint LIGO-Virgo run," Phys. Rev. D 85, 122007 (2012), DOI: 10.1103/PhysRevD.85.122007

128. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from intermediate mass binary black holes," Phys. Rev. D 85, 102004 (2012), DOI: 10.1103/PhysRevD.85.102004

129. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Implications for the origin of GRB 051103 from LIGO observations,' Astrophys. J. 755, 2 (2012), DOI: 10.1088/0004-637X/755/1/2/meta

130. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First low-latency LIGO+Virgo search for binary inspirals and their electromagnetic counterparts," 2012 A&A 541, A155 (2012), DOI: 10.1051/0004-6361/201218860

131. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Upper limits on a stochastic gravitational-wave background using LIGO and Virgo interferometers at 600-1000 Hz," Phys. Rev. D 85, 122001 (2012), DOI: 10.1103/PhysRevD.85.122001

132. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from low mass compact binary coalescence in LIGO's sixth

science run and Virgo's science runs 2 and 3," Phys. Rev. D 85, 082002 (2012), DOI: 10.1103/PhysRevD.85.082002

133. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for periodic gravitational waves in the full S5 LIGO data," Phys. Rev. D 85, 022001 (2012), DOI: 10.1103/PhysRevD.85.022001

134. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Implementation and testing of the first prompt search for gravitational wave transients with electromagnetic counterparts," A&A Volume 539, March (2012), DOI: 10.1051/0004-6361/201118219

135. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Directional Limits on Persistent Gravitational Waves Using LIGO S5 Science Data," Phys. Rev. Lett. 107, 271102 (2011), DOI: 10.1103/PhysRevLett.107.271102

136. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Beating the spin-down limit on gravitational wave emission from the vela pulsar," Astrophys. J. 737, 93 (2011), DOI: 10.1088/0004-637X/737/2/93

137. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from binary black hole inspiral, merger, and ringdown," Phys. Rev. D 83, 122005 (2011), DOI: 10.1103/PhysRevD.83.122005

138. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational wave bursts from six magnetars," Astrophys. J. Lett. 734, L35 (2011), DOI: 10.1088/2041-8205/734/2/L35

139. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves associated with the August 2006 timing glitch of the Vela pulsar," Phys. Rev. D 83, 042001 (2011), DOI: 10.1103/PhysRevD.83.042001

140. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Calibration of the LIGO gravitational wave detectors in the fifth science run," Nucl.Instrum.Meth.A624:223-240, (2010), DOI: 10.1016/j.nima.2010.07.089

141. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "First search for gravitational waves from the youngest known neutron star," The Astrophysical Journal, Volume 722, Number 2 (2010), DOI: 10.1088/0004-637X/722/2/1504

142. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational waves from compact binary coalescence in LIGO and Virgo data from S5 and VSR1," Phys. Rev. D 82, 102001 (2010), DOI: 10.1103/PhysRevD.82.102001

143. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Predictions for the rates of compact binary coalescences observable by ground-based gravitational-wave detectors," Classical and Quantum Gravity, Volume 27, Number 17 (2010), DOI: 10.1088/0264-

9381/27/17/173001

144. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "All-sky search for gravitational-wave bursts in the first joint LIGO-GEO-Virgo run," Phys. Rev. D 81, 102001 (2010), DOI: 0.1103/PhysRevD.81.102001

145. J. Abadie [et al., including **S. Ghosh**] (LIGO Scientific Collaboration and Virgo Collaboration), "Search for gravitational-wave inspiral signals associated with short gamma-ray bursts during LIGO's fifth and Virgo's first science run," ApJ 715 1453 (2010), DOI: 10.1088/0004-637X/715/2/1453

Talks and poster presentations

April 2022 Talk: Rapid gravitational wave source properties inference using supervised learning, APS meeting, New York city, NY **[International]**

May 2019 Talk: Joint constraints on neutron star equation of state using gravitational waves, Berkeley ML and MMA workshop, Berkeley, CA **[International]**

Dec 2018 Talk: Low-Latency source-classification of compact binary coalescences using gravitational wave, GWPAW 2018, Maryland. **[International]**

Oct 2018 Talk: Identification of electromagnetically "bright" gravitational-wave events, 2018 Midwest Relativity Meeting, Milwaukee, WI.

Oct 2017 Talk: From the ashes of a pair of neutron stars: The tale of a kilonova, Physics and Astronomy Colloquium, Oxford, Mississippi (**Invited**).

Oct 2017 Talk: Observation strategy for electromagnetic follow-up of gravitational-wave events using ZTF, GROWTH Annual Conference, Milwaukee, Wisconsin. **[International]**

Mar 2017 Poster: Low latency EM Bright classification pipeline for O2A. LIGO-Virgo meeting, Pasadena, California. **[International]**

Mar 2017 Poster: Investigation of detection and sky-localization of NSBH coalescences. LIGO-Virgo meeting, Pasadena, California. **[International]**

Oct 2016 Talk: The dawn of gravitational wave astronomy. Presidency University, Kolkata, India (**Invited**).

Sep 2016 Talk: EM-Bright classification for LIGO's second observing run. IUCAA, Pune, India (**Invited**).

June 2016 Talk: Tiling strategies for follow-up of gravitational wave sources and source classification during second observing run. Virtual observatory meeting, Strasbourg, France. **[International]**

May 2016 Talk: Effect of precession on sky-localization & low latency parameter estimation. Virgo week, Cascina, Italy. **[International]**

Sep 2015 Poster: Hunting optical counterparts of gravitational-wave events using arrays of telescopes. LIGO-Virgo meeting, Budapest, Hungary. **[International]**

Feb 2015 Talk: Hunt for optical counterparts for gravitational wave events. Fourth Dutch Gravitational wave meeting, Leiden, The Netherlands.

Nov 2014 Talk: Pointing strategies for BlackGEM for gravitational wave counterparts. NOVA Network 3 meeting, Leiden, The Netherlands.

Sep 2014 Talk: Search for electromagnetic counterpart of gravitational wave events using optical array of telescopes. Virgo week, Cascina, Italy. **[International]**

April 2014 Talk: Optical Followup of Gravitational Wave Events. Sant Cugat Forum for Astrophysics, Sant Cugat, Spain. **[International]**

Feb 2014 Talk: Systematic errors in gravitational waves parameter estimation. Third Dutch Gravitational wave meeting, ASTRON.

Dec 2013 Talk: The BlackGEM array, a dedicated gravitational waves trigger followup facility. Astronomy and Physics with LIGO India (APLI), Pune, India (**Invited**).

Dec 2013 Poster: Gravitational wave astronomy using compact binary systems and their Electromagnetic counterparts, GWPAW 2013, Pune, India. **[International]**

Dec 2011 Poster: Coherent multi-detector searches for gravitational waves from short duration gamma-ray bursts. 7th International Conference on Gravitation and Cosmology, Goa, India. **[International]**

April 2011 Talk: Targeting gravitational wave signals from short duration gamma ray bursts with large sky position errors. American Physical Society meeting, Anaheim, California. **[International]**

Jan 2011 Poster: Coherent compact binary coalescence searches for external triggers with large sky-position errors, GWPAW, Milwaukee, Wisconsin. **[International]**

Jan 2010 Talk: Robust multi-detector statistics for coherently searching for signals from coalescing compact binaries. GWDAW 14, Rome, Italy. **[International]**

Conferences and meetings attended

April 2022 American Physical Society meeting, New York city.

May 2019 Berkeley Machine Learning and Multi-Messenger Astronomy workshop.

Mar 2019 LIGO-Virgo meeting, Lake Geneva, Wisconsin.

Dec 2018 Gravitational waves Physics and Astronomy workshop (GWPAW), Maryland.

Oct 2018 Midwest Relativity Meeting, Milwaukee, Wisconsin.

Oct 2017 GROWTH Annual Conference, Milwaukee, Wisconsin.

Mar 2017 LIGO-Virgo meeting, Pasedena, California.

June 2016 Virtual observatory meeting, Strasbourg, France.

May 2016 Virgo Week, Cascina, Italy.

Mar 2016 Fifth Dutch Gravitational Wave meeting, Amsterdam, the Netherlands.

Dec 2015 A Century of General Relativity, Berlin, Germany.

Nov 2015 Nova Network 3 meeting, SRON, Leiden, The Netherlands.

Sep 2015 LIGO-Virgo meeting, Budapest, Hungary.

Feb 2015 Third Dutch Gravitational wave meeting, Leiden, The Netherlands.

Nov 2014 Nova Network 3, Leiden, The Netherlands.

Sep 2014 Virgo Week, Cascina, Italy.

April 2014	Sant Cugat Forum for Astrophysics, Sant Cugat, Spain.
Feb 2014	Third Dutch Gravitational wave meeting, Netherlands Institute of Radio Astronomy, ASTRON, The Netherlands.
Dec 2013	Astronomy and Physics with LIGO India (APLI), Pune, India.
Dec 2013	Gravitational wave Physics and Astronomy workshop (GWPAW), Pune, India.
Sep 2013	LIGO-Virgo meeting, Hannover, Germany.
March 2012	LIGO-Virgo meeting, Cambridge, Massachusetts.
Dec 2011	ICGC 2011, Goa, India.
April 2011	American Physical Society meeting, Anaheim, California.
March 2011	LIGO-Virgo meeting, Arcadia, California.
Jan 2011	Gravitational waves Physics and Astronomy workshop (GWPAW), Milwaukee, Wisconsin.
June 2010	LIGO-Virgo meeting, Hanover, Germany.
March 2010	LIGO-Virgo meeting, Arcadia, California.
Jan 2010,	Gravitational waves data analysis workshop (GWDAW), Rome, Italy.

Teaching

Spring 2022	PHYS 192 - University Physics II (Montclair State University)
Fall 2021	PHYS 220 - Oscillations, Waves, & Optics (Montclair State University)
Spring 2021	PHYS 340 - Electricity and Magnetism (Montclair State University)
Fall 2020	PHYS 191 - University Physics I (Montclair State University)
Spring 2020	PHYS 280 - Astronomy for Physicists (Montclair State University)
Spring 2020	PHYS 192 - University Physics II (Montclair State University)
Spring 2018	Astronomy 103 - Introductory undergraduate course on astronomy (UWM)

Mentoring students

- Elton Ago (Computer Science) - Summer 2022 - current
- Elizabeth Kapelevich (Physics) - Fall 2021 - current
- Ricky Wilde (Mathematics) - Summer 2021 - Fall 2021
- Michael Camilo (Physics) - Spring 2021 - current
- Jacob Santos (Physics) - Summer 2021

Referee

Grants	Reviewer in the panel of NASA's Astrophysics Theory Program
Journals	Served as referee for reputed journals like Classical and Quantum Gravity (2021 impact factor = 3.528), Astronomy & Astrophysics (2020 impact factor = 5.802), and Astronomy and Computing (2021 Impact factor = 1.927).
Internal	Internal peer reviewer for The LIGO-Virgo-Kagra collaborations.

Department of Physics and Astronomy, Montclair State University
Montclair, New Jersey, United States
(001) 920 757 3945 • ☎ (001) 973 655 7797
ghoshs@montclair.edu
https://msuweb.montclair.edu/ ghoshs/profile/

Other activities

- Co-organized Banff International Research Station workshop titled "Detection and Analysis of Gravitational Waves in the era of Multi-Messenger Astronomy: From Mathematical Modelling to Machine Learning" at Oaxaca, Mexico Nov 14-19, 2021.

Public outreach

July 2022	Public lecture at Weston Science Scholars Series, "Astrophysics of the Extreme Universe"
March 2022	Public lecture at STAR Astronomy Club March Meeting, "Gravitational wave astronomy - Analysis of gravitational wave on supercomputers"
October 2021	Public lecture at Gurudas College, Kolkata, India, "The Extreme Universe"
July 2021	Public lecture at North Jersey Astronomical Group meeting, "Cosmology using gravitational waves"
April 2018	Public talk at UWM Planetarium - Astrobreak, "Mysteries of the Extreme Universe"
March 2018	Public talk at Anodyne Coffeshop for coffeeshop astrophysics, "Mysteries of the Extreme Universe"
2017-current	Member of coffeeshop astrophysics - Group of students and postdocs within the department of physics organizing public lectures on popular scientific discoveries.
July 2016	Reünistendag, Radboud University, Nijmegen, Public lecture, "The first direct detection of gravitational-waves"
May June 2016	Article in Bengali (three parts) about the discovery of gravitational waves by LIGO at http://bigyan.org.in: [first part], [second part], [third part].
July 2008	Sky watcher's association, Kolkata, India: Public lecture on Gravitational waves.

Academic institutes visited

August 2017	Caltech, Pasadena
Fall 2016	Inter University Center for Astronomy and Astrophysics (IUCAA), Pune, India.
Spring 2013	Inter University Center for Astronomy and Astrophysics (IUCAA), Pune, India.
Summer 2012	Inter University Center for Astronomy and Astrophysics (IUCAA), Pune, India.
Summer 2010	Albert Einstein Institute (AEI), Hanover, Germany.
Fall 2009	Albert Einstein Institute (AEI), Hanover, Germany.

Grants, awards, and other recognitions

2022	CSAM Faculty Student Summer Research Program grant - College of Science and Mathematics, Montclair State University: $5000
2021	National Science Foundation Standard Grant (3 years) - Division of Physics: $150K
2021	CSAM Faculty Student Summer Research Program grant - College of Science and Mathematics, Montclair State University: $9000
2020	National Science Foundation XSEDE Grant - Educational: 100K SUs, equivalent to $2000

Department of Physics and Astronomy, Montclair State University
Montclair, New Jersey, United States
(001) 920 757 3945 • ☎ (001) 973 655 7797
ghoshs@montclair.edu
https://msuweb.montclair.edu/ ghoshs/profile/

2017 Princess of Asturias Award as part of the LIGO Scientific Collaboration (LSC)

2017 HEAD Rossi Prize of the American Astronomical Society (as part of the LIGO discovery team)

2017 Group Achievement Award of the Royal Astronomical Society (as part of the LIGO group)

2016 Gruber Cosmology Prize (as part of the LIGO discovery team)

2016 Special Breakthrough Prize in Fundamental Physics (co-recipient as part of LIGO-Virgo Collaboration)

2013 Honorable mention in GWIC and Branccini Thesis prizes.

2009 College of science research assistantship in Washington State University

2007 Millennium Fellowship in Washington State University

Successful proposals

2016 Acceptance of LOFAR Cycle 6 observation proposal LC7_026 for EM follow-up of gravitational wave triggers from LIGO-Virgo's second observing run, titled "Low-frequency follow-up of transient triggers."

2016 Acceptance of LOFAR Cycle 6 observation proposal LC6_014 for EM follow-up of gravitational wave triggers from LIGO-Virgo's second observing run, titled "Low-frequency follow-up of transient triggers."

2015 Acceptance of LOFAR observation proposal LC5_023 titled "Electromagnetic follow-up of LIGO gravitational wave alerts: a pilot study with LOFAR."

Computational skills

Programming Languages:	C, PYTHON
Software Packages:	Matlab, LaTeX, Gnuplot
Operating Systems:	UNIX. Windows, Linux
Advanced Computing:	Message Passing Interface(MPI), PBS scripting, HTCondor for massively parallel tasks over large computing clusters, Bayesian Inference, Machine Learning, Big Data

Languages

English	**Fluent - full proficiency**
Bengali	**Mother tongue**
Hindi	**Medium working proficiency**

Department of Physics and Astronomy, Montclair State University
Montclair, New Jersey, United States
(001) 920 757 3945 • ☎ (001) 973 655 7797
ghoshs@montclair.edu
https://msuweb.montclair.edu/ ghoshs/profile/