Soumendra Kishore Roy

soumendrakisho.roy@stonybrook.edu SoumendraRoy

Designation

PhD Candidate
Department of Physics and Astronomy
Stony Brook University

Education

2021 - Present PhD Student in Physics, Stony Brook University, NY, USA

2018 - 2020 Master of Science in Physics, Presidency University, Kolkata, India

2015 - 2018 Bachelor of Science in Physics (Major), Presidency University, Kolkata, India

Research Positions

2021 - Present
Advisor: Prof. Will M. Farr
Stony Brook University and Center for Computational Astrophysics (CCA)
Research Assistant at Stony Brook and Guest Researcher at CCA

2020 - 2021
Advisor: Prof. Parthasarathi Majumdar
Indian Association for the Cultivation of Science, Kolkata, India
Research Intern

Research Interest

My research focuses on gravitational-wave astronomy, with particular interest in population and cosmological parameter inference. My core expertise lies in hierarchical Bayesian inference, which I apply to connect binary stellar evolution with the population of compact binary mergers to understand their origins.

List of Publications

Orcid id: 0000-0001-9295-5119

arXiv Link: arxiv.org/a/roy_s_11

1st/2nd Author Papers:

9. Spectral Siren Cosmology with a Weakly Evolving Black-Hole Mass Function (in prep); **Soumendra Kishore Roy**, Ignacio Magaña Hernandez, Will M. Farr; Expected Submission: Dec 31, 2025.
8. From Peak to Smooth: The Mass Distribution of the 35 Msun Feature in GWTC-4 (in prep); **Soumendra Kishore Roy**, Lieke van Son, Will M. Farr; Expected Submission: Dec 1, 2025.
7. A Mid-Thirties Crisis: Dissecting the Properties of Gravitational Wave Sources Near the 35 Solar Mass Peak; **Soumendra Kishore Roy**, Lieke van Son, Anarya Ray, Will M. Farr; Accepted for publication in the Classical and Quantum Gravity special issue "Gravitational Wave Physics and Astrophysics Ten Years After GW150914" (in press); URL: `http://iopscience.iop.org/article/10.1088/1361-6382/ae1921`; arXiv:2507.01086.
6. Cosmology with Binary Neutron Stars: Does the Redshift Evolution of the Mass Function Matter? **Soumendra Kishore Roy**, Lieke van Son, Anarya Ray, Will M. Farr; ApJL 985 L33 (2025); arXiv:2411.02494.
5. Not just winds: why models find binary black hole formation is metallicity dependent, while binary neutron star formation is not; Lieke van Son, **Soumendra Kishore Roy** et al.; ApJ 979 209 (2025); arXiv:2411.02484.

4. Effective General Relativistic Description of Jamming in Granular Matter; **Soumendra Kishore Roy**, Pratyusava Baral, Ratna Koley, Parthasarathi Majumdar; arXiv:2011.01194.

3. Probing the Post-Minkowskian Approximation using Recursive Addition of Self-Interactions; **Soumendra Kishore Roy**, Ratna Koley, Parthasarathi Majumdar; Phys. Rev. D 102, 084045 (2020); arXiv:2007.02887.

2. Prospects of Probing Dark Energy with eLISA: Standard versus Null Diagnostics; Pratyusava Baral, **Soumendra Kishore Roy**, Supratik Pal; MNRAS, 500, 2896 (2021); arXiv:2005.07231.

1. Kinematics of Two-Particle Scattering in Black Hole Backgrounds; **Soumendra Kishore Roy**, Ratna Koley, Parthasarathi Majumdar, Phys. Rev. D 100, 064052 (2019); arXiv:1905.09089.

Collaboration Papers with Significant Contributions:

3. GWTC-5.0: Population Properties of Merging Compact Binaries (in prep); The LVK Collaboration (including **Soumendra Kishore Roy**); Expected Submission: May 2025.

2. GWTC-4.0: Population Properties of Merging Compact Binaries; The LVK Collaboration (including **Soumendra Kishore Roy**); Submitted to ApJL; arXiv.org:2508.18083.

1. GWTC-4.0: Updating the Gravitational-Wave Transient Catalog with Observations from the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run; The LVK Collaboration (including **Soumendra Kishore Roy**); Submitted to ApJL; arXiv:2508.18082.

Selected Presentations

1. **GW Focused Session,** CITA, Canada — Talk (December 2025; Upcoming)
2. **Institute for Cosmic Ray Research,** Kashiwa, Japan — Talk (April 2025)
3. **Research Center for the Early Universe,** Tokyo, Japan — Talk (April 2025)
4. **Stellar black hole formation and detection,** YITP, Kyoto, Japan — Contributed Talk (March 2025)
5. **Princeton Astro-Coffee,** Princeton University, USA — Talk (November 2024)
6. **GWPAW 2024,** Birmingham, UK — Contributed Poster (May 2024)
7. **APS April Meeting 2024,** Sacramento, California, USA — Contributed Talk (April 2024)
8. **CosmoMingle 2024,** Indian Statistical Institute, Kolkata, India — Talk (Jan 2024)
9. **Indian Statistical Institute Colloquium,** Kolkata, India — Invited Talk (June 2023)
10. **Center for Computational Astrophysics,** New York, USA — GW Group Meeting Tutorial (November 2022)
11. **31st Meeting of Indian Association of General Relativity and Gravitation,** IIT Gandhinagar, India — Contributed Talk (Online, December 2020)
12. **Mathematical and Computational Approaches for Solving the Source- Free Einstein Field Equations,** ICERM, Brown University, USA — Contributed Lightning Talk (Online, October 2020)
13. **LISA Symposium XIII** — Pre-Recorded Contributed Talk (Online, September 2020)
14. **30th Meeting of Indian Association for General Relativity and Gravitation,** BITS Pilani Hyderabad, India — Contributed Poster (January 2019)

Selected Workshops

1. **LIGO-Virgo-KAGRA Collaboration Meeting,** Northwestern University, USA (March 2023)
2. **GW Open Data Workshop,** Center for Computational Astrophysics, NY, USA (May 2022)
3. **Gravitational Wave Astronomy,** International Center of Theoretical Studies, Bengaluru, India (July 2019)
4. **Advanced School on Gravitational Wave,** Presidency University, Kolkata, India (December 2016)

Awards and Fellowships

1. **Junior Research Fellow**, Department of Higher Education, Ministry of Human Resource Development, India, 2019 (Awarded to the top 0.5% Students out of 25,000 Examinees)
2. **ICTS S.N. Bhatt Memorial Excellence Fellowship 2018** (Awarded to the top 15 Students among $\sim$1000 Applicants)
3. **INSPIRE Fellow**, Department of Science and Technology, India, 2015, (awarded to the top 1% students out of 300,000 students at the higher secondary (+2) level, who are pursuing bachelors degrees in the sciences)

Teching Experiences

1. **Laboratory for Classical Physics**, PHY133, Teaching Assistant, Stony Brook University (Fall 2026)
2. **Astronomy**, AST203, Teaching Assistant, Stony Brook University (Spring 2025)
3. **Introduction to Planetary Sciences**, AST205, Teaching Assistant, Stony Brook University (Fall 2024)
4. **Laboratory for Classical Physics**, PHY133, Teaching Assistant, Stony Brook University (Summer 2023)
5. **Undergraduate Astronomy Lab**, AST112, Course Instructor, Stony Brook University (Spring 2022 & Spring 2023)
6. **Introduction to Solar System**, AST101 & AST105, Teaching Assistant, Stony Brook University (Fall 2021, Fall 2023 & Fall 2024)
7. Taught parts of several courses at the Master's level, including **the functional quantization of Φ^4 theory, the derivation of the FLRW metric using general relativity, inflation, and Gauss quadrature**, Presidency University, Kolkata, India

Academic Advising Experience

1. **Aritra Bakshi (Presidency University, Kolkata, India)** — Jan 2025 - Present
   Aritra is a third-year undergraduate student majoring in Physics. Aritra is working on understanding systematics in jointly estimating population, cosmological, and neutron star equation of state parameters from the detections of binary neutron star mergers using next-generation gravitational wave detectors.
2. **Dwaipayan Mukherjee (Presidency University, Kolkata, India)** — Jan 2025 - Present
   Dwaipayan is a third-year undergraduate student majoring in Physics. Dwaipayan is investigating the inconsistency in the neutron star-black hole mass gap between electromagnetic and gravitational-wave observations.

Computational Skills

- **'PYTHON'** — 7+ years experience
- **'JULIA'** — 1+ years experience
- **'MATHEMATICA'** — 2+ years experience
- **'FORTRAN'** — 2+ years experience

International collaborations

1. **Compact Object Mergers: Population Astrophysics and Statistics (COMPAS)** member since 2024
2. **LIGO** member since 2022 as part of the LIGO-Virgo-KAGRA Collaboration
3. **Cosmic Explorer Consortium** member since 2022

Scientific Outreach

1. **Invited Public Talk to School Students**, Jodhpur Park Boys School, Kolkata, India. Topic: Gravitational Waves (Online, September 2020)
2. **Invited Public Talk to College Students**, Presidency University, Kolkata, India. Topic: Gravitational Waves (Online, September 2020)
3. **One of the Founders and Co-organizers** of the Presidency Physics Academic Fest, Presision, which included the **First Undergraduate Symposium in India**

Selected Professional Services

1. **SOC Member**, Undergraduate Physics Symposium, Presision 2020 & Presision 2018 (September 2020 & August 2018)
2. **Volunteer**, Square Kilometer Array, Vigyan Samagam, The Mega Science Exhibition, Kolkata, India (December 2019)

References

1. **Prof. Will M. Farr**, Associate Professor, Stony Brook University, NY and Group Leader, Gravitational Wave Astronomy, Center for Computational Astrophysics, Flatiron Institute, NY, USA
   Connection: Ph.D. Advisor
   Email: will.farr@stonybrook.edu
2. **Prof. Lieke van Son**, Assistant Professor, Institute for Mathematics, Astrophysics and Particle Physics, Radboud University, Nijmegen, Netherlands
   Connection: Research Mentor
   Email: lieke.vanson@ru.nl
3. **Prof. Parthasarathi Majumdar**, Visiting Professor, School of Physical Sciences, Indian Association for the Cultivation of Science, Kolkata, India (Retired as Senior Professor of Ramakrishna Mission Vivekananda Educational and Research Institute, Belur, Howrah, India)
   Connection: Course Instructor, B.Sc. and M.Sc. Thesis Advisor
   Email: parthasarathi.majumdar@iacs.res.in
4. **Prof. Ratna Koley**, Assistant Professor, Presidency University, Kolkata, India
   Connection: Course Instructor, B.Sc. and M.Sc. Thesis Advisor
   Email: ratna.physics@presiuniv.ac.in
5. **Prof. Supratik Pal**, Professor and Head, Indian Statistical Institute, Kolkata, India
   Connection: Research Mentor
   Email: supratik@isical.ac.in