SHARAN BANAGIRI

POSTDOCTORAL ASSOCIATE, CIERA

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Citizenship	India

Research Interests

Astrophysics and cosmology with gravitational waves

Astrophysics of compact objects

Application of statistical methods, especially Bayesian methods, to astrophysical data

Education

University of Minnesota, Minneapolis, Minnesota, USA

Ph.D., Physics, 2014 – 2021
Dissertation: *Gravitational Waves as Tools for Astrophysics and Cosmology*
Advisor: Prof. Vuk Mandic

Indian Institute of Technology, Hyderabad, Telangana, India

B.Tech, Mechanical engineering with a minor in physics, 2009 – 2013

Honors and Awards

Aneesur Rahman Award, University of Minnesota, 2020
A School of Physics and Astronomy award to advanced graduate students with outstanding research contributions

Doctoral Dissertation Fellowship, University of Minnesota, 2019 - 2020
A pan university annual fellowship given to the most accomplished Ph.D. candidates to support their dissertation research

Hoff Lu Fellowship, University of Minnesota, 2018
A School of Physics and Astronomy fellowship to promising graduate students to support a summer of research

Academic Experience

CIERA, Northwestern University, Evanston, Illinois USA

Postdoctoral Associate **July 2021 - present**
Mentor: Prof. Vicky Kalogera

University of Minnesota, Minneapolis, Minnesota USA

Graduate researcher **July 2016 - 2021**
Advisor: Prof. Vuk Mandic

Primary Publications

I list the papers below to which I made key contributions. Papers marked with † have a student I mentored as the first author.

Relating Core-Collapse Supernova Asymmetry and Natal Kicks
Banagiri, S., Kalogera, V.
(To be Submitted)

Constraining the Orbital Parameters of Double Neutron Stars through Observations of Short Gamma-ray Bursts and Core-Collapse Supernova
Banagiri, S., Nugent, A., Kalogera, V.
(To be Submitted)

† **Forecasting the Stochastic Gravitational-Wave Background from Compact Binaries Observable by Next-Generation Gravitational-Wave Detectors**
Bellie, D., *Banagiri, S.*, Doctor, Z., Kalogera, V.
(To be Submitted)

A Unified p_{astro} for Gravitational Waves: Consistently Combining Information from Multiple Search Pipelines
Banagiri, S., Berry, C. P. L., Cabourn Davies, G. S., Tsukada, L., and Doctor, Z.
arXiv.2305.00071 (Submitted to Physical Review D)

Direct Statistical Constraints on the Natal Kick Velocity of a Black Hole in an X-ray Quiet Binary *Banagiri, S.*, Doctor, Z., Kalogera, V., Kimball, C., and Andrews, J. J.
arXiv.2211.16361 (Submitted to the Astr. Phys. J)

Data quality up to the third observing run of advanced LIGO: Gravity Spy glitch classifications
Glanzer, J., *Banagiri, S.* et al
Classical and Quantum Gravity, vol. 40, no. 6, 2023

Mapping the gravitational-wave sky with LISA: a Bayesian spherical harmonic approach
Banagiri, S., Criswell, A., Kuan, T., Mandic, V., Romano, J. D., and Taylor, S. R.
Monthly Notices of the Royal Astronomical Society, vol. 507, no. 4, pp. 5451–5462, 2021

Searching for cross-correlation between stochastic gravitational-wave background and galaxy number counts
Yang, K. Z., Mandic, V., Scarlata, C., and *Banagiri, S.*
Monthly Notices of the Royal Astronomical Society, vol. 500, no. 2, pp. 1666–1672, 2021.

Searching for anisotropy in the distribution of binary black hole mergers
Payne, E., *Banagiri, S.*, Lasky, P. D., and Thrane, E.
Physical Review D, vol. 102, no. 10, 2020

Measuring angular N -point correlations of binary black hole merger gravitational-wave events with hierarchical Bayesian inference
Banagiri, S., Mandic, V., Scarlata, C., and Yang, K. Z.
Physical Review D, vol. 102, no. 6, 2020

Constraining the gravitational-wave afterglow from a binary neutron star coalescence
Banagiri, S., Coughlin, M.W, et al
Monthly Notices of the Royal Astronomical Society, vol. 492, no. 4, pp. 4945–4951, 2020

Search strategies for long gravitational-wave transients: Hidden Markov model tracking and seedless clustering
Banagiri, S., Sun, L., Coughlin, M. W., and Melatos, A.
Physical Review D, vol. 100, no. 2, 2019

Search for Gravitational Waves from a Long-lived Remnant of the Binary Neutron Star Merger GW170817
Abbott, B. P., ..., *Banagiri, S.*, et al
The Astrophysical Journal, vol. 875, no. 2, 2019

Multiwavelength observations of cosmological phase transitions using LISA and Cosmic Explorer Fitz Axen, M., *Banagiri, S.*., Matas, A., Caprini, C., and Mandic, V.
Physical Review D, vol. 98, no. 10, 2018

Contributed Publications

In addition to the key papers above, I list below papers to which I made important contributions.

Measurement of the Cross-Correlation Angular Power Spectrum Between the Stochastic Gravitational Wave Background and Galaxy Over-Density
Yang, K. Z., Suresh, J., Cusin, G., *Banagiri, S.*, et al
arXiv.2304.07621 (Submitted to Physical Review D)

pygwb: Python-based library for gravitational-wave background searches
Renzini, A. I., ..., *Banagiri, S.*, et al
arXiv.2303.15696 (accepted at The Astrophysical Journal)

Correlated 1-1000 Hz magnetic field fluctuations from lightning over Earth-scale distances and their impact on gravitational wave searches
Janssens, K., ..., *Banagiri, S.*, et al
Physical Review D, vol. 107, no. 2, 2023

Search for gravitational-wave transients associated with magnetar bursts in Advanced LIGO and Advanced Virgo data from the third observing run
Abbott, R., ..., *Banagiri, S.*, et al
arXiv.2210.10931 (Submitted to Physical Review D)

Jetted and Turbulent Stellar Deaths: New LVK-Detectable Gravitational Wave Sources
Gottlieb, O., ..., *Banagiri, S.*, et al
arXiv.2209.09256 (accepted at The Astrophysical Journal Letters)

Searches for Continuous Gravitational Waves from Young Supernova Remnants in the Early Third Observing Run of Advanced LIGO and Virgo
Abbott, R., ..., *Banagiri, S.*, et al
The Astrophysical Journal, vol. 921, no. 1, 2021

Upper limits on the isotropic gravitational-wave background from Advanced LIGO and Advanced Virgo's third observing run
Abbott, R., ..., *Banagiri, S.*, et al
Physical Review D, vol. 104, no. 2, 2021

Environmental noise in advanced LIGO detectors
Nguyen, P., ..., *Banagiri, S.*, et al
Classical and Quantum Gravity, vol. 38, no. 14, 2021

Search for the isotropic stochastic background using data from Advanced LIGO's second observing run
Abbott, B. P., ..., *Banagiri, S.*, et al
Physical Review D, vol. 100, no. 6, 2019

Search for Transient Gravitational-wave Signals Associated with Magnetar Bursts during Advanced LIGO's Second Observing Run Abbott, B. P., ..., *Banagiri, S.*, et al
The Astrophysical Journal¡/i¿, vol. 874, no. 2, 2019

I am a co-author on 130 papers in total. As a member of the LIGO scientific collaboration, I have been a coauthor on all LIGO-VIRGO-KAGRA papers since 2017. A complete list of my publications can be found on INSPIRE-HEP or on the ADS service.

Conference Presentations and talks

(selected)

Accessing the astrophysical significance of gravitational-wave triggers
April 2023, American Physical Society April meeting, Minneapolis

A Unified $p_{\rm astro}$ for Gravitational Waves
December 2022, Gravitational Wave Physics and Astronomy Workshop, Melbourne (invited talk)

Mapping the gravitational-wave background with the LISA space mission using a spherical harmonic basis
July 2021, Amaldi 14 (remote)

Mapping the gravitational-wave sky with the LISA space mission
December 2020, Cosmology Seminar, University of Minnesota

Astrophysics and cosmology with gravitational waves
November 2020, LIGO Seminar at Caltech (remote) (invited)

A Bayesian analysis for the anisotropies in the stochastic gravitational-wave background with LISA
September 2020, LISA Symposium (remote)

Measuring angular correlations in the ensemble of binary black-hole mergers
December 2019, Texas Symposium on Relativistic Astrophysics, Portsmouth UK (invited)

Measuring anisotropies of sub-threshold binary black-hole mergers
October 2019, Cosmology Seminar, University of Minnesota

Gravitational-wave searches for post-merger remnants following GW170817
June 2019, IGC@25: Multi-messenger Universe, Penn State

Gravitational-wave searches for post-merger remnants of GW170817
2018, Cosmology Seminar, University of Minnesota

LVC searches for long-lived post-merger remnant of GW1708017
October 2018, Midwest Relativity Conference, WI

Gravitational-wave searches for long-lived post-merger remnants from GW1708017
September 2018, LIGO-Virgo Collaboration Meeting

service

Reviewer for The Astrophysical Journal, Physical Review D, and Physical Review X

Local organizing committee member for the LIGO-Virgo-KAGRA March 2023 meeting

Internal reviewer for the Burst, Stochastic, and Compact Binary groups within the LIGO-VIRGO-KAGRA collaboration

Internal P&P reviewer for six short-author papers in the LIGO Scientific Collaboration

CIERA Connections Seminar committee member, Northwestern University *(2022 – present)*

School of Physics and Astronomy Colloquium Committee Member, University of Minnesota *(2016 – 2017)*

TEACHING & MENTORSHIP

Guangyi Zhang, REU student, (2023)
Project: Developing a non-parametric model to fit the double white dwarf foreground with LISA

Jennifer Sanchez, Graduate Student (2022 - Present)
Project: Gravityspy

Darsan S Bellie, Undergraduate Student (2021 - Present)
Project: Estimating the stochastic gravitational-wave background for next-generation gravitational-wave detectors

Alexander Criswell, Graduate Student (2019 - 2021)
Project: Mapping the gravitational sky with LISA and developing the BLIP pipeline

Tommy Kaun, Undergraduate student (2020 - 2021)
Project: Developing the BLIP pipeline

Teaching Assistant for Ast 5731, Astrostatistics for graduate students (2020)

Teaching Assistant for Phy 2601, introductory quantum mechanics for undergraduates (2018)

Teaching assistant for various introductory undergraduate physics courses (2014 - 2018)

OUTREACH

(selected)

Chicago Astronomy on Tap, May 2023

Northwestern Astronomer Evening, January and May 2023

Invited guest lecture at UIC, March 2023

Invited guest lecture at UIC, April 2022

Amateur Astronomers Association of New York invited lecture, October 2021

Scientific guide for two LIGO Hanford public tours, July 2019

PROFESSIONAL MEMBERSHIP

LIGO Scientific Collaboration, American Physical Society, American Astronomical Society, LISA Consortium

COMPUTER SKILLS

Python, MATLAB, Mathematica, Shell Scripting, C/C++, HTCondor, LaTeX, Git, Linux, vim, emacs, Slurm and HTCondor for high-performance computing.