Nikhil Sarin

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Education

Monash University
Ph.D., Astrophysics, Feb 2018-July 2021
Thesis: "The observational implications of neutron star post-merger remnants" supervised by Assoc Prof. Paul Lasky and Dr. Greg Ashton.
Fields: neutron star mergers, gamma-ray bursts, gravitational waves

Honours (1^{st} class), Astrophysics, 2017.
Thesis: "Gamma-ray burst afterglows and gravitational waves" supervised by Dr. Paul Lasky and Dr. Letizia Sammut.

BSc, Major in Astrophysics and Geology, 2014-2016.

Academic experience

Monash University
Postdoctoral Fellow, School of Physics and Astronomy, July 2021-November 2021

Nordita Institute
Nordita Fellow, Nordita Institute, November 2021- Current

Awards and Fellowships

Research Training Scheme, Australian Postgraduate Award
PhD Scholarship, Australian Research Council, 2018-2021

MoCA prize
Best Honours student in Astrophysics, Monash University, 2017

J.L Williams Honours Scholarship
Honours scholarship, 2017

Monash Science future leaders
Science future leaders program (Emerald Tier), 2015

Teaching and Supervision

School of Physics & Astronomy, Monash University
Teaching Associate, 2017-2021.
Teagan Clarke - Undergraduate research project on fast radio bursts, 2019
Nico Keeghan - Undergraduate research project on millisecond pulsars, 2021

Languages and Skills

English, Hindi
Python, LaTeX, Git, Bash, Fortran, Mathematica, HTML, Stan

Publications

Listed below are only publications for which I have made significant contributions. I am an author on numerous other publications as a member of the LIGO Scientific Collaboration.

Submitted

14. **Sarin**, & Lasky. (2021), *Multimessenger astronomy with a kHz-band gravitational-wave observatory.* Submitted to PASA.

13. **Sarin**, Hamburg, Burns et al. (2021), *Low-efficiency long gamma-ray bursts: A case study with AT2020blt.* Submitted to MNRAS.

12. **Sarin**, Ashton, Lasky et al. (2021), *CDF-S XT1: The off-axis afterglow of a neutron star merger at* $z = 2.23$. Submitted to ApJL.

Refereed

11. Strang, Melatos, **Sarin** & Lasky (2021), *Exploring properties of neutron stars born in short gamma-ray bursts with a plerion-like X-ray plateau.* MNRAS, 507:2

10. **Sarin** & Lasky (2021), *The evolution of binary neutron star post-merger remnants: a review.* General Relativity and Gravitation 53:59. **Invited review.**

9. **Sarin**, Lasky & Ashton (2020), *Interpreting the X-ray afterglows of gamma-ray bursts with radiative losses and millisecond magnetars.* MNRAS, 499:4

8. Ackley et al. (2020), *Neutron Star Extreme Matter Observatory: A kilohertz-band gravitational-wave detector in the global network.* PASA 37:e047
   My contribution: As a member of OzGrav, the Australian Research Council Centre of Excellence for gravitational-wave discovery, I have been involved in developing the science case for a dedicated high-frequency gravitational-wave detector. In particular, focusing on the ability of such a detector to unequivocally identify the fate of a binary neutron star merger.

7. Romero-Shaw et al. (2020), *Bayesian inference for compact binary coalescences with BILBY: Validation and application to the first LIGO–Virgo gravitational-wave transient catalogue.* MNRAS, 499:3
   My contribution: As one of the developers for the Bilby package, I was involved in the review of core features in preparation for Bilby to become the standard inference software for the LIGO Scientific Collaboration.

6. **Sarin**, Lasky & Ashton (2020), *Gravitational waves or deconfined quarks: What causes the premature collapse of neutron stars born in short gamma-ray bursts?*, Physical Review D, 101:063021

5. **Sarin**, Lasky & Ashton (2019), *X-ray afterglows of short gamma-ray bursts: Magnetar or Fireball?*, ApJ, 872:114

4. Ashton, Hübner, Talbot, Lasky et al. (2019), *Bilby: A user-friendly Bayesian inference library for gravitational-wave astronomy*, ApJS 241:2
   My contribution: As one of the developers for the Bilby package, my key contributions have been to implement Monte-Carlo Gaussian noise realisations, the reduced-order quadrature likelihood for compact binary coalescence's, and unit tests.

3. **The LIGO-Virgo Scientific Collaboration**, Abbott et al. (2019), *Search for Gravitational Waves from a Long-lived Remnant of the Binary Neutron Star Merger GW170817.* ApJ, 875:2
My contribution: I was on the paper writing team, contributing significantly to the writing of the introduction and waveform sections. I contributed to the astrophysical interpretation of the results, and calculated detection thresholds for similar signals with third-generation detectors.

2. **Sarin**, Lasky, Sammut & Ashton (2018), *X-ray guided gravitational-wave search for binary neutron star merger remnants*, Physical Review D, 98:043011.

1. **The LIGO-Virgo Scientific Collaboration**, Abbott et al. (2017), *Search for post-merger gravitational waves from the remnant of the binary neutron star merger GW170817* ApJL, 851, L16.
My contribution: I helped develop the waveform models that were used to set the upper-limit on potential gravitational-wave emission.

Conference Proceedings

2. **Sarin**, Lasky & Ashton (2020), *The premature collapse of neutron stars born in short gamma-ray bursts.* Conference Proceedings of the Yokohama Yamada conference.

1. Lasky, P., **Sarin** & Ashton (2019), *Neutron Star Merger Remnants: Braking Indices, Gravitational Waves, and the Equation Of State.* Conference Proceedings of the Xiamen-CUSTIPEN Workshop

Service

I have served as a referee for The Astrophysical Journal, The Astrophysical Journal Letters and as an internal peer-reviewer in the LIGO Scientific Collaboration.

Conferences and Talks

Amaldi Conference, 2021 Virtual conference. June 2021

Caltech, Pasadena, USA. Virtual seminar. November 2020 (**Invited**)

Flatiron Institute, New York, USA. Virtual seminar. August 2020

University of California, Berkeley, USA. Virtual seminar. August 2020

Gran Sasso Institute, L'Aquila, Italy. Virtual seminar. July 2020

Swinburne University, Melbourne, Australia. Virtual seminar. July 2020

University of Bath, Bath, U.K. Virtual seminar. July 2020

University of Leicester, Leicester, U.K. Virtual seminar. July 2020 (**Invited**)

University College London, London, U.K. Virtual seminar. July 2020

University of Coimbra, Coimbra, Portugal. Virtual seminar. June 2020 (**Invited**)

Perimeter Institute, Waterloo, Canada. Virtual seminar. June 2020

Oskar Klein Centre, Stockholm, Sweden. Virtual seminar. June 2020

University of Melbourne, Melbourne, Australia. Virtual seminar. June 2020

University of Western Australia, Perth, Australia. Virtual seminar. June 2020 (**Invited**)

Yokohama Yamada conference, November 2019. Gamma-ray bursts in the gravitational-wave era in Yokohama, Japan.

YITP, long-term workshop, September-October 2019. Multi-messenger astrophysics in the gravitational-wave era. long-term workshop in Kyoto, Japan.

LIGO PE F2F, February 2019. LIGO parameter estimation group meeting to develop LIGO parameter-estimation infrastructure.
ANITA meeting, February 2019. Annual Australian National Institute for Theoretical Astrophysics (ANITA) meeting at Swinburne University.

OzGrav retreat, December 2018. Australian research council centre for excellence for gravitational-wave research (OzGrav) annual retreat at Novotel Vines resort, Perth.

ASA meeting, July 2018. Annual Astronomical Society of Australia meeting at Swinburne University.
ANITA meeting, February 2018. ANITA meeting at University of Western Australia.