

Gayathri V

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PERSONAL INFORMATION

Name: **Gayathri Vivekananthaswamy**

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WORK EXPERIENCE

2022 – present **Postdoctoral Fellow**

University of Wisconsin, Milwaukee

- Group lead by Prof. Jolien Creighton and Prof. Patrick Brady

2020 – 2022 **Postdoctoral Fellow**

University of Florida, Florida

- Group lead by Prof. Imre Bartos

EDUCATION

2014 – 2019 **Ph.D in Physics**

Indian Institute of Technology Bombay, India.

- Supervisor: Prof. Archana Pai

2011 - 2013 **M.Sc in Physics**

Mahatma Gandhi University, Kottayam, India.

2008 – 2011 **B.Sc in Physics**

Government College Chitture, Palakkad, India.

- University of Calicut

RESEARCH INTERESTS

Broad interests Gravitational wave astronomy.

- Specific Interests**
- Detection algorithms of gravitational wave transients with interferometric detectors.
 - Search for intermediate-mass black hole binaries and eccentric binary black hole mergers from Advanced LIGO and Advanced Virgo observation data.
 - Enhancing gravitational waves science with machine learning.
 - Noise Veto Techniques

EXPERTISE

- Coherent Wave burst: the coherent network algorithm for detection and reconstruction of gravitational wave bursts. I have an in depth knowledge on this algorithm; equipped with six-year of experience with focus on the simulation, noise background, and sensitive distance reach study
- Wavegraph : Extension of coherent Wave Burst to chirp-like signals.
- Q-transform : Multi-resolution time-frequency GW transient search for excess power. I have experience in injection study with the Q-transform algorithm.
- LALinference: LAL routines for Bayesian inference data analysis
- PyCBC: Python based the compact binary coalescence software. Used for detection of gravitational wave from compact binary coalescence from noisy detector data and inference analysis.
- RIFT: an algorithm to perform Rapid parameter Inference on gravitational wave sources via Iterative Fitting.

INVITED TALKS

- Oral presentation at the Miami 2022, Gravitational wave source populations: Disentangling an AGN component on 14-20 December 2022.
- Oral presentation at the XXXIst General Assembly International Astronomical Union on Aug 2 - 11, 2022, South Korea.
- The heaviest black holes of LIGO-Virgo-GW190521, on 21th April 2022 in Indian Institute Of Technology Madras.
- Intermediate mass black hole binary: GW190521, 24th April, 2022 in Chennai Mathematical Institute.
- Who ordered LIGO's most massive black hole?, 9th May 2022 in Raman Research Institute
- The heaviest black holes of LIGO-Virgo-GW190521, 13th May 2022 in Indian Institute Of Technology Palakkad.
- Who ordered LIGO's most massive black hole?, 8th May 2022, Indian Institute Of Technology Bombay
- The heaviest black holes of LIGO-Virgo, Miami 2021 conference, Dec 16, 2021.
- Who ordered LIGO's most massive black hole?, Nov 10, 2021, Physics department, Columbia University.
- Phantom of the Universe: The Hunt for Dark Matter, Oct 30, 2021, Santa Fe College, Gainesville, FL.
- Gravitational wave astronomy, Nov 26,2020, Physics department, Bharata Mata College, Kerala.
- Gravitational Astronomy- LIGO-India Outreach Week - Vigyan Samagam, Nehru Science Centre - 27th May to 2nd Jun 2019.

CONFERENCE PRESENTATION

- Poster presentation in AAS meeting Jan 2023, Gravitational wave source populations: Disentangling an AGN component.
- Oral presentation at the APS meeting (April 2021), GW190521 as a Highly Eccentric Black Hole Merger.
- Oral presentation at the APS meeting (April 2021), The Heaviest Black Holes of LIGO/Virgo.
- Poster presentation at the HOPE Meeting with Nobel Laureates at Tokyo, Japan (March 2018), "Waveletbased search of coalescing compact binaries with GW detectors".
- Oral presentation at the Astronomical Society of India Meeting, Jaipur(March 2017), "Waveletbased search of coalescing compact binaries with GW detectors".
- Oral presentation at the IAGRG conference at IIT Guwahati, Assam , India (May 2017), "A new wavelet-based clustering algorithm for compact binaries search in GW window."
- Oral presentation at the Era of Gravitational-Wave Astronomy (TEGrAW), Paris, (June 2017), "Wavelet-based search of coalescing compact binaries with GW detectors".
- Poster presentation at the ICGC conference at IISER Mohali, India (December 2015), "Wavegraph – extending coherent WaveBurst sensitivity to compact binary coalescence chirps".

SHORT AUTHOR PUBLICATIONS

26. **V. Gayathri**, I. Bartos, S. Rosswog, M. C. Miller, D. Veske, W. Lu, S. Marka, Do gravitational wave observations in the lower mass gap favor a hierarchical triple origin?, arXiv:2307.09097, 2023.
25. Marek J. Szczepańczyk, Yanyan Zheng,..., **V. Gayathri**,... et al. An Optically Targeted Search for Gravitational Waves emitted by Core-Collapse Supernovae during the Third Observing Run of Advanced LIGO and Advanced Virgo, arXiv:2305.16146, 2023.

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24. I. Bartos, S. Rosswog, **V. Gayathri**, M. C. Miller, D. Veske, S. Marka, "Hierarchical Triples as Early Sources of r-process Elements, 2023,arXiv:2302.10350.
 23. **V. Gayathri**, Daniel Wysocki, Y. Yang, I. Bartos, and R. O'Shaughnessy, "Gravitational wave source populations: Disentangling an AGN component", 2023, ApJL 945 L29.
 22. Marek J Szczepańczyk, Francesco Salemi, Sophie Bini, Tanmaya Mishra, Gabriele Vedovato, **V. Gayathri**, Imre Bartos, Shubhagata Bhaumik, Marco Drago, Odysse Halim, Claudia Lazzaro, Andrea Miani, Edoardo Milotti, Giovanni A. Prodi, Shubhanshu Tiwari, Sergey Klimentko "All-sky search for gravitational-wave bursts in the third Advanced LIGO-Virgo run with coherent WaveBurst enhanced by Machine Learning", Phys. Rev. D 107, 062002, 2023.
 21. H. L. Iglesias, J. Lange, I. Bartos, S. Bhaumik, R. Gamba, **V. Gayathri**, A. Jan, R. Nowicki, R. O'Shaughnessy, D. Shoemaker, R. Venkataramanan, and K. Wagner, "Reassessing candidate eccentric binary black holes: Results with a model including higher-order modes", arXiv:2208.01766, 2022.
 20. Dixeena Lopez, **V. Gayathri**, Archana Pai, Ik Siong Heng, Chris Messenger, and Sagar Kumar Gupta, "Application of Gaussian mixture modeling in all-sky short duration gravitational-wave burst search", Phys. Rev. D 105, 063024, 2022.
 19. T. Mishra, B. O'Brien, M. Szczepańczyk, G. Vedovato, S. Bhaumik, **V. Gayathri**, G. Prodi, F. Salemi, E. Milotti, I. Bartos and S. Klimentko, "Search for binary black hole mergers in the third observing run of Advanced LIGO-Virgo using coherent WaveBurst enhanced with Machine Learning", Phys. Rev. D 105, 083018, 2022.
 18. **V. Gayathri**, J. Healy, J. Lange, B. O'Brien, M. Szczepańczyk, I. Bartos, M. Campanelli, S. Klimentko, C. Lousto, R. O'Shaughnessy, "GW190521 as a Highly Eccentric Black Hole Merger", Nature Astronomy, arXiv:2009.05461 (2021).
 17. O'Brien, Brendan, Szczepańczyk, Marek, **V. Gayathri**, I. Bartos, G. Vedovato, G. Prodi, G. Mitselmakher, and S. Klimentko, "Detection of LIGO-Virgo binary black holes in the pair-instability mass gap", Phys. Rev. D 104, 082003 (2021).
 16. Tanmaya Mishra, Brendan O'Brien, **V. Gayathri**, M. Szczepańczyk, S. Bhaumik, I. Bartos, and S. Klimentko, "Optimization of model independent gravitational wave search using machine learning", Phys. Rev. D 104, 023014 (2021)
 15. M. Saleem, Javed Rana, **V. Gayathri**, Aditya Vijaykumar, Srashti Goyal, Surabhi Sachdev, Jishnu Suresh, S. Sudhagar, Arunava Mukherjee, Gurudatt Gaur, Bangalore Sathyaprakash, Archana Pai, Rana X Adhikari, P. Ajith, Sukanta Bose, "The Science Case for LIGO-India", Class. Quantum Grav. 39 025004 (2022).
 14. **V. Gayathri**, Y. Yang, H. Tagawa, Z. Haiman, and I. Bartos, "Black hole mergers of AGN origin in LIGO/Virgo's O1-O3a observing periods", The Astrophysical Journal Letters, 920 L42 (2021).
 13. MMarek Szczepańczyk, Sergey Klimentko, Brendan O'Brien, Imre Bartos, **V. Gayathri**, Guenakh Mitselmakher, Giovanni Prodi, Gabriele Vedovato, Claudia Lazzaro, Edoardo Milotti, Francesco Salemi, Marco Drago, and Shubhanshu Tiwari, "Observing an intermediate mass black hole GW190521 with minimal assumptions", Phys. Rev. D 103, 082002
 12. **V. Gayathri**, J. Healy, J. Lange, B. O'Brien, M. Szczepańczyk, I. Bartos, M. Campanelli, S. Klimentko, C. O. Lousto, and R. O'Shaughnessy, "Measuring the Hubble Constant with GW190521 as an Eccentric black hole Merger and Its Potential Electromagnetic Counterpart", The Astrophysical Journal Letters, 908 L34 (2021).
 11. Y. Yang, **V. Gayathri**, S. Marka, Z. Marka, and I. Bartos, "Determining the Hubble Constant with Black Hole Mergers in Active Galactic Nuclei", arXiv:2009.13739 (2020).
 10. **V. Gayathri**, Dixeena Lopez, Pranjal R.S., Ik Siong Heng, Archana Pai, and Chris Messenger, "Enhancing the sensitivity of transient gravitational wave searches with Gaussian Mixture Models", Phys. Rev. D 102, 104023(2020).
 9. Y. Yang, **V. Gayathri**, I. Bartos, Z. Haiman, M. Safarzadeh, and H. Tagawa, "Black Hole Formation in the Lower Mass Gap through Mergers and Accretion in AGN Disks", The Astrophysical Journal Letters, 901 L34 (2020).
 8. Nirban Bose, Archana Pai, Koustav Chandra, and **V. Gayathri**, "Chirp mass based glitch identification in long duration gravitational wave transients", Phys. Rev. D 102, 084034 (2020).

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7. M. Drago, **V.Gayathri**, S. Klimentko, C. Lazzaro, E. Milotti, G. Mitselmakher, V. Necula, B. O'Brian, G. A. Prodi, F. Salemi, M. Szczepanczyk, S. Tiwari, V. Tiwari, G. Vedovato, I. Yakushin, "Coherent WaveBurst, a pipeline for unmodeled gravitational-wave data analysis", arXiv:2006.12604 (2020).
 6. Koustav Chandra, **V.Gayathri**, Juan Calderón Bustillo, and Archana Pai, "NuRIA: Numerical Relativity Injection Analysis of spinning binary black hole signals in Advanced LIGO data", Phys. Rev. D 102, 044035,(2020)
 5. **V.Gayathri**, I. Bartos, Z. Haiman, S. Klimentko, B. Kocsis, S. Márka, and Y. Yang, "GW170817A as a Hierarchical Black Hole Merger", The Astrophysical Journal Letters, 890 L20 (2020).
 4. Y. Yang, I. Bartos, **V.Gayathri**, K. E. S. Ford, Z. Haiman, S. Klimentko, B. Kocsis, S. Márka, Z. Márka, B. McKernan, and R. O'Shaughnessy, "Hierarchical Black Hole Mergers in Active Galactic Nuclei", Phys. Rev. Lett. 123, 181101 (2019).
 3. **V.Gayathri**, P. Bacon, A. Pai, E. Chassande-Mottin, F. Salemi, and G. Vedovato, "Astrophysical signal consistency test adapted for gravitational-wave transient searches", Phys. Rev. D 100, 124022, 2019.
 2. P. Bacon, **V. Gayathri**, E. Chassande-Mottin, A. Pai, F. Salemi, and G. Vedovato, "Driving unmodeled gravitational-wave transient searches using astrophysical information", Phys. Rev. D 98, 024028, 2018.
 1. Chassande-Mottin,E, Eric Lebigot, Hugo Magaldi, Eve Chase, Archana Pai, **V. Gayathri**, Gabriele Vedovato. , "Wavelet graphs for the direct detection of gravitational waves", 25e Colloque GRETSI,2015

**MAJOR CONTRIBUTED
COLLABORATION
PUBLICATIONS**

9. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., "Search for Eccentric Black Hole Coalescences during the Third Observing Run of LIGO and Virgo", arXiv:2308.03822, 2023.
8. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., "Search for Eccentric Black Hole Coalescences during the Third Observing Run of LIGO and Virgo", arxiv:2308.03822.
7. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., "GWTC-3: Compact Binary Coalescences Observed by LIGO and Virgo During the Second Part of the Third Observing Run", arxiv:2111.03606.
6. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., Search for intermediate mass black hole binaries in the third observing run of Advanced LIGO and Advanced Virgo, arxiv:2105.15120, 2021.
5. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., Properties and Astrophysical Implications of the 150 M_{\odot} Binary Black Hole Merger GW190521, The Astrophysical Journal Letters, 900 (2020)
4. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., GW190521: A Binary Black Hole Merger with a Total Mass of 150 M_{\odot} , Phys.Rev.Lett. 125 (2020) 10, 101102
3. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., Search for intermediate mass black hole binaries in the first and second observing runs of the Advanced LIGO and Virgo network, Physical Review D 100, 064064 (2019).
2. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., "Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO" , Physical review D 96, 022001 (2017).
1. The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration: R. Abbott,... **V.Gayathri**,... et al., "Gravitational waves and gamma-rays from a binary neutron star merger: GW170817 and GRB 170817A" , The Astrophysical Journal Letters, 848(2), L13 (2017)

OUTREACH ACTIVITY

- LIGO-India Outreach Week - Vigyan Samagam, Nehru Science Centre - 27th May to 2nd Jun 2019
- LIGO-India Outreach at Techfest 2019, IIT Bombay.
- LIGO-India Outreach at Techfest 2018, IIT Bombay.
- LIGO-India Outreach at Techfest 2017, IIT Bombay.

WORKSHOPS MEETINGS, SCHOOLS AND VISITS

- GW@ASI2014: Satellite workshop on Gravitational Wave Astronomy at the ASI Meeting, IISER Mohali during 20-22 March 2014.
- ICTS Summer School on Gravitational-Wave Astronomy at ICTS Bangalore from 29 June 2015 to 10 July 2015 and 25 July 2016 to 05 August 2016.
- Time Series Analysis for Synoptic Surveys and Gravitational Wave Astronomy at the ICTSTIFR, Bangalore during March 20-23, 2017.
- Visit to Astro Particule et Cosmologie, CNRS - Universite Paris Denis Diderot, Paris for collaboration work on Wavegraph from 04th September to 31st October 2015, 01st November to 30th November 2016 and June 2017.

AWARDS AND ACHIEVEMENTS

- University first rank holder in M.Sc physics 2013.
- Department of Science Technology Inspire fellow from 2014.
- The Japan Society for the Promotion of Science: HOPE fellow at 2018.

MEMBERSHIPS IN PROFESSIONAL COLLABORATION

- Indian initiative on gravitational wave observatory (IndIGO) from 2014-2019.
- LIGO Scientific Collaboration (LSC), 2014 on-wards.

LIGO-VIRGO CONTRIBUTION

- Active member in LIGO-Virgo Collaboration Burst group (from 2014) and IMBHB-CBC-Burst working group in LVC (from 2017)
- O1-O2 all-sky IMBHB collaboration paper: Lead analyst from Burst side and lead member in the paper writing team.
- O3 all-sky IMBHB collaboration paper: paper manager, paper writing team member and the analyst from Burst side.
- Part of GW190521 discovery,
- Burst-BBH group chair
- Developer for the coherent WaveBurst search algorithm.

UNDERGRADUATE TEACHING EXPERIENCE

- Mechanics, Mathematical tools and hands-on with MATLAB, Mathematical tools and hands-on with Mathematica, Thermal and Statistical Physics: Teaching assistant (BS-MS) IISER-TVM 2014-2017
- Electronics Teaching assistant (B.Tech) IIT Bombay 2018

RESEARCH GUIDING

- Machine learning coherent WaveBurst: Dixeena Lopez(Master student) , IISER-TVM.
- Eccentric black hole binary search: Shubhagata Bhaumik(PhD student), UF.

LIST OF RECOMMENDER'S

- Prof. Jolien Creighton,
Professor, CGCA, Physics Department,
University Wisconsin Milwaukee, U.S.A,
E-mail: jolien@uwm.edu,
Phone: +1 (414) 229 4960.
- Prof. Patrick Brady,
Distinguished Professor, CGCA, Physics Department,
University Wisconsin Milwaukee, U.S.A,
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Professor, Department of Physics,
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Associate Professor, School of Mathematical Sciences,
Rochester Institute of Technology, U.S.A
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