



Abhimanyu Susobhanan

Areas of Interest

Gravitational Waves, Pulsars, Binary Systems, Astrophysical Software

Education

Aug 2015–
Sep 2021 **Master of Science in Physics + Doctor of Philosophy in Astrophysics**, *Department of Astronomy & Astrophysics, Tata Institute of Fundamental Research, Mumbai, Maharashtra, India*

Thesis Title: [Perspectives in nanohertz gravitational-wave astronomy](#)

Advisor: Prof. Achamveedu Gopakumar

Aug 2008–
May 2012 **Bachelor of Technology in Physical Sciences**, *Department of Earth & Space System Sciences, Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India*

CGPA: 8.27/10

Research & Professional Experience

Jun 2022 –
present **Postdoctoral Fellow**, *Center for Gravitation Cosmology and Astrophysics, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin, USA*

- Efficient methods for computing pulsar timing array signals due to supermassive eccentric binaries, implemented in the [GWecc.jl](#) package.
- Single-pulsar Bayesian search for supermassive eccentric binaries using [GWecc.jl](#) in the NANOGrav data.
- The [chimera](#) pipeline to reduce large volumes of pulsar data obtained using the CHIME telescope.
- Leading the development team for the [PINT](#) pulsar timing package.

Sep 2021 –
Jan 2022 **Postdoctoral Fellow**, *National Centre for Radio Astrophysics, Tata Institute of Fundamental Research, Pune, Maharashtra, India*

- Multiple pulsar timing projects as part of the Indian Pulsar Timing Array, including the [InPTA Data Release 1](#).

Aug 2015–
Sep 2021 **Research Scholar**, *Department of Astronomy & Astrophysics, Tata Institute of Fundamental Research, Mumbai, Maharashtra, India*

- The [pinta](#) pipeline to reduce pulsar data obtained using the GMRT telescope.
- Modeling pulsar timing array signals induced by supermassive eccentric binaries.
- The *ELL1k* timing model for nearly circular pulsar binaries experiencing significant advance of periastron.
- A new phasing approach to modeling the optical outbursts of the blazar OJ 287 using its binary black hole central engine model, implemented in the [opha](#) package.
- An analytic solution to the third post-Newtonian-accurate Kepler equation.
- Mentored two undergraduate students and two masters students
- Conducted teaching and training sessions on Linux, Python, pulsar data reduction, and pulsar timing at multiple workshops.
- Teaching assistant for Astronomy & Astrophysics I, Astronomy & Astrophysics II, and Electro-

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1/4

- Sep 2012–**Scientist/Engineer**, *Liquid Propulsion Systems Centre, Indian Space Research Organization*, Valiyamala, Thiruvananthapuram, Kerala, India
 Jun 2015
- A searchable internal repository for quality assurance reports named PEARL-DB.
 - An internal secure file-sharing service named BHANDAAR.
 - Development and maintenance of the center website, employees' portal, and recruitment portal.

Publications

Publications with Major Contribution

- 2023* [1] Subhajit Dandapat, Michael Ebersold, **Abhimanyu Susobhanan**, et al., “*Gravitational Waves from Black-Hole Encounters: Prospects for Ground- and Galaxy-Based Observatories*”, Accepted for publication in Physical Review D, arXiv: [2305.19318](https://arxiv.org/abs/2305.19318)
- 2022* [2] **Abhimanyu Susobhanan**, “*Post-Newtonian-accurate pulsar timing array signals induced by inspiralling eccentric binaries: accuracy and computational cost*”, Submitted to Classical and Quantum Gravity, arXiv: [2210.11454](https://arxiv.org/abs/2210.11454)
- 2022 [3] Pratik Tarafdar et al. (38 authors including **Abhimanyu Susobhanan**), “*The Indian Pulsar Timing Array: First data release*”, Publications of the Astronomical Society of Australia, 39, E053, DOI: [10.1017/pasa.2022.46](https://doi.org/10.1017/pasa.2022.46)
- 2021 [4] Jaikhomba Singha et al. (32 authors including **Abhimanyu Susobhanan**), “*Evidence for profile changes in PSR J1713+0747 using the uGMRT*”, Monthly Notices of the Royal Astronomical Society: Letters, 507, 1, L57–L61, DOI: [10.1093/mnrasl/slab098](https://doi.org/10.1093/mnrasl/slab098)
- 2021 [5] **Abhimanyu Susobhanan**, Yogesh Maan, Bhal Chanda Joshi, et al., “*pinta: The uGMRT Data Processing Pipeline for the Indian Pulsar Timing Array*”, Publications of the Astronomical Society of Australia, 38, E017, DOI: [10.1017/pasa.2021.12](https://doi.org/10.1017/pasa.2021.12)
- 2021 [6] **Abhimanyu Susobhanan**, Achamveedu Gopakumar, George Hobbs, and Stephen Taylor, “*Pulsar timing array signals induced by black hole binaries in relativistic eccentric orbits*”, Physical Review D, 101, 4, 043022, DOI: [10.1103/PhysRevD.101.043022](https://doi.org/10.1103/PhysRevD.101.043022)
- 2018 [7] **Abhimanyu Susobhanan**, Achamveedu Gopakumar, Bhal Chanda Joshi, and Ranjan Kumar, “*Exploring the effect of periastron advance in small-eccentricity binary pulsars*”, Monthly Notices of the Royal Astronomical Society, 480, 4, 5260-5271, DOI: [10.1093/mnras/sty2177](https://doi.org/10.1093/mnras/sty2177)
- 2017 [8] **Abhimanyu Susobhanan**, Achamveedu Gopakumar, Bhal Chanda Joshi, and Ranjan Kumar, “*Exploring the effect of periastron advance in small-eccentricity binary pulsars*”, Monthly Notices of the Royal Astronomical Society, 480, 4, 5260-5271, DOI: [10.1093/mnras/sty2177](https://doi.org/10.1093/mnras/sty2177)
- 2017 [9] Yannick Boetzel, **Abhimanyu Susobhanan**, Achamveedu Gopakumar, Antoine Klein, and Philippe Jetzer, “*Solving post-Newtonian accurate Kepler equation*”, Physical Review D, 96, 4, 044011, DOI: [10.1103/PhysRevD.96.044011](https://doi.org/10.1103/PhysRevD.96.044011)

Other Publications

- 2023* [10] Avinash Kumar Paladi et al. (31 authors including **Abhimanyu Susobhanan**), “*Multi-band Extension of the Wideband Timing Technique*”, Submitted to Monthly Notices of the Royal Astronomical Society, arXiv: [2304.13072](https://arxiv.org/abs/2304.13072)
- 2023* [11] Aman Srivastava et al. (31 authors including **Abhimanyu Susobhanan**), “*Noise analysis in the Indian Pulsar Timing Array Data Release I*”, Submitted to Physical Review D, arXiv: [2303.12105](https://arxiv.org/abs/2303.12105)

- During April 2020, I contributed to a popular YouTube video, created by *NASA Jet Propulsion Laboratory*, titled [Timing of Black Hole Dance Revealed by NASA Spitzer Space Telescope](#).
- Online lecture on “Physics in Daily Life” to high school students as part of the Promotion of Excellence among Gifted Children program of the Government of Kerala (November 2020).

References

Prof. Achamveedu Gopakumar

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Prof. Bhal Chanda Joshi

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Dr. George Hobbs

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Marsfield, NSW, Australia
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