Raghav Girgaonkar

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LinkedIn, Orcid, GitHub

Research Interests

Gravitational-Wave Astrophysics; Radio Astronomy, Pulsar Timing Arrays, Radio Transients and the applications of elements of Machine Learning, Bayesian Statistics, Data Science and Instrumentation to these fields.

Education

Bachelor of Technology in Engineering Physics Aug. 2017 - July 2021
Indian Institute of Technology, Hyderabad, Telangana, India
Cumulative GPA: 8.64/10.0

Double Major in Electrical Engineering Jan 2019 - July 2021
Indian Institute of Technology, Hyderabad, Telangana, India
Cumulative GPA: 8.21/10.0

Awards and Achievements

MITACS Globalink Research Internship (*Cancelled due to the COVID 19 pandemic*) 2020
Kishore Vaigyanik Protsahan Yojana (KVPY) Scholarship 2015

Professional Memberships

The Indian Pulsar Timing Array Consortium June 2019 - Present

Skills

- Programming languages: Python, MATLAB, C/C++, CUDA
- Operating systems: Linux, Windows, macOS
- Software: LaTeX, Git/SVN, PSRCHIVE, PSRCAT, TEMPO2

Publications

Published

1. ***pinta*: The uGMRT Data Processing Pipeline for the Indian Pulsar Timing Array:** Abhimanyu Susobhanan, Yogesh Maan, Bhal Chandra Joshi, T. Prabu, Shantanu Desai, K. Nobleson, Sai Chaitanya Susarla, **Raghav Girgaonkar**, Lankeswar Dey, Neelam Dhanda Batra, Yashwant Gupta, A. Gopakumar, Manjari Bagchi, Avishek Basu, Suryarao Bethapudi, Arpita Choudhary, Kishalay De, M. A. Krishnakumar, P. K. Manoharan, Arun Kumar Naidu, Dhruv Pathak, Jaikhomba Singha, Mayuresh P. Surnis
arXiv:2007.02930 (2021)
(Published in Publications of the Astronomical Society of Australia, doi: 10.1017/pasa.2021.12)
2. **High Precision Measurements of Interstellar Dispersion Measure with the upgraded GMRT:** M. A. Krishnakumar, P. K. Manoharan, Bhal Chandra Joshi, **Raghav Girgaonkar**, Shantanu Desai, Manjari Bagchi, K. Nobleson, Lankeswar Dey, Abhimanyu Susobhanan, Sai Chaitanya Susarla, Mayuresh P. Surnis, Yogesh Maan, A. Gopakumar, Avishek Basu, Neelam Dhanda Batra, Arpita Choudhary, Kishalay De, Yashwant Gupta, Arun Kumar Naidu, Dhruv Pathak, Jaikhomba Singha, T. Prabu
arXiv:2101.05334 (2021)
(Published in the Astronomy and Astrophysics Journal, doi :/10.1051/0004-6361/202140340)
3. **Evidence for profile changes in PSR J1713+0747 using the uGMRT:** Jaikhomba Singha, Mayuresh P Surnis, Bhal Chandra Joshi, Pratik Tarafdar, Prerna Rana, Abhimanyu Susobhanan, **Raghav Girgaonkar**, Neel Kolhe, Nikita Agarwal, Shantanu Desai, T Prabu, Adarsh Bathula, Subhajit Dandapat, Lankeswar Dey, Shinnosuke Hisano, Ryo Kato, Divyansh Kharbanda, Tomonosuke Kikunaga, Piyush Marmat, Sai Chaitanya Susarla, Manjari Bagchi, Neelam Dhanda

Batra, Arpita Choudhury, A Gopakumar, Yashwant Gupta, M A Krishnakumar, Yogesh Maan, P K Manoharan, K Nobleson, Arul Pandian, Dhruv Pathak, Keitaro Takahashi
arXiv:2107.04607 (2021)
(Published in the Monthly Notices of the Royal Astronomical Society: Letters Journal, doi : /10.1093/mnrasl/slab098)

Preprints

1. **Low-frequency wideband timing of InPTA pulsars observed with the uGMRT:** K Nobleson, Nikita Agarwal, **Raghav Girgaonkar**, Arul Pandian, Bhal Chandra Joshi, M A Krishnakumar, Abhimanyu Susobhanan, Shantanu Desai, T Prabu, Adarsh Bathula, Timothy T Pennucci, Sarmistha Banik, Manjari Bagchi, Neelam Dhanda Batra, Arpita Choudhary, Subhajit Dandapat, Lankeswar Dey, Yashwant Gupta, Shinnosuke Hisano, Ryo Kato, Divyansh Kharbanda, Tomonosuke Kikunaga, Neel Kolhe, Yogesh Maan, Piyush Marmat, P Arumugam, P K Manoharan, Dhruv Pathak, Jaikhomba Singha, Mayuresh P Surnis, Sai Chaitanya Susarla, Keitaro Takahashi
arXiv:2112.06908 (2021)
(Under review at the Monthly Notices of the Royal Astronomical Society Journal)

Research/Work Experiences

Amity-Berkeley SETI Junior Research Fellowship Nov 2021 - Present
Mentored by Dr Vishal Gajjar, (UC Berkeley) and Dr Siddharth Pandey, (Amity University, Mumbai)

Ongoing project to build FPGA backends and GPU accelerated pipelines for the high-speed data capture of high resolution data from the uGMRT and to conduct the first experiments related to Search for Extraterrestrial Intelligence (SETI) in India. Part of the Breakthrough Listen Initiative.

The Indian Pulsar Timing Array Consortium (InPTA) June 2019 - Present
Mentored by Dr Bhal Chandra Joshi, (National Centre for Radio Astrophysics) and Dr Shantanu Desai, (Indian Institute of Technology Hyderabad)

- Contributed to cataloging of pulsar data from the GMRT from earlier observations.
- Helped in the reduction of data using the developed pipeline, also contributed to testing and am part of the testing group for future releases.
- Conducted/Supervised multiple observation sessions both in-person and remotely at GMRT.
- Helped in documentation and preparation of observation files and data processing manuals which are to be used by the wider collaboration.
- Part of multiple working groups within the collaboration which focus on multiple aspects of pulsar timing.

Noise Fundamentals June 2019 - July 2019
Inter-University Centre for Astronomy and Astrophysics
Mentored by Mr Jameer Manur and Dr. Joydeep Bagchi

- Studied Johnson's and Shot Noise with experimental results.
- Experimentally obtained high precision measurements of the charge of an electron and the Boltzman constant.
- Wrote final report with documentation of experimental results.

Pratiti Technologies Pvt. Ltd. May 2018 - June 2018
Summer Intern

- Worked on IoT solutions for Light-weight Deflectometer.

- Studied the Bulk Modulus of multi-layered soil.

Positions of Responsibility

Undergraduate Student Mentor July 2018 - May 2019
Mentor to undergraduate freshmen as a part of *Sunshine*, the counselling cell of the Indian Institute of Technology, Hyderabad

Teaching Assistant Spring 2019
Teaching Assistant for Dr Shubho R. Roy for the course *Thermodynamics* offered to undergraduate freshmen. Responsibilities included grading papers and tests along with clearing student doubts.

Projects: Ongoing and Completed

1. **Machine Learning Applications for RFI Removal** 2021
Ongoing project which aims to develop machine learning tools for efficient identification and removal of RFI from pulsar data.

2. **Studies of Effect of Scatter Broadening on Dispersion Measures of Pulsars** 2021
Ongoing project which studies the effect of scatter broadening in InPTA pulsars and its effect on their Dispersion Measures.

3. **Possible Profile/Mode change in the Pulsar J1713+0747** 2021
Ongoing project which explores a profile change in the pulsar J1713+0747 and studies it's effects on timing precision.

4. **High Precision Dispersion Measure Measurements with the Upgraded GMRT** 2021
Collaborative project where two methods have been developed to determine the Dispersion Measure (DM) of InPTA pulsars. An epoch where the effect of a coronal mass ejection on the DM of pulsar is also studied. This project has been published as a paper (Krishnakumar et al, 2021).

5. **Flux Calibration, Analysis and Imaging of Pulsars** 2020
Ongoing project of flux calibration reduction and post-analysis of InPTA pulsar data and imaging for InPTA pulsars.

6. **pinta: The Data Reduction Pipeline for the Indian Pulsar Timing Array Consortium** 2020
Collaborative project for developing and testing *pinta*, a data reduction pipeline to process pulsar data taken from GMRT for analysis.

7. **Stock Market Analysis** 2019
Analysis of Stock market index for "S&P" 500 using neural networks. GitHub Link

Presentations

High precision measurements of interstellar dispersion measure with the upgraded GMRT September 25, 2021
Presentation on behalf of the InPTA Collaboration at the Undergraduate Physics Symposium, Presidency University, Kolkata

Summer School/ Workshops

Workshop on High Performance Computing for Astronomy and Astrophysics September 2021

- A virtually conducted school by IIT Kharagpur and SKA-India on High performance computing and GPU optimisation.

Green Bank Observatory / Arecibo Observatory Single Dish Observing School September 2021

- A virtually conducted school which gives an insight into the workings and observation process of the Green Bank Telescope and also gives an introduction to Radio Astronomy.

International Centre for Theoretical Sciences: Summer School on Gravitational Wave Astronomy July 2021

- Summer school with lectures on Stochastic GW background from the early universe and Stochastic astrophysical foreground from compact binary mergers.

International Pulsar Timing Array Science Week June 2021

- Science Week organized by the International Pulsar Timing Array where pulsar timing results and updates were discussed by worldwide PTA collaborations.

International Pulsar Timing Array Student Week June 2019

- Student Week Workshop organized by the International Pulsar Timing Array at the National Centre for Radio Astrophysics, Pune, India.

Extracurricular Activities

The Literary Society, IIT Hyderabad: Member

- Contributed articles and poems to institute magazine.
- Participated and organized quizzes.