Rahul Gopalakrishnan

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IUCAA, Pune, India

Work Experience

Software Engineer, SUIT Payload of Aditya-L1 Mission **Jun 2023 – Present**
Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

- Led the science and calibration observation planning during the SUIT payload verification phase.
- Designed and implemented the SUIT data processing pipeline, handling 100 Gb of daily data and delivering science-ready products within 24 hours.
- Developed the Quick Look Display (QLD) for real-time data quality assessment and the Sun Center Finder for ISRO's mission feedback, both deployed at ISRO.
- Designed and implemented the SUIT internal database and query system for efficient data management along with the SUIT website with automated outreach product uploads.
- Created the SUIT simulator to verify program sequences before execution.
- Oversee daily operations at the SUIT Payload Operation Center, including observation planning, server maintenance, and data storage management.

AstroSat Support Executive, CZTI Payload of AstroSat Mission **Feb 2023 – May 2023**
Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

- Developed an automated Gamma Ray Burst (GRB) detection algorithm using the Sum Threshold method (Paper in preparation).
- Conducted X-ray polarization analysis using CZTI data and maintained a comprehensive catalog.

Scientific Trainee, CZTI Payload of AstroSat mission **Feb 2022 – Feb 2023**
Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

- Developed a pipeline wrapper script to execute all processing modules based on user requirements.
- Analyzed CZTI data and reported approximately 40 GRBs to the GCN Circulars Archive (View on ADS).
- Investigated the detectability of GRBs with CZTI and presented findings at the AstroSat CZTI Workshop at IUCAA in September 2022.
- Maintained the CZTI GRB catalog and updated it on the website (link).
- Monitored instrument health, identified and disabled noisy pixels, and performed targeted GRB searches based on reports from other instruments.

Research Experience

Masters Thesis - From Hydrodynamics to Astrophysics - A Numerical Study **May 2019 – April 2020**
Indian Institute of Science Education and Research (IISER), Bhopal
Guide: Dr. Ritam Mallick, Associate Professor, IISER Bhopal, India

Developed an exact numerical solver for Euler's equations and studied standard hydrodynamic problems such as the SOD shock tube and Sedov-blast problems by creating simulation codes. Applied these hydrodynamic techniques to model a toy supernova case, analyzing variations in physical properties.

Cource Project - Simulating Oscillating Chemical Reaction **Jan 2019 – April 2019**
Indian Institute of Science Education and Research (IISER), Bhopal
Guide: Dr. Nirmal Ganguly, Assistant Professor, IISER Bhopal

Simulated the Belousov-Zhabotinsky (BZ) reaction, one of the most well-known oscillating chemical reactions, using numerical techniques such as the Runge-Kutta method and Newton-Raphson technique. Analyzed the conditions leading to periodicity and chaotic behavior in the reaction.

Reading Project - Introduction to Solid State Physics **May 2017 – July 2017**
Indian Institute of Science Education and Research (IISER), Bhopal
Guide: Dr. Surajit Saha, Assistant Professor, IISER Bhopal

Gained foundational knowledge in solid-state physics through laboratory work and literature review.

Publications

Journal Articles

1. Soumya Roy, Durgesh Tripathi, ... **Rahul Gopalakrishnan** ..., et al. "Near- and Mid-ultraviolet Observations of X-6.3 Flare on 2024 February 22 Recorded by the Solar Ultraviolet Imaging Telescope on board Aditya-L1". In: *The Astrophysical Journal Letters* 981.1 (Mar. 2025), p. L19. ISSN: 2041-8205, 2041-8213. 10.3847/2041-8213/adbobe.

2. Soumya Roy, Durgesh Tripathi, ... **Rahul Gopalakrishnan** ..., et al. "X class flare on 31st december, 2023 observed by the Solar Ultraviolet Imaging Telescope". In: *The Astrophysical Journal Letter* (2025). Accepted.
3. Janmejoy Sarkar, VN Nived, ... **Rahul Gopalakrishnan** ..., et al. "Test and Calibration of the Solar Ultraviolet Imaging Telescope (SUIT) on board Aditya-L1". In: (2025). https://doi.org/10.48550/arXiv.2503.23476.
4. Durgesh Tripathi, A. N. Ramaprakash, ... **Rahul Gopalakrishnan** ..., et al. "The Solar Ultraviolet Imaging Telescope on Board Aditya-L1". en. In: *Solar Physics* 300.3 (Mar. 2025), p. 30. ISSN: 1573-093X. 10.1007/s11207-025-02423-1.
5. Divita Saraogi, J Venkata Aditya, ... **Rahul Gopalakrishnan** ..., et al. "Localization of gamma-ray bursts using AstroSat Mass Model". In: *Monthly Notices of the Royal Astronomical Society* 530.2 (Feb. 2024), pp. 1386–1393. ISSN: 0035-8711. 10.1093/mnras/stae435.

In Preparation

1. **Rahul Gopalakrishnan**, Rushikesh Deogaonkar, Soumya Roy, et al. "Unraveling the Secrets of the lower Solar Atmosphere: One year of Operation of the Solar Ultraviolet Imaging Telescope (SUIT) on board Aditya-L1". In Prep. Feb. 2025.
2. **Rahul Gopalakrishnan**, Jitendra Joshi, Navaneeth P.K, et al. "Automated GRB detection using Sum-threshold Algorithm with CZTI". In Prep. Apr. 2025.
3. **Rahul Gopalakrishnan**, Nived V.N, Soumya Roy, et al. "Data Processing Pipeline of Solar Ultraviolet Imaging Telescope (SUIT) onboard Aditya-L1". In Prep. Mar. 2025.

Conference Proceedings

1. **Rahul Gopalakrishnan**, Nived V. N, Durgesh Tripathi, et al. "Data processing pipeline of SUIT onboard Aditya-L1". In: *43rd Meeting of the Astronomical Society of India (ASI)*. Oral Presentation. Astronomical Society of India. NIT Rourkela, India, 2025.
2. **Rahul Gopalakrishnan**, Vipul Prasad, A.R Rao, et al. "Detectability of GRBs in CZT Imager of AstroSat". In: *Astrosat CZTI Workshop*. Oral Presentation. CZTI payload of AstroSat Mission. IUCAA Pune, India, 2022.
3. **Rahul Gopalakrishnan** and Ritam Mallick. "From Hydrodynamics to Astrophysics - A numerical Study". In: *In-House Physics Symposium*. Poster Presentation. IISER Bhopal, India, 2020.

Workshops and Conferences

`Jan 6 – 10, 2025` **AI/ML Applications to Astronomy and Astrophysics**: Participation - Workshop for young researchers and faculty with a background in astronomy and astrophysics and an interest in the application of AI/ML techniques in Astronomy.

`Dec 5 – 7, 2019` **CompFlu-2019**: Participation - Meet for researchers in the interdisciplinary area of complex fluids and soft matter.

Education

BS-MS Dual Degree `Aug 2015 – Jul 2020`
`Indian Institute of Science Education and Research (IISER), Bhopal`
`CPI: 7.98/10`

Relevant Courses: Introduction to Astronomy and Astrophysics, Numerical Methods and Programming, Computational Fluid Dynamics, General Theory of Relativity, Quantum Field Theory, and Cosmology

Higher Secondary Education `Jun 2013 – Mar 2015`
`ASMMHSS Alathur, Palakkad`
`Percentage: 97.08%`

Skills

- **Languages** : Proficient in reading, writing, and speaking English, Hindi, and Malayalam, with strong speaking skills in Tamil.
- **Programming** : Python (Astropy, SunPy, Matplotlib, NumPy, SciPy, etc.), C++, XML/XSL, LaTeX, etc.
- **Databases** : MySQL, SQLite
- **Web Development** : HTML, CSS, JavaScript, Apache Web Server
- **Operating Systems** : Linux

Miscellaneous

Achievements

`2020` **DST Fellowship**: INSPIRE Fellowship for PhD

`2015 – 2020` **INSPIRE Fellowship**: Awarded to the top 1% students in the year 2015

References

Prof. Durgesh Tripathi
Principal Investigator of SUIT/Aditya-L1
Senior Professor
Operation Director, SUIT Payload
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Prof. Gulab Chand Dewangan
Senior Professor
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