Rahul Gopalakrishnan

Astrophysicist

rahulg.astro@gmail.com | akarahulg | akarahulg

thisisrahulg.xyz | 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

In-charge of the science and calibration observation planning during the SUIT payload verification phase and 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 of which were successfully deployed at ISRO. Designed and implemented the SUIT internal database and query system for efficient data management and automated the SUIT website for outreach product uploads. Created the SUIT simulator to verify program sequences before execution and currently 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 prep.) and also 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 and updated the CZTI GRB catalog on the website (link). Monitored instrument health, identified and disabled noisy pixels, and performed targeted GRB searches based on reports from other instruments. Ensured the smooth operation and maintenance of software systems in the CZTI POC.

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, V.N. Nived, and ... **Rahul Gopalakrishnan** ... "Test and Calibration of the Solar Ultraviolet Imaging Telescope (SUIT) on board Aditya-L1". In: *Submitted to Sol. Phys.* (2025).
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

Other Courses

Introduction to Machine Learning, ESCAPE Summer School (online)

References

Prof. Durgesh Tripathi
Principal Investigator of SUIT/Aditya-L1
Senior Professor
Operation Director, SUIT Payload
IUCAA Pune, India,
Post Bag 4, Ganeshkhind, Pune, Maharashtra – 411007
durgesh@iucaa.in

Dr. Ritam Mallick
Associate Professor
IISER Bhopal, India,
Bhopal, Madhya Pradesh – 462066
mallick@iiserb.ac.in

Prof. Gulab Chand Dewangan
Senior Professor
IUCAA Pune, India,
Post Bag 4, Ganeshkhind, Pune, Maharashtra – 411007
gulabd@iucaa.in