

Abhinna Sundar Samantaray

PHD STUDENT | ASTROPHYSICIST

Zentrum für Astronomie der Universität Heidelberg | Astronomisches Rechen-Institut (ARI), Mönchhofstr. 12-14 69120 Heidelberg

☎ +49 (6221) 54-1844 | ✉ abhinna.samantaray@uni-heidelberg.de | 📄 [abhinna-sundar-b23733156](https://orcid.org/abhinna-sundar-b23733156) | 🐦 [Cosmoparticle](#)

Education

Doctor in Philosophy (PhD) in Astrophysics

UNIVERSITÄT HEIDELBERG, MAX PLANCK INSTITUT FÜR ASTRONOMIE (MPIA)
IMPRS-HD fellow (19th generation)

Heidelberg, Germany

Aug 2023 - Present

Bachelor's and Master's in Physics (Minor in Astrophysics)

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER), MOHALI
CPI (Cumulative Performance Index): **9.2** (out of total 10)

Mohali, Punjab, India

Aug 2017 - May 2022

List of Publications

Solar flare catalog from 3 years of Chandrayaan-2 XSM observations

ARAVIND BHARATHI, **ABHINNA SUNDAR SAMANTARAY**, DEVANSH JAIN ET. AL.

[<arXiv:2312.09191>](#)

Springer: Solar Physics

AstroSat observations of interacting galaxies NGC 7469 and IC 5283

ABHINNA SUNDAR SAMANTARAY, HK JASSAL, KP SINGH, GC DEWANGAN

under review

Astronomy and Astrophysics (A&A)

Stellar Variability and Distance Indicators in Nearby Galaxies. I. RR Lyrae and Anomalous Cepheids in Draco dwarf spheroidal

ANUPAM BHARADWAJ, MARINA REJKUBA, **ABHINNA SUNDAR SAMANTARAY**, ET. AL.

under review

Astrophysical Journal(AJ)

Multi-wavelength Study of Magnetic Cataclysmic Variables using *Astrosat*

ABHINNA SUNDAR SAMANTARAY AND KULINDER PAL SINGH

<Embargo>

DSpace IISER Mohali

Multiwavelength AstroSat Observations of AR UMa, BL Hyi, 1RXSJ161935.7+524630 ()

ABHINNA SUNDAR SAMANTARAY, KALA G PRADEEP, KULINDER PAL SINGH, GULAB DEWANGAN ET. AL.

In preparation

Research Experience

MS THESIS: Multi-wavelength Study of Magnetic Cataclysmic Variables using AstroSat [[Thesis Abstract Link](#)]

Indian Institute of Science Education and Research (IISER) Mohali, India

SUPERVISOR: **PROF. KULINDER PAL SINGH**, INSA SENIOR SCIENTIST

Aug 2021 - May 2022

- Performed detailed UV and X-ray timing and spectral analysis of the three MCVs AR UMa, QS Tel, and 1RXS J161935.7+524630 using the AstroSat UV (UVIT) and the soft X-ray (SXT) data.
- Extracted the lightcurves and spectra, and to determine the best fit spectral models and parameter values
- By observing in both UV and X-Ray regimes, we co-relate the spectral energy distributions, fluxes, and spectral variations.

Research Project - Multiwavelength study of NGC 7469 [[Abstract link](#)]

Indian Institute of Science Education and Research (IISER) Mohali, India

SUPERVISOR: **DR. HARVINDER KAUR JASSAL**, (IISER MOHALI) & PROF. KULINDER PAL SINGH

Oct 2022 - Nov 2023

- Detected the presence of an inner spiral arm of the Syfert Galaxy NGC 7469 which had not been resolved earlier.
- Studied the interaction of NGC 7469 with its smaller companion galaxy IC5283 where the tidal interaction is seen in a tail.

Research Project - An Automatic Identification Algorithm for Sub-A Class Solar Flares using X-ray Light Curves

Indian Institute of Technology (IIT),
Bombay & ISRO

SUPERVISORS: **DR. ABHILASH SARWADE**, ISRO & **DR. KASIVISWANATHAN SANKARASUBRAMANIAN**, PRL

May 2022 - Dec 2022

- Worked upon the development of a 3-step pipeline to automatically detect solar flares in integrated X-ray light curves from observations primarily using Chandrayaan-2/XSM.
- The pipeline includes a multi-flare decomposition step to obtain single flares from flaring durations.

Research Intern - Detection and Modelling of Gamma Ray Bursts using AstroSat's Scanning Sky Monitor (SSM) [[Report](#)]

Indian Institute of Science Education
and Research (IISER) Mohali, India

SUPERVISORS: **PROF. KULINDER PAL SINGH**, INSA SENIOR SCIENTIST & **DR. M.C. RAMADEVI**, ISRO

May 2020 - Feb 2021

- Created an algorithm and a program to detect the signals of Gamma-ray bursts events and generated light curves for the same. These are thermonuclear outbursts from neutron star systems that are observed within one stare of 10 minutes by AstroSat's SSM.
- For all the FREDs detected, those stares were checked for neutron star systems from the source list for that particular stare.

Research Intern - Astrometry & Photometry of Open Star Cluster: King 2 ([Link](#))

Indian Institute of Science Education
and Research (IISER) Mohali, India

SUPERVISOR: **PROF. KULINDER PAL SINGH**, INSA SENIOR SCIENTIST

May 2019 - Dec 2019

- Identified the members of the King 2 Open cluster using Astrometry.
- Aperture Photometry was used to extract the magnitudes and luminosity
- Fitted the members of the King2 in the HR diagram to study their evolution

Workshops and Summer Schools Attended

Unraveling Galaxy Evolution with JWST

Heidelberg, Germany

IMPRS HEIDELBERG SUMMER SCHOOL

September 2023

- The school focused on the most relevant aspects of galaxy evolution addressed by JWST, from nearby to the most distant galaxies.

Coordinated Surveys of the Southern Sky

European Southern Observatory

ORGANIZERS: **EUROPEAN SOUTHERN OBSERVATORY (ESO)**, **SQUARE KILOMETRE ARRAY (SKA) OBSERVATORY**

Feb 2023

- Sessions focussing on planned surveys and current and upcoming survey facilities, including SKA pathfinder and precursor instruments as well as the SKA, and ESO's optical, near infrared and mm facilities.

Galaxy Evolution with the ESA Euclid Mission and ESO Telescopes

ESA, Madrid, Spain

EUROPEAN SPACE ASTRONOMY CENTRE (ESAC)

October 2022

- The workshop addressed ESA/ESO synergies and beyond, for realizing the full potential of the Euclid legacy programmes.
- Covered High-redshift objects in the wide-and deep Euclid surveys, Evolution of galaxies and their nuclear black holes at intermediate redshifts, & Galaxies in the local universe

12th ARIES Training School in Observational Astronomy (ATSOA) [[Certificate](#)]

ARIES, Nanital, India

ORGANIZERS: TEAM ATSOA, 2022

May 2022

- Attended set of lectures on various Astrophysical Phenomena and instrumentation techniques
- Worked on the project 'Numerical Simulations of Fluid Instabilities' where I simulated Rayleigh-Taylor and Kelvin-Helmholtz instabilities using PLUTO code

Astronomical Society of India (ASI) 2022 [[Certificate](#)]

IIT Roorkee

ORGANIZERS: **PROF. DIPANJAN MUKHERJEE** (IUCAA PUNE), **PROF. GULAB DEWANGAN** (IUCAA PUNE) AND CO.

Mar 2022

- Solved the Bondi flow as a representative case of transonic solutions, Keplerian disc, and photon propagation around Schwarzschild black holes using PLUTO code

High Performance Computing - Astronomy & Astrophysics Workshop [[Certificate](#)]

Indian Institute of Technology (IIT)
Kharagpur, India

ORGANIZERS: **DR. NEERAJ GUPTA** (IUCAA PUNE), **DR. GIRISH KULKARNI** (TIFR) AND CO.

Sept 2021

- The workshop aimed to cover different aspects relevant for using HPC to solve problems in such areas. Basics of HPC programming framework was complemented by timely and relevant topics in Astronomy & Astrophysics where HPC resources are indispensable.

- The workshop aimed for both both theoretical and hands-on sessions on Electromagnetic Transients, Gravitational Wave Analysis, and Electromagnetic Counterparts to Gravitational Waves

Interests

1. Extragalactic Astronomy

2. Stellar Astrophysics

3. Compact Objects

4. Multi-Wavelength Astronomy

Major Courses Undertaken (Astronomy & Astrophysics)

Fundamentals of Astronomy, Computational Physics I, Gravitation and Cosmology, Astrophysics I, Physics of Fluids, High Energy Astrophysics, Computational Physics II, Cosmology and Galaxy Formation, Modelling Complex Systems

Computational Skills

Astronomy Softwares	IRAF, SAO DS9, CLEAN (for periodogram analysis), CCDLAB, GSpec (RMFIT), Curvit, HEASoft, SIMBAD, Aladin
Languages	Python (Scipy, Numpy, AstroPy, Matplotlib, Astropy), C++, PLUTO (basics), MATLAB, SageMath
Coding in Python	Numerical Computing, Data Analytics
Other Tools	LaTeX, Proficient in MS Office, gnuplot, TopCat
Operating System	Windows, Scientific computing in Linux (Ubuntu)

Seminars, Presentations, and Science Outreach

Jan 2024	Star formation in interacting galaxies NGC 7469 and IC 5283 (invited talk) , upcoming....	<i>NISER BBSR, India</i>
Feb 2024	Star formation in interacting galaxies NGC 7469 and IC 5283 (invited talk) , upcoming....	<i>IIT Bombay, India</i>
Nov 2023	Star formation in the Milky Way and nearby galaxies , Presented a talk on the concept of star formation in the galaxies, and how it leads to galaxy evolution.	<i>IMPRS-HD, Germany</i>
Oct 2022	An Automatic Identification of Solar Flares/ XSM , Presented a talk on the detection of solar flares in integrated X-ray light curves from observations primarily using Chandrayaan-2/XSM	<i>IIT Bombay, India</i>
Jun 2022	Fluid Instabilities in Astrophysical Systems , Presented a talk on Rayleigh-Taylor and Kelvin-Helmholtz fluid instabilities in the Astrophysical systems	<i>ARIES, India</i>
Apr 2022	Sunyaev Zeldovich Effect , Presented a talk on Sunyaev Zeldovich Effect, Thermal, Kinetic SZ Effect and cosmological significance of SZE	<i>IISER Mohali, India</i>
Apr 2022	Superluminal Motion in Astrophysical Jets , Presented a talk on superluminal motion and how are they observed in relativistic jets	<i>IISER Mohali, India</i>
Mar 2022	40th Meeting of Astronomical Society of India (ASI), 2022 , Presented a poster on Multi-wavelength studies of AR UMa, QS Tel & 1RXSJ161935.7+524630 using AstroSat	<i>IIT Roorkee & ARIES Nanital, India</i>
Mar 2022	5th Meeting of young astronomers at CAMK PAN , Contributed a talk on Multi-wavelength Study of MCVs in the 5th Meeting of young astronomers at CAMK PAN	<i>Warsaw , Poland</i>
Nov 2021	Power Spectrum Analysis and Phase Folding with Lomb-Scargle Method , Presented a talk on Power Spectrum Analysis and generating Phase Folded curves using the Lomb-Scargle algorithm	<i>IISER Mohali, India</i>
Aug 2021	Cataclysmic Variables , Presented a talk on Cataclysmic Variables, talked about the classification, mechanisms and light curves of CVs.	<i>IISER Mohali, India</i>
Mar 2021	Gamma-Ray Bursts , Presented a seminar on Gamma-Ray Bursts, talked about the types, principles, mechanisms of the bursts.	<i>IISER Mohali, India</i>
Oct 2020	Study of X-ray flares , Presented a talk on theory of X-ray flares, their light curves, and some data processing.	<i>IISER Mohali, India</i>

Scholarships / Fellowships

Young Scientist Award

HECTOR FELLOW ACADEMY GGMBH

2023-27

- Recipient of the prestigious award amounting to €2,00,000

DST INSPIRE Scholarship

MINISTRY OF SCIENCE AND TECHNOLOGY

2017-22

- Recipient of the fellowship for being in the top 1% of the students of India.

AWES Education Scholarship Scheme for Army Personnel (ESSA)

ARMY WELFARE EDUCATION SOCIETY (AWES)

2021

- Recipient of the one-time scholarship for scoring high marks during the undergraduate studies.

Scholastic Achievements and Scores

Academic Excellence Certificate [[link 1](#), [link 2](#)]

SCORED HIGHEST IN THE 7TH, 8TH, 9TH AND 10TH SEMESTERS

2021, 2022

CSIR NET JRF (Junior Research Fellowship) June 2021 [[JRF Scorecard](#)]

ALL INDIA RANK (AIR) 177 (PERCENTILE= 99.37)

2022

Graduate Aptitude Test in Engineering (GATE) 2022 [[Scorecard](#)]

ALL INDIA RANK (AIR) 261 (PERCENTILE= 98.65)

2022

Joint Entrance Screening Test (JEST) 2022 [[Scorecard](#)]

ALL INDIA RANK (AIR) 250 (PERCENTILE= 95.10)

2022

National Astronomy Olympiad

ALL INDIA RANK (AIR) 216

2015

Volunteer Experience

2017-22	Astronomy Club , Organized and participated in various events like Astronomy camps, quizzes, demonstrations, and public lectures etc.	<i>IISER Mohali, India</i>
2017-22	Physics Club , An active member for the club, organized and participated in many club events	<i>IISER Mohali, India</i>
2021-22	Basketball Coordinator , Coordinated basketball tournaments and various other activities for the year 2021-22	<i>IISER Mohali, India</i>
2018	Senior peer group member for 2018 batch , Member of the group formed by senior students to provide cushion to the transition of new comers for 2018 batch.	<i>IISER Mohali, India</i>

Other Awards and Honors

2017	1st Prize (Zonal Topper) , CBSE 12th Board	<i>Jabalpur, India</i>
2016	7th Rank (State Level) , International Maths Olympiad (IMO)	<i>Jabalpur, India</i>
2015	Certificate of Merit , Class 10th CBSE Board	<i>Jabalpur, India</i>

Extra Curricular Activities

2021,22	Winner in Basketball and Cricket , Intra IISERM Sports Meet 2021-22	<i>IISER Mohali, India</i>
2022	Runner Up in Kho-Kho and Football , Intra IISERM Sports Meet 2021-22	<i>IISER Mohali, India</i>
2019	Runner Up in Basketball , Inter IISER Sports Meet (IISM) 2019	<i>IISER Pune, India</i>
2018	Runner Up in Basketball , Inter IISER Sports Meet (IISM) 2018	<i>NISER BBSR, India</i>
2018	Winner in Cricket , Intra IISER Mohali Sports Meet 2018	<i>IISER Mohali, India</i>
2017	Winner in Quiz Competition , Inter House Quiz Competition	<i>APS Jabalpur, India</i>