Atreyi Dasgupta

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Education

Apeejay School Nerul *Mumbai*

High School Diploma 2007 - 2021

BITS Pilani, Hyderabad Campus *Hyderabad*

Integrated Masters Degree, Physics 2021- 2025

CGPA : 7.83

Technical Skills

Programming	Matlab, C, Python, Mathematica
Libraries and Software	Pandas, Numpy, Scipy, Astropy, Jupyter Notebooks, matplotlib, emcee, corner, , IPTA, Autocad
Development	Office, Git, LaTeX, HTML
Languages	English, Hindi, Bengali

Projects

Temperature and Emission Measure Analysis on Solar Flares *ISRO*

Indian Space Research Organisation (ISRO) September 2023 - Ongoing

- Engaging in a comprehensive project focused on the analysis of **X-ray light curves** obtained from cutting-edge solar observation instruments aboard the **Chandrayaan 2 orbiter (XSM)** and the upcoming **Aditya L1 satellite (SoLEXS)**.
- Conducting an extensive review of relevant research papers to gain insights into the various classifications and characteristics of solar flares.
- Principal research objective: The precise extraction of critical solar flare parameters, **temperature (T) and emission measures (EM)**.

Exploring Radiative processes using Radio Astronomy Data Analysis *IIT Bombay, Krittika Club*

Guided by Arvind Balasubramanian and Kunal Deshmukh Summer 2023

- Mastered foundational **radio astronomy** concepts using **CASA software** for data analysis and interpretation.
- Developed proficiency in processing radio telescope data, generating informative plots for clear visualization.
- Utilized **MCMC techniques** to extract the **afterglow of GW170817** and investigated **fast radio bursts (FRBs)** and dispersion measure (DM) values for insights into energetic bursts and intervening medium.

Development of Neural Network-based Model for Predicting Equations of State of Neutron Stars *BITS Pilani*

Guided by Dr. Sarmishtha Banik June 2023 - Ongoing

- Implementing a **machine learning model** based on neural networks to analyze and predict the **equations of state of neutron stars**.
- Training the model using comprehensive datasets of neutron star properties, including mass, density, and other relevant parameters.
- Validating the accuracy and reliability of the neural network model through rigorous testing and comparison with established theoretical models and observational data.

Simulation of Binary Black Holes *BITS Pilani*

Guided by Dr. Rickmoy Samanta January 2024 - Ongoing

- Implementing Binary Black Hole Simulations in Einstein Gravity as well as modified theories of Gravity.
- Checking the validity of the theories of gravity by comparing the simulations to present-time data.
- Comparing the Binary Black Hole simulations with LIGO-VIRGO data

Pulsar Data Analysis using InPTA *BITS Pilani*

Course Project: Radio Astronomy September 2023

- Utilized the **'psredit'** subroutine from the **PSRCHIVE package** to extract relevant data from the early epoch data files.
- Employed the **'psrplot'** subroutine within the PSRCHIVE package to generate plots such as: frequency against phase and obtaining the intensity versus phase plot, which represented the average or integrated profile for the pulsar.
- Used 'psredit' to retrieve the Dispersion Measure (DM) and ascertain the DM correction status.

Data Analysis using Horn Antenna *BITS Pilani*

AD ASTRA club July 2023 - Ongoing

- Developing a precise physical model of radio astronomy, incorporating **horn antenna design** and optimization techniques.
- Utilizing low noise amplifiers and soundcard-based data transfer methods to collect high-quality astronomical data.
- Determining the relative speed of the hydrogen gas clouds in the Milky Way Galaxy to plot the **Galaxy Rotation Curve**.

Fundamentals of General Relativity *BITS Pilani*

Guided by Dr. Rahul Nigam Dec. 2022 - May 2023

- Proficient understanding of special relativity, including Lorentz transformations, time dilation, length contraction, and the concept of spacetime.
- Skilled in visualizing events using **Minkowski, spacetime diagrams**, and comprehensive knowledge of the spacetime interval.
- Developed problem-solving skills in applying general relativity principles to explain phenomena such as gravitational waves and black holes.

Geometrical Extension of Einstein's General Relativity *BITS Pilani*

Guided by Dr. Bivudutta Mishra August 2023 - December 2023

- Conducting an in-depth study of **Teleparallel formulation of Gravity**.
- Utilizing advanced mathematical tools and theoretical frameworks to formulate and analyze the proposed extension, ensuring consistency with observational data and established principles of modern cosmology.
- Utilizing the low-redshift data to impose observational constraints on the free parameters of the $f(R, G) = R^n G^{1-n}$ model through the implementation of the Markov Chain Monte Carlo (MCMC) method.

Awards and Honors

2023 **International Astronomy and Astrophysics Competition**: **Silver Honour**

Position Of Responsibility

Ad Astra Club: Astronomy Club of BITS Pilani *2023*

President

- Leading and managing **50+** club members, effectively delegating responsibilities and fostering a collaborative environment.
- Hosted events such as **Chandrayaan 3 landing screening** which had over **1500+** attendees and Interactive Stargazing Sessions with our state of the art **9.25-inch diffraction-limited Schmidt-Cassegrain telescop**e.
- Designing and executing projects such as: Building a **horn antenna** to prove the existence of dark matter and Building an Astronomy based **Crypthunt game**: Galactrix, for everyone to enjoy.

Volunteering

SEDS Antariksh, VIT Chennai *2023*

Exploring Neutron Star Mergers

- Invited to be a **guest speaker**.
- **80+** attendees joined the talk on Neutron Star Merger, focusing on **GW170817.**

Website for Aspiring Astrophysicists *2023*

Astrophysics by Atreyi

- Establishing a website as a **central resource** for **aspiring astrophysicist**s, catering to all levels of learners.
- Curating career guidance, educational content, and cosmic exploration, fostering an inclusive community of learners.

Github tutorials for radio astronomy *2023*

Radio Astronomy Tutorials

- Made open source and accessible **github tutorials** for data analysis in **Radio Astronomy**.
- Theory behind the concepts and the codes are provided.

Extracurricular Activities

Spectrum:The Physics Association *2022*

Editorial Team

- Writing engaging articles on exciting topics in physics.

Mental Health Support Group (MHSG) *2022*

Editorial Team

- Writing awareness articles on mental health issues.

BITS Pilani, Hyderabad Campus *2023*

Science Day and Teacher's Day

- Main singer in both the events in college

Into the Cosmos: A beginner's guide *2022- ongoing*

Atreyi Dasgupta

- Writing a book on a basic guide to Astrophysics for beginners in the field.