

SHIVAM KUMARAN

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Present Address - Indian Institute of Space Science and Technology, Thiruvananthapuram, Kerala, India. PIN-695547

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EDUCATION

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| • Dual Degree (B.Tech+MS) , CGPA - 8.95 / 10
July 2017 - July 2022
MS - Astronomy and Astrophysics
B-Tech - Engineering Physics
Indian Institute of Space Science and Technology ,
Thiruvananthapuram , Kerala. | • AISSCE-2017 , Score - 90.2% 2017
Jawahar Vidya Mandir Shyamali , Ranchi , Jharkhand, India |
| | • AISSE-2015 ,CGPA - 10 / 10 2015
DAV Public School Chatra , Jharkhand, India |

RESEARCH INTERESTS SUMMARY

My primary research interest is to use machine learning methods in astronomical data analysis, which includes but is not limited to identifying sources and studying their properties from the observed data. I want to design and explore novel and efficient methods for identifying and characterizing astronomical sources' population which would help us understand the structure formation and dynamics of large structures like Galaxies and Globular clusters. I am open to exploring new ideas and expanding my research avenues. My career goal is to work in a collaborative environment as a data scientist in astronomy.

RELEVANT SKILLS

Languages:	English (primary) , Hindi
Programming:	Python, C++, Javascript
Machine Learning / Deep Learning:	Tensorflow, Keras, Sklearn, LightGBM, XGBoost
Data Science :	Pandas, Seaborn.
Astronomical Software & Tools:	Astropy, Astroquery, HEASOFT, XSPEC, IRAF, CASA

RELEVANT COURSES

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| • Introduction of Astronomy and Astrophysics | • Deep Learning for Computational Data Science | • Probability, Statistics and Numerical Methods |
| • Astronomical Techniques | • Machine Learning for Signal Processing | • Data Analysis Astronomy Lab |
| • Computational Astrophysics | • Computer Programming and Applications | • Observational Astronomy Lab |
| • Radiation Processes in Astrophysics | | |

RESEARCH EXPERIENCE

- **Probabilistic Classification of *Chandra* X-ray Sources Using Machine Learning** Aug 2021 - Ongoing
Thesis project for Master of Science degree
Supervisors / Collaborators :

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| – Dr. Samir Mandal
Indian Institute of Space Science and Technology, Kerala, India | – Dr. Sudip Bhattacharyya
Tata Institute of Fundamental Research, Mumbai, India | – Dr. Deepak Mishra
Indian Institute of Space Science and Technology, Kerala, India |
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This project involved the development of an automated classification algorithm based on the LightGBM model. We have used data from the X-ray, Optical, and UV domains to train the classifier. We have achieved a classification accuracy of 93% and have demonstrated the model's science capability on a subset of variable sources and globular cluster sources in NGC-104.

Abstract and summary of the thesis is submitted with this application.

- **Low Mass X-ray binary MAXI J1820+070 Timing and Spectral Analysis** Aug 2020 - Oct 2020
Guide - Dr. Samir Mandal (Dept. of Earth and Space Sciences, IIST)

This project involved the spectral and timing analysis of the source MAXI J1820+070 using *SWIFT* UVOT/XRT data. We explored the accretion disc properties of the LMXB using UV/XRT lightcurve correlation. We also did a simultaneous multi-wavelength model fitting of the source spectrum using XSPEC. We developed a python package for UVOT data analysis and made it available as open-source at :

<https://github.com/KumaranShivam5/UVOT.git>

- **X-ray spectra parameter estimation and data imputation for astrophysical source X-ray spectrum using Auto-Encoder** January 2020 -June 2020
Guide - Dr Deepak Mishra , (HoD. Dept. of Avionics, IIST) ,

In this 6-month-long course project, we developed a CNN-based model for parameter prediction of spectra fitting. For the case of missing data in some wavelengths, we also developed an algorithm that reconstructs the spectrum in an iterative phased manner using a denoising auto-encoder.

- **Indian SWAN (Sky Watch Array Network) Radio Astronomy** Dec 2018
Guide - Dr. Avinash Deshpande, Raman Research Institute , Bangalore, India
Winter School for radio astronomy at Gauribidnur radio observatory, organised by Raman Research Institute Bangalore, India

- **Computational Astrophysics Simulation Projects**

- Simulation of gravitational lensing effect
[Link for globular cluster gravitational lensing simulation animation](#)
[Link for Gravitational lensing simulation animation](#)
- Synthetic radial velocity curves generation
[Link to the animation file showing radial velocity curve with varying orbit parameter](#)
- 51 Pegasi-b orbital parameter estimation
[Link to the Jupyter Notebook](#)

LEADERSHIP ROLES

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| <ul style="list-style-type: none"> • Virtual Convocation , IIST : 2020 and 2021
Role - Core team member
Designed virtual reality setup in Blender | Role - Web Team Head
Full stack web development
Workshop management team leader |
| <ul style="list-style-type: none"> • Conscientia and Dhanak 2019 (IIST's Technical and Cultural festival) | <ul style="list-style-type: none"> • Academic vice captain
J.V.M Shayamali , Ranchi, India |

REFERENCES

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| <ul style="list-style-type: none"> • Dr. Samir Mandal
Professor, Dept. of Earth and Space Sciences
Indian Institute of Space Science and Technology,
Kerala, India.
Contact No : +91 9249661660
Email ID : sam.cenb@gmail.com , samir@iist.ac.in | <ul style="list-style-type: none"> • Dr. Sudip Bhattacharyya
Professor(H), Dept. of Astronomy and Astrophysics
Tata Institute of Fundamental Research, Mumbai, India
Contact No : 91 (022) 2278 2925
Email ID : sudip@tifr.res.in |
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