

Parth Sastry

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I am a graduate student in the Department of Physics, University of Massachusetts, Dartmouth working in Prof. Robert Fisher's group. I am currently exploring simulations of magnetorotational instabilities (MRIs) in accretion disks. My other research interests include astrophysical turbulence, doubly degenerate mergers and development of numerical MHD solvers. I've also previously worked on polarisation analysis of Gamma-Ray Bursts and Lagrangian Coherent Structures in dynamical systems. I have a strong coding background in Python, C/C++, MATLAB and FORTRAN.

education

Ongoing	M.S Physics, Ph.D. Engineering and Applied Sciences University of Massachusetts, Dartmouth
2022	B.Tech Engineering Physics Indian Institute of Technology, Bombay Thesis: X-Ray Polarimetry with the Daksha Space Telescope Advisor : Prof. Varun Bhalerao

research projects

Using Adaptive Mesh Refinement (AMR) in FLASH to look at evolution of MRIs in Accretion Disks
2023 - ongoing

Parth Sastry, Robert Fisher, Mark Ivan Ugalino

- ✂ Working on using AMR to improve efficiency of full MHD simulations of accretion disks in magnetized merger remnants

X-Ray Polarimetry with the Daksha Space Telescope 2022

Suman Bala, Sujay Mate, *Parth Sastry*, Advait Mehla, Divita Saraogi, et. al.

Daksha Science Preprint : [arXiv:2211.12052](https://arxiv.org/abs/2211.12052), Polarisation Preprint : *in prep*

- ✂ Worked on polarisation sensitivity calculations for Daksha, a proposed IITB-led space telescope
- ✂ Developed an analysis pipeline used on MDP calculations using simulations ran on full mass model for Daksha in GEANT4

Lagrangian Coherent Structures in Boids-like Simulations of Isolated Ant Colonies 2022

Parth Sastry, Manikandan Mathur

Code : https://github.com/parthsastry/AntSimulations_LCS

- ✂ Conducted Boids-like simulations of ants as mixed-memory reinforced random walks
- ✂ Performed LCS analysis on observed lane formation and schooling effects
- ✂ Reproduced circular milling as an asymptotic stationary solution of the dynamical system

Modelling of resonantly excited nonlinear wave trains in Saturn's rings 2022

Parth Sastry, Marius Lehmann

- ✂ Analyzed wavelet transforms of simulations of density waves in Saturn's "A" and "B" rings
- ✂ Working on modifying hydrodynamic simulation code to account for jumping of Lindblad Resonance Locations
- ✂ Compared wavelet transform data from simulations to Cassini-Huygens observations

posters/papers

Posters

- ✂ S Bala, S Mate, *P Sastry*, A Mehla, D Saraogi, Mithun NPS, S Palit, CS Vaishnav, G Waratkar, V Bhalerao, S Tendulkar, S Vadawale. GRB prompt emission polarimetry with proposed Indian high-energy transient monitor - Daksha. Poster (to be) presented at: Astronomical Society of India 2023; March 2023; Poster Link
- ✂ S Bala, *P Sastry*, D Saraogi, S Mate, S Palit, V Bhalerao, S Tendulkar, Mithun NPS, CS Vaishnav, S Vadawale. Daksha: X-Ray polarisation sensitivity. Poster presented at: Astronomical Society of India 2022; March 2022; Poster Link

Papers

- ✂ V. Bhalerao, D. Sawant, [et al, including *P. Sastry*] (2023) Science with the Daksha High Energy Transients Mission; Submitted to ApJ; arxiv link
- ✂ S. Bala, S. Mate, *P. Sastry*, et al (2023) Daksha Polarisation Sensitivity; Unpublished, In Prep
- ✂ S. Bala, D. Mukherjee, D. Bhattacharya, *P. Sastry*, J. Roy, V. Bhalerao (2023); A possible physical explanation of the observed anharmonic ratio between the cyclotron line energies of Cep X-4; Unpublished, Internal Circulation

outreach and teaching

Krritika Summer Program Mentor

2022

Parth Sastry

- ✂ Mentored 5 students on developing N-body simulation codes for simulations of galactic evolution as part of Krritika's(student-run astronomy club of IIT-B) Summer Program
- ✂ Conducted tutorials and workshops on collaborative code development and N-body simulation algorithms such as the Barnes-Hut algorithm

Writer for IEEE Sensors Digest

2021

Prof. Anil Roy, *Parth Sastry*

- ✂ Worked on writing for an IEEE sensors digest, aimed at educating pre-university kids about sensors used in everyday life

Teaching Assistant for Introductory Quantum Physics

2020

Parth Sastry

- ✂ Ran weekly tutorial sessions for solving problem sets and clarifying doubts for an introductory quantum mechanics course for freshmen

courses

Undergraduate-level Courses

Physics	Quantum Mechanics 1, Quantum Mechanics 2, , Photonics, Special Theory of Relativity, Classical Mechanics, Thermal Physics, Condensed Matter Physics, Statistical Physics, Electromagnetic Theory
Mathematics	Calculus, Linear Algebra, Ordinary and Partial Differential Equations, Complex Analysis, Introduction to Numerical Analysis
Computer Science	Logic for Computer Science, Data Structures and Algorithms, Design and Analysis of Algorithms, Computer Networks, Operating Systems
Others	Analog Electronics, Analog Electronics Lab, Digital Electronics Lab, Microprocessor Lab, Data Analysis and Interpretation

Graduate-level Courses

Physics	Statistic Thermodynamics, Fluid Dynamics, Non-Linear Dynamics, General Theory of Relativity, Astrophysics, Intro to Nuclear and Particle Physics, Intro to Atomic and Molecular Physics, Methods in Analytical Techniques, Computational Many Body Physics, Advanced Simulation Techniques in Physics, Physics of Semiconductor Devices, High-Energy Astrophysics [‡] , Gravitational Wave Astronomy [‡] , Quantum Computing [‡]
Mathematics	Differential Geometry, Combinatorics 2
Computer Science	High-Performance Scientific Computing [‡] , Foundations of Intelligent and Learning Agents, Digital Image Processing, Automated Reasoning
Others	Advanced Mathematical Methods, Numerical Methods

[‡]. To be completed by May 2023

references

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Prof. Sarah Caudill
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Prof. Manikandan Mathur
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