

Rahul Shinde

· GRADUATE STUDENT · RESEARCHER ·

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Education

Brown University

Providence, USA

MASTER OF SCIENCE (RESEARCH FOCUSED) | MAJOR: PHYSICS

Aug 2021 - May 2023

- GPA: **4.0/4.0**
- Outstanding Academic Accomplishment, Best Master's Thesis
- Master's Thesis: Investigating the Abnormal Weak Lensing Signal of Abell 1285

RELEVANT COURSES

- General Relativity, Electromagnetic Theory, Quantum Physics- I & II, Classical Theoretical Physics

BITS Pilani, Pilani Campus

Rajasthan, India

BACHELOR OF ENGINEERING | MAJOR: ELECTRICAL AND ELECTRONICS | MINOR: PHYSICS

Aug 2017 - May 2021

- Minor GPA (Best 5 courses): **8.4/10**
- Undergraduate Thesis: Localization Phenomenon in One Dimension

RELEVANT COURSES

- Intro to Astronomy and Astrophysics, Introductory Cosmology, Computational Physics, Nonlinear Dynamics and Chaos

Experience

Observational Cosmology and Gravitational Lensing Group, Brown University | |

Providence, USA

RESEARCH ASSISTANT, Advisor: Ian Dell'Antonio

Jan 2022 - Present

- **Local Volume Complete Cluster Survey (LoVoCCS)**
 - Employed LSST science pipelines along with LoVoCCS pipeline to process raw DECam data, measure the lensing signal and estimate the dark matter distribution in the galaxy clusters Abell 1285, Abell 1644 and Abell 2051
 - Investigated the abnormal weak lensing signal of A1285 by creating a pipeline to analyze 65 galaxy clusters in both WL and X-ray domains
 - Represented the astrolensing group twice at the annual poster presentation at Brown University
- **Jedisim (Lensing Simulation)**
 - Worked on improving *jedisim* - a lensing simulator developed to test the LoVoCCS pipeline
 - Successfully scaled the simulation by 225x to efficiently create a background image with 41 million lensed galaxies
 - Reduced simulation time significantly by identifying bottlenecks and implementing multithreading, resulting in a 93% decrease in processing time and memory usage
 - Simulated lensing effects of filament structures connecting galaxy clusters to test a detection algorithm developed by the group
- **Merging Clusters**
 - Currently studying the velocity dispersion, richness and spatial flux distribution in potential merging clusters in the LoVoCCS survey
 - This work would be compared with the weak lensing results for the respective clusters

STAR Lab, IIT Bombay |

Mumbai, India

SUMMER RESEARCH INTERN, Advisor: Varun Bhalerao

May 2019 - July 2019

- Worked on the satellite team *Daksha*, an all-sky high energy transient monitor with a very wide energy band, a massive undertaking by multiple Indian institutes funded by ISRO
- Performed simulations for the secondary source localization technique used on-board using Compton Imaging
- Incorporated the geometry of the detectors used (CZT, NaI) to perform preliminary calculations that would later be verified with actual experiments using an Americium-241 isotope as source

Team Anant, BITS Pilani

Rajasthan, India

STUDENT MEMBER, ATTITUDE DETERMINATION AND CONTROL SUBSYSTEM, Team Mentor: Kaushar Vaidya

Jan 2018 - Aug 2018

- Worked as a member of the ADCS team for the university's nanosatellite team
- Implemented numerous algorithms for estimation and error correction
- Worked on simulation of magnetorquers using a Helmholtz's cage and led discussions for the same
- Briefly worked on building the orbit propagator

Teaching

Department of Physics, Brown University

Providence, RI, USA

GRADUATE TEACHING ASSISTANT, COURSES: **PHYS 0030, PHYS 0040, PHYS 0060**

September 2021 - May 2022

- Designed and provided solutions to homework assignments and exams for the courses- Electromagnetism and Modern Physics, Basic Physics A and Basic Physics B
- Proctored and graded exams and homework assignments for undergraduate courses with 200+ students
- Held office hours for a semester to tutor students and provide help with their homeworks

Academic Projects

Localization Phenomenon in One Dimension

May 2021

UNDERGRADUATE THESIS ADVISOR: J.N. BANDOPADHYAY

- Worked in the domain of Quantum Floquet Systems. Studied periodically driven quantum phenomena
- Simulated localization phenomenon model under floquet disturbance
- Studied how topological band properties can be changed using periodic driving

Introductory Cosmology

May 2020

STUDENT ORIENTED PROJECT, ADVISOR: TAPOMOY GUHA SARKAR

- Studied current literature on a myriad of topics like cosmological structure formation and cosmic microwave background radiation
- Simulated different inflation models and compared them in a report

Ion Thrusters to Saturn |

November 2020

UNIVERSITY PHYSICS COMPETITION, ADVISOR: RISHIKESH VAIDYA

- Proposed an optimal trajectory for a low-thrust powered spacecraft to Saturn
- Employed multiple gravity assists to conserve fuel and time
- Used GMAT mission analysis software to simulate the trajectory and find fuel consumed and time taken

Publications

LoVoCCS – II. Weak Lensing Mass Distributions, Red-Sequence Galaxy Distributions, and Their Alignment with the Brightest Cluster Galaxy in 58 Nearby X-ray-Luminous Galaxy Clusters

February 2024

SUBMITTED TO THE ASTROPHYSICAL JOURNAL | [ARXIV](#)

Authors: Shenming Fu, Ian Dell'Antonio, ... , **Rahul Shinde** et al.

Awards

Outstanding Academic Accomplishment |

May 2023

DEPARTMENT OF PHYSICS, BROWN UNIVERSITY

- Scholarship awarded in recognition of academic excellence as a Master's student
- Ranked 1 in a class of 40+ graduate students over 4 semesters

ScM Research Excellence |

May 2023

DEPARTMENT OF PHYSICS, BROWN UNIVERSITY

- Scholarship awarded in recognition of the best master's thesis in the department
- Presented findings and successfully defended thesis

Bronze Medalist, University Physics Competition |

November 2020

INTERNATIONAL UNDERGRADUATE CONTEST IN PHYSICS

- Represented university in an international competition with 386 participating teams
- Proposed an optimal trajectory for a low-thrust powered spacecraft to Saturn

Second Place, Decoherence |

Jan 2019

NATIONAL PHYSICS COMPETITION, IISC, BANGALORE

- Ranked 2nd among 150 teams from all over the country through 3 rounds of testing
- Analyzed and modelled the behaviour of a cup-string telephone and optimized the performance

Outreach

AstroCodEx, Yale University |

May 2024

HACKATHON/CONFERENCE, ORGANIZER: *Imad Pasha*

- Selected & invited to create high-quality exercises that leverage astronomical data and techniques to teach critical coding skills to students
- Travel grant provided to attend conference

Eclipse Modelling Team

Sept 2023 - present

CENTER FOR THE FUNDAMENTAL PHYSICS OF THE UNIVERSE (CFPU), BROWN UNIVERSITY, TEAM MENTOR: *Richard J. Gaitskell*

- Building an automated physical simulation for the upcoming total solar eclipse to illustrate the phenomenon
- Creating a 20'x20' scaled-down demonstration for high school and undergraduate students

Skills

Programming Python, MATLAB, C, Mathematica

HPC/Software High Performance Computing (OSCAR Supercomputer), Slurm Workload Manager, SExtractor, DS9, Git, Linux, LaTeX

Libraries Astropy, Astroquery, NumPy, SciPy, Scikit-Learn, OpenCV, Pandas, Matplotlib, Seaborn, FITSIO, CUDA

Database SQL, NASA NED, SIMBAD, Vizier