Riya

Curriculum Vitae

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Education

2016–2020 **Bachelor of Technology**, *Department of Mechanical Engineering, Indian Institute of Technology, Bombay, India.*
CGPA: 9.38/10

2016 **Intermediate**, *Jawahar Vidya Mandir, Shyamali, Ranchi, India*, Percentage: 93%.

2014 **Matriculation**, *Bridgeford School, Ranchi, India*, CGPA: 10/10.

Research Interests

Astrophysics, Cosmology, Dark Matter and Dark Energy, Particle Physics, Satellite Technology, Aerospace Systems

Academic Achievements

2018 Ranked 7^{th} amongst **150** students in Mechanical Engineering Department

2016 Awarded the prestigious Kishore Vaigyanik Protsahan Yojna **(KVPY)** fellowship by **IISc**

2015 Ranked 1^{st} in Ranchi Chapter of Prof. Brahm Prakash Memorial Materials Quiz conducted by the Indian Institute of Metals

Research Experience

2018-Present **Star Formation Rate using Diffused Supernova Neutrino Background**

Supervisor *Prof. Vikram Rentala, Department of Physics, Indian Institute of Technology, Bombay*

- Involved in the validation of the existing star formation theories on the basis of observation of diffused supernova neutrino background (DSNB) going to be detected at Super-K.
- Simulated neutrino flux from diffused supernova neutrino background for different detected energy bins in a **neutrino detector** and validated the results from published plots
- Reviewed the existing methods for measuring star formation rate and analyzed the **best-fit models**.
- Critically examined the star formation theories using **chi-square test**

Technical Projects

2017-Present **IIT Bombay Student Satellite Project**

Advitiy - Second Generation Student Satellite of IIT Bombay

Attitude Determination and Control Subsystem

- Simulated attitude dynamics of satellite in python to determine the **attitude** deviation of satellite
- Justified that the satellite needs to be **controlled in eclipse region** after analyzing attitude deviation, power availability, transmission strength and system constraints
- Evaluated the use of **photovoltaic modules** (used for solar panels) for the sun vector measurement; **rejected the idea** as improvement in mass and power budget is negligible compared to increase in failure probability of satellite due to increased complexity of required electric circuit
- Analyzed the feasibility of different **sun-vector measurement** technologies for our satellite

Payload Subsystem

- Explored different applications of **cubesat based telescope** such as aerosol measurement, studying sun's chromosphere, finding relationship between solar flares and energetic particles etc. and inspected their implementation in a satellite
- Analyzed the electrical, mechanical and control law requirements of **star-tracker** to determine the feasibility of its application as an attitude sensor for cubesats following the guidelines of **ISRO**
- Worked on the design of electron emission circuit of **tether** for **deorbiting** the satellite

Course Projects

Spring 2018 **Big Bang Nucleosynthesis** (Course: Astrophysics)

Prof. Vikram Rentala, Department of Physics

- Obtained an overview of big bang nucleosynthesis, searched open problems and further studied the problem of **discrepancy** between predicted and measured amount of **lithium**
- Reviewed the prediction of **H, D, He** and **Li** abundances in the universe using currently accepted Maxwell Boltzmann distribution and then compared them to **Tsallis nonextensive statistics** model

Autumn 2017 **Multi-Client Server** (Course: Computer Networks)

Prof. Mythili Vutukuru, Department of Computer Science and Engineering

- Designed a server in **C++** which procures and serves data to multiple connected clients using **epoll**
- Formulated an algorithm to read key-value pairs from clients, store it and serve the values to clients

Summer of Science

An initiative by Maths and Physics Club to boost knowledge of pure sciences where one can study any topic under the guidance of a proficient mentor

Relativity Studied **special theory of relativity** and **tensor analysis** to lay the foundation of general theory

Cosmology Studied basics such as redshift, cosmological distance, density parameter, acceleration equation, Friedmann equation and used them to understand higher concepts such as dark matter, cosmic microwave background, inflation, baryogenesis etc. using newtonian approach

Internship

Winter 2017 **Aerostat for Military Surveillance**

Manastu Space Technologies Private Limited

- Designed an aerostat, a lighter than air aircraft and developed a two dimensional **gore-profile** for the construction of 3D design
- Manufactured a **prototype** using Low Density Polyethylene and experimentally determined the increase in lift for **kytoon** which is a combination of heavier than air kite and lighter than air balloon

Positions of Responsibility

2018-Present **Subsystem Leader, Control Subsystem, Advitiy**

- Spearheaded a team of **8** people to develop **quality assured** simulation frame-work for attitude dynamics of satellite
- As a part of the Social Goal of the project, a pro bono outreach effort to facilitate knowledge sharing, contributed to **Satellite 101 wiki**, which reached **5.8k** pageviews and **1.4k** users around the globe within a month
- Executed three step recruitment process to select **8** students for the subsystem from **50+** applicants evaluating their technical ability, practical approach and team work

Summer 2018 **Teaching Assistant**

Prof. D M Dewaikar, Department of Civil Engineering, IIT Bombay

- Entrusted with the responsibility of tutoring **35** students for the course 'Engineering Mechanics'
- Helped students get better insight of the course, clarified doubts and assisted in solving numericals

Autumn 2017 - Spring 2018 **Associate Secretary**

Department of Mechanical Engineering, IIT Bombay

- Responsible for facilitating the interaction of **140+ freshmen** with department faculties and seniors
- Successfully organized events like convocation, department trip etc. catering to **500+ students**

Technical Skills

Languages	Python, C++, LaTeX, HTML
Simulation	MATLAB
OS	Windows, Linux
Microcontroller	Arduino, Embedded C
CAD	SOLIDWORKS, AutoCAD

Relevant Courses

- **Mechanical**
- Fluid Mechanics
- Heat Transfer
- Thermodynamics
- Mechanical Measurements
- **Mathematics**
- Introduction to Numerical Analysis
- Linear Algebra
- Calculus
- Data Analysis and Interpretation
- Differential Equations
- **Physics**
- Astrophysics
- Basics of Electricity and Magnetism
- Quantum Physics and Application
- Electrical and Electronics Circuits

Extra-Curricular

Sports and Cultural

- **Winner** of institute girls' **football tournament**
- Represented hostel in design genre of Freshiezza, inter hostel freshmen cultural competition

Social Service

- Taught **basic mathematics** to students belonging to classes **6-9** at Abhyasika, an NGO which provides free and quality education to underprivileged children of nearby slums, for **4 months**
- Assisted in execution of 'SHE' an initiative by **Techfest** to promote Sanitary and Health Education through a network of distribution of **200000+** sanitary pads through a route covering **37** villages

Public Outreach

- Organized and conducted a **Ground Station Workshop** under Advitiy attended by **50+** students and presented the use and working of rotor and rotor-interface for precise alignment of antenna
- Exhibited Pratham in engineers' conclave held at sixth **Inter-IIT Technical Meet**

Hobbies

- Went to several **amateur astronomy** events including visit to Giant Metrewave Radio Telescope
- Went to various treks organised by institute including trek to **Kalsubai**, highest peak in Maharashtra