

Apurv Keer | Curriculum Vitae

☎ (+91)9167710830 • ✉ apurvkeer@gmail.com

Education

Indian Institute of Technology Bombay <i>Bachelors of Technology, Department of Physics</i> Majoring in Engineering Physics , while pursuing an Honours in Physics	(GPA: 8.00/10) ('21 - Present)
Nirmala Memorial Foundation College Of Science And Commerce <i>Intermediate / +2: Physics, Mathematics, Chemistry, Computer Science</i>	(GPA: 95.5%) ('19 - '21)
St. John's High School <i>Matriculation: Science, Mathematics, Social Sciences, Languages</i>	(GPA: 90.2%) ('19)

Scholastic Achievements

Secured **99.15** percentile in **Joint Entrance Exam - Main** amongst **1 million+** candidates ('21)
Secured **98.11** percentile in **Joint Entrance Exam - Advanced** amongst **0.14 million+** candidates ('21)
Secured **99.86** percentile in **MHT Common Entrance Test** amongst **0.41 million+** candidates ('21)

Key Projects

Exact Black Hole Solutions in Modified Gravity

(Guide: Prof. Shankaranarayanan S, Department of Physics) (Jan '23-Present)

- Studying **General Relativity** and doing exercises from the book **Gravitation : Foundations and Frontiers** by Prof. T. Padmanabhan
- Surveying a review on **4D Einstein Gauss-Bonnet Gravity** to understand **Lovelock gravity** and the **Gauss-Bonnet term**

Cosmology And Dark Matter

(Summer Of Science, Maths And Physics (MnP) Club, IIT Bombay) (May '22-July '22)

- Studied Einstein's **General Relativity** and used it to study **mathematical models** of the universe
- Studied the **epochs** of our universe and it's various models explaining **dark matter** and **dark energy**
- Made a comprehensive **report** on \LaTeX and an interactive **presentation** for others to use as a reference

Exploring HR Diagrams

(Computational Astronomy Bootcamp, Krittika: The Astronomy club of IIT Bombay) (Aug '22-Nov '22)

- Virtually attended two weeks of workshops about **computational astronomy**
- Focusing on understanding **Stellar Evolution** and **Stellar Classification** using **observational data**
- Using **Python**, **Numpy** and **Matplotlib** for array manipulation and **Statistical Physics** for inferring results
- Working on the data of cluster **NGC 2808** from **HST UV Globular Cluster Survey (HUGS)** with more than **100 million** data points, created the **HR Diagram** of the cluster and a **scatter plot** of the **stellar positions** data

Astrophysically Accurate Animations

(Krittika Summer Project, Krittika: The Astronomy club of IIT Bombay) (June '22-Sept '22)

- Made a simulation of **Binary Black hole merger** using **Blender** - a 3D computer graphics software
- Demonstrated the **merging of black holes** and **Gravitational Waves** using **graphical visualization**
- Implemented the use of **python scripting** in Blender to **accurately plot orbits** of the black holes

Course Projects

Non-Linear Dynamics in Biochemical Networks

(Guide: Prof. Amitabha Nandi, Department of Physics)

(Autumn '22)

- Worked in a team of 4 on basic building blocks of **dynamic behaviour** in **non-linear control systems**
- Studied how simple **signaling pathways** can be embedded in networks using **positive** and **negative feedback** to generate **complex behaviours** like **toggle switches** and **oscillators** using **mathematical techniques**
- Analysed** and prepared a **presentation** on a research paper about **Sniffers, buzzers, toggles, and blinkers**: dynamics of regulatory and signaling pathways in the cell

Underlying Events in Proton-Proton Collisions

(Guide: Prof. Sadhana Dash, Department of Physics)

(Autumn '22)

- Worked on data of **two million** events in pp collision systems generated using Pythia 8 Monte Carlo event generator
- Worked across **six multiplicity** classes categorizing the particle distribution into **three regions** based on the azimuthal angle of direction of the leading jet and exploring the **transverse momentum** and **rapidity** distributions
- Used **ROOT** software to **plot** distributions in various regions and multiplicity classes to **inferred** various trends

On Disproving Ether Drag Hypothesis

(Guide: Prof. Hridis Pal, Department of Physics)

(Autumn '22)

- Gave a **presentation** for **60+ students** about a **contradictory hypothesis** of the **Special Relativity**
- Studied **Stellar Aberration, Fresnel Drag Coefficient & Fizeau's experiment** about light drag in a moving medium which disproved the **ether drag hypothesis** and the **existence** of a special reference frame, **ether** frame

Technical Skills

Languages	C++, HTML, Python (Numpy, Pandas, Scipy, Matplotlib, Astropy)
Softwares	Blender, L ^A T _E X, ROOT, LTSpice, AutoCAD

Courses Undertaken

Physics	Special Theory of Relativity, General Relativity*, Classical Mechanics, Basics of Electricity & Magnetism, Quantum Mechanics*, Waves and Oscillations*, Data Analysis & Interpretation, Non-Linear Dynamics, Thermal Physics
Electrical Engineering	Introduction to Electronics, Digital Systems*, Electronics Lab (Basic & Op-amp circuits, Digital electronics*)
Mathematics	Linear Algebra, Complex Analysis, Differential Equations, Calculus, Introduction to Numerical Analysis*
Miscellaneous	Engineering Graphics & Drawing, Economics, Freshman Biology, Computer Programming and Utilization, Chemistry

Extracurriculars

- Awarded **Student Of The Year** by **Times Of India NIE** for securing **first** rank in the school ('19)
- Appointed as the school **Head Boy**, **St. John's High School**, for **three consecutive years** ('17 - '19)
- Placed **4th** in the **Mumbai** and was selected for **State Level Suryanamsakar** competition ('16)
- Learned **Drums** through **Introductory Music Learning** Programme by **IIT Bombay** ('22)