Manan Seth, 20

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https://github.com/Manan-Seth/Projects
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Education

2019 - Present — **B.Tech. Engineering Physics with Honours**
Indian Institute of Technology, Bombay.
CPI: 8.56

Awards and Scholarships

2019
- Secured a rank in the **top 1%** in IIT-JEE Advanced examination among 160,000 applicants.

2018
- Conferred with the **KVPY Scholarship** by Govt. of India by securing a rank in the top 1%.
- **Rank 9 and Rank 3** in the first and second levels respectively of International Olympiad of Science by Silverzone Olympiads.
- **Rank 5** in the International Olympiad of Mathematics by Silverzone Olympiads.
- **All India Rank 71** in the National Level Talent Search Examination (NSTSE).

Projects

Helioseismology and Exotic Particle Physics [*May'21-Present*]
Prof. Vikram Rentala, IIT Bombay

- Studied the equations of stellar structure, stellar oscillations, basics of Helioseismology, including observational and inversion techniques and the solar abundance problem
- Discussed various solutions to the solar abundance problem as part of Prof. Rentala's research group
- Studied non-diffusive energy transport through exotic particles in the Sun as a possible solution
- Exploring possibilities of detection of g-modes to resolve the solar interior in greater detail

Quantum Imaging Using Complex Degree of Coherence [*Jan'21-Apr'21*]
Prof. Anshuman Kumar, Waves & Oscillations & Optics, IIT Bombay

- Analysed methods in **optical imaging and metrology** of remote bodies through measurements of quantum parameters using **linear optics** and quantum photon number resolving detectors
- Demonstrated the limitations of classical imaging due to the Rayleigh diffraction limit and suggested improvements by simulating a **quantum imaging framework** by creating an executable paper
- Implemented an **image reconstruction algorithm** based on Fourier Transformation
- The project demonstration was adjudged to be one of the best in the course and earned a perfect score

High Energy Astrophysics [*April'20-Jun'20*]
Summer of Science, Maths and Physics Club, Institute Technical Project, IIT Bombay

- Studied about the High Energy Astrophysics phenomena and allied areas
- Studied several high energy particle and astrophysical phenomena such as Nuclear Interactions, Ionisation Losses, Synchrotron Radiation, Interstellar gas interactions and the various cases of **death of stars**
- Acquired fundamental knowledge of related domains such as the Special Theory of Relativity, Study of Cosmic Rays, **Stellar Evolution** and the Study of Galaxies

Fractals in Nature [*Sept'20-Dec'20*]

Prof. Amitabha Nandi, Nonlinear Dynamics, IIT Bombay

- Studied the fundamentals of fractals by calculating fractal dimension simulating the Mandelbrot and Julia sets
- Calculated the fractal dimension of real world objects like Broccoli and Romanesco by experimentally determining cross sectional dimension and fitting it to a Pythagoras tree model

Hertzsprung-Russell Diagrams [*Nov'19-Jan'20*]

Krittika Winter Projects, Krittika - The Astronomy Club, Institute Technical Project, IIT Bombay

- Analysed extensively HR Diagrams and their uses in Astronomy in a group of 4 members
- Built a strong base of Astronomy and main sequence stellar evolution, used **isochrone fitting on Python** to plot HR Diagrams and estimated factors like age, distance and others of globular clusters whose data was obtained from the Hubble UV Globular-Cluster Survey - **HUGS Catalogue**

Positions of Responsibility

Institute Astronomy Secretary | **Krittika** [*Apr'21-Present*]

Convener | **Krittika** [*Jun'20-Apr'21*]

Krittika: The Astronomy Club, Institute Technical Council *IIT Bombay*

- Managed a team of 40+ astronomy enthusiasts from across the country belonging to various institutes for the Krittika Summer Projects on topics such as photometry of supernovae, analysing eclipsing binaries and simulating Kirkwood gaps
- Organised an extensive lecture series on various aspects of astronomy by involving professors from IIT Bombay and TIFR.
- Headed a review panel and supervised the Institute Technical Summer Projects for over 50 teams and mentors working on projects involving ML, coding, web and app development and 3D Modelling.
- Part of team of 10 conveners, responsible for organising several **Institute-Wide Events** such as lectures, workshops, group discussions, projects, stargazing sessions and interactive online activities including quizzes and trivia.
- Processed images taken by the 0.7m GROWTH-India telescope at Hanle-Ladakh for Astrophotography
- Moderated a three-day long Astrophysics workshop with **over 200 attendees** covering theoretical and coding experience for topics like EM Transients, Grav. Wave Analysis and their EM Counterparts

Key Courses

Physics	Supervised Learning Project, Quantum Information and Computing*, Quantum Mechanics 1 and 2, General Theory of Relativity, Non-Linear Dynamics, Introduction to Condensed Matter Physics*, Statistical Physics*, Electromagnetic Theory*, Photonics, Waves and Oscillations and Optics, Introduction to Special Theory of Relativity, Classical Mechanics, Data Analysis and Interpretation, Quantum Physics and Application, Basics of Electricity and Magnetism, Physics Lab 1, 2 and 3
Mathematics	Numerical Analysis, Complex Analysis, Differential Equations I and II, Calculus, Linear Algebra
Miscellaneous	Electronics Labs I, II, III and IV, Reading Literature, Digital Systems, Economics, Introduction to Electronics, Organic and Inorganic Chemistry, Engineering Graphics and Drawing, Biology

**to be completed by Apr 22*

Skills

Programming	C++, Python (Numpy, Astropy, Matplotlib, Pandas), Java, Root
Softwares	LaTeX, LTSpice, AutoCAD, Fusion 360, DS9