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: 8.3

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

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 and suggested improvements by simulating a classical and **quantum imaging framework** by creating an executable paper on python
- 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

Arduino Based Smart Heart Monitor *[Sept '21 - Oct '21]*
Prof. Varun Bhalerao, Microprocessors Lab, IIT Bombay
- Developed Smart Heart Monitor through analog and digital hardware and C++ based Arduino IDE software processing on Arduino Uno in a group of three members
- Implemented a system to read person's live PPG waveform and coded **moving average algorithm** on Arduino to obtain and display pulse rate and blood oxygen saturation to high accuracy levels

Helioseismology and Exotic Particle Physics *[May'21-Present]*
Prof. Vikram Rentala, IIT Bombay
- Studied the equations of stellar structure & oscillations by using observational & inversion techniques, including the **instrumentation of upcoming space based LISA** Gravitational Wave Detector
- Discussed various solutions to the solar abundance problem as part of Prof. Rentala's research group

Higher Moments of Transverse Momentum in p-p Collisions *[Sep'20-Dec'20]*
Prof. Sadhana Dash, Data Analysis and Interpretation, IIT Bombay
- Analysed the trends of standardized and intensive skewness and standardized variance of p-p collisions generated using Pythia 8 Monte Carlo event generator in a group of seven members
- Learnt how to use the data analysis package **ROOT** developed by **CERN**

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 four 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**

Mathematical Modelling of Topologically Interesting Surfaces [*May'20-Jul'20*]

Institute Technical Summer Project, Institute Technical Council, IIT Bombay

- Received special mention for reaching the **Top 6** teams out of the 65 participating teams by developing **3-D Printable Software Models** and interactive **Online Learning Resources**
- Created mathematically accurate virtual models of Klein Bottles, Möbius Strips, 3-D representations of wavefunctions of a one-electron hydrogen atom and ball-and-stick models of chemical compounds
- Used **Application Programming Interface** for Fusion 360 and coded for surfaces **using Python**

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

Prof. Amitabha Nandi, Nonlinear Dynamics, IIT Bombay

- Studied concepts of fractals like fractal dimension by 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**

Constructing a Synthetic Analemma [*May'20-Aug'20*]

Krittika Summer Projects, Krittika - The Astronomy Club, Institute Technical Project, III Bombay

- Studied the complex orbital motions of heavenly bodies from the earth's frame of reference giving rise to Analemmas in a group of eight members
- Derived the equation of motion of bodies in the frame of reference of an observer on earth, and analysed the effect of each observational and orbital parameter on the properties of the analemma

Positions of Responsibility

Institute Astronomy Secretary | **Krittika** [*Apr'21-Apr'22*]

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

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

- Managed 40+ astronomy enthusiasts from **across the country** from various institutes for the Krittika Summer Projects on photometry of supernovae, analysing eclipsing binaries and Kirkwood gaps
- Organised an extensive lecture series on astronomy by involving professors from IITB 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 **Institute-Wide Events** such as lectures, workshops, group discussions, projects, stargazing sessions and interactive online activities.
- 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, Introduction to Renewable Energy Technologies, Reading Literature, Digital Systems, Economics, Introduction to Electronics, Organic and Inorganic Chemistry, Engineering Graphics and Drawing, Biology

Skills

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