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Department: Energy Science and Engineering, IIT Bombay

ACADEMIC DETAILS

Examination	University	Institute	Year	CPI/%
Graduation	IIT Bombay	IIT Bombay	2026	7.73
Intermidiate	BSER	Navjeevan Science School, Sikar	2021	96.20%

Pursuing Minor in **Machine Intelligence and Data Science**

Scholastic Achievements

- Consolidated a **top 5% rank** in **IIT JEE Advanced** examination among **0.16 million** candidates *(2022)*

Key Projects Undertaken

Energy Science Project

Battery v/s Hydrogen | Course Project: Hydrogen Energy *(Feb'24 - Apr'24)*
Guide: Prof. Pratibha Sharma | Energy Science and Engineering *IIT Bombay*

- Researched **battery** evolution or gathered **EV** sales data, and investigated **FCEV** as part of a three-person team
- Investigated **hydrogen** economies and compared future trends of hydrogen versus EV tecno in Germany and Japan
- Assessed **H-CNG** based engine feasibility and estimated **0.06 MT hydrogen** allocation for H-CNG applications
- Implemented **ARIMA** to forecast EV sales, renewable and nonrenewable energy production and costs,identify correlations

Carbon Capture Technologies | Learners' Space *(July'24 - Present)*

- Researched carbon capture technologies and their role in **climate change** analysis, including IAMs and SSP scenarios
- Analyzed global and Indian strategies for integrating **carbon capture** to combat **climate change** more effectively.
- Evaluated carbon capture **policies** and their impact on **sustainable development** and climate mitigation efforts

CFD Analysis: Double Pipe Heat Exchangers | Fluid Mechanics & Heat Transfer *(Mar'24 - Apr'24)*
Guide: Prof. Manaswita Bose | Energy Science and Engineering *IIT Bombay*

- Designed and meshed double pipe **heat exchanger** models, optimizing performance for different fluids or flow types
- Performed CFD simulations of counterflow and parallel flow heat exchangers using various fluids in **Ansys Fluent**

The Role Of ESG Metrics In Investment Strategies | FinSearch *(July'24 - Present)*

- Analysis of ESG reports to evaluate company performance, focusing on **sustainability**, **ethics**, and **transparency**
- Developed ESG investment strategies, integrating **environmental**, social, and governance factors for optimal returns
- Researched **ESG frameworks** and standards, ensuring alignment with best practices and **regulatory requirements**
- Assessed transparency in ESG reporting, addressing **criticisms** and enhancing investment **decision-making** processes

Design and Development of power- electronics | iSURP *(July'24 - Present)*
Guide: Prof. S Ravi Prakash Reddy | Energy Science and Engineering *IIT Bombay*

- Evaluated and simulated a **boost converter** in PLECS, focusing on its DC-DC power conversion for electric vehicles
- Designed and simulated a **boost PFC converter** in **PLECS**, investigating methods to achieve unity power factor by controlling the duty ratio of the switch, essential for efficient /textbfAC-DC conversion in **EV** charging systems.

Mobile Charger | Course Project: Power- electronics *(Mar'24 - April'24)*
Guide: Prof. S Ravi Prakash Reddy | Energy Science and Engineering *IIT Bombay*

- Examined charger circuit analytically, simulated it in **Plecs** software, and validated performance via **Oscilloscope**
- Demonstrated proficiency in **power electronics** by designing, simulating, and testing **charger circuit** practically

Box Type Solar Cooker | Fundamentals of Energy Engineering *(Mar'23 - April'23)*
Guide: Prof. Shireesh Kedare | Energy Science and Engineering *IIT Bombay*

- Designed a cost-effective solar cooker using aluminum foil and cardboard, reaching temperature near **94°C** in **1 hour**
- Built a box-type cooker with 4 reflectors, measuring its First Figure of Merit **0.1107** and thermal efficiency **11.4%**
- Documented design parameters with a **0.2144** concentration ratio to optimize solar energy for cooking technologies

Otto Cycle | Course Project: Thermodynamics and Energy Conversion *(Sept'23)*
Guide: Prof. Ashish Kumar Sarangi | Energy Science and Engineering *IIT Bombay*

- Studied and evaluated a real **Otto Cycle**, calculating its **performance** parameters using practical data collected
- Used **Python** to effectively sort data, plot graphs, and compare theoretical and practical work done by Otto Cycle

ML and Other Projects

Computer Vision *(Jun'24-Present)*

Summer Project: Summer of Science | Institute Technical Council, IIT Bombay

- Gained expertise in implementing and troubleshooting **deep learning** models, focusing on practical applications
- Learned advanced architectures: **VGG16, RCNN, Faster RCNN, Mask RCNN, UNet, R2Attention UNet**
- Implemented VGG16 for **image classification** and Mask R-CNN for **object detection**, achieving improvements
- Developed and deployed **UNet** and **R2Attention UNet** for **image segmentation**, achieving accuracy enhancements.

ReinFLY: AI Learns to Play Flappy Bird *(Jun'24-Present)*

Summer Project: Seasons of Code | Web and Coding Club, IIT Bombay

- Created a fully functional Flappy Bird game from scratch using **Pygame** library to understand game mechanics
- Implemented a **Deep Q-Network** model to train an AI agent to play Flappy Bird autonomously and more efficiently
- Utilized **reinforcement learning** techniques to **optimize** the agent's performance and improve game play strategies
- Fine-tuned hyper parameters to improve the agent's learning process, achieving significantly higher scores and stability

T20 Score Prediction *(Dec'23-Jan'24)*

Winter Project: Winter in Data Science | Analytics Club, IIT Bombay

- Performed extensive **EDA** Analysis and feature engineering on T20 Match datasets to enhance predictive accuracy
- Preprocessed data using **ColumnTransformer** and **Pipeline**, incorporating **one-hot encoding** and **scaling**
- Implemented and evaluated **Linear Regressor, Random Forest, KNN, Decision Tree, and XGBoost models**
- Achieved **88.74%** accuracy with **RF**, selecting the best model, and deployed the predictive model using **Streamlit**.

Space Solutions for Dual Occupancy in Older Hostels | Design Thinking *(Feb'24 - Apr'24)*

Guide: Prof. Nishant Sharma | Industrial Design Centre *IIT Bombay*

- Created a mobile app interface using **Figma** that shows the real-time occupancies of hostel & college study facilities
- Utilized the product design methodologies like user persona creation empathy mapping for user-centric solutions
- Applied the **SCAMPER** framework for product ideation and iterative **prototyping**, effectively using various creative techniques like brainstorming, mind mapping, and affinity mapping to refine and further enhance critical product concepts

Line Follower and Mountain Cargo Carrier | Course Project: Makerspace *(July'23)*

Guide: Prof. Ankit Jain | Mechanical Engineering, Prof. Joseph John | Electrical Engineering *IIT Bombay*

- Designed and built a pre-programmed **line-following bot** capable of climbing slopes up to 30° with a 500g payload
- Crafted the cargo bot's mechanical parts using AutoCAD **Fusion 360**, **3D printing**, and **laser cutting** technologies
- Implemented the **electrical** architecture using **Arduino board**, **motor drivers**, intricate connections and assembly
- Created a gravitational load-dumping mechanism that activates automatically upon reaching its designated destination

Positions of Responsibility

Web Activity Associate | NSS, IIT Bombay *(Jun'23 - Apr'24)*

Part of a team of 4 people responsible for maintaining and updating the websites of NSS, IIT Bombay

- Contributed to the previous **webpages** of NSS, making changes and updating the existing codebase on **PHP**
- Collaboratively developed a **digital attendance** portal on the NSS website for AA to take attandense of volunteers
- Collaborated with the team develop the new **NSS website**, including the Home page and department pages
- Contributed to the creation and ground implementation of the **website** for **Flair, the Annual event of NSS**

Technical Skills

Programming	**C++**, **Python**, HTML, CSS, JavaScript, SQL
Data Science	**Tensorflow, Keras, Pytorch**, Numpy, Pandas, Matplotlib, Seaborn
Tools	AutoCAD, COMSOL, ANSYS, LaserCAD, Arduino IDE, LaTeX, Figma, Excel, Office Suite

Key Courses Undertaken

- **Energy Science:** Fundamentals of Energy Science and Engineering, Hydrogen Energy, Reactions for Energy, Fluid Mechanics and Heat Transfer, Thermodynamics and Energy Conversion, Material Science for Energy Applications,Power Electronics, Electrical Networks and Machines, Electrical Networks and Machines Lab, Energy Conversion Lab, Environmental Studies
- **ML and Computer Science:** Computer Programming and Utilization, AI and Data Science, Introduction to Machine Learning, Supervised Machine Learning, Advanced Learning Algorithms
- **Mathematics & Physics:** Calculus, Linear Algebra,Differential Equations,Introduction to classical Physics, Introduction to Quantum Physics, Organic & Inorganic Chemistry, Physical Chemistry
- **Miscellaneous:** Economics, Design Thinking for Innovation, Makerspace

Extra-Curricular Activities

- Volunteered as substitute teacher for 50+ students at Dhruva VRIKSH, preparing for JEE *(Aug '22 - Nov '22)*
- Participated in Muskaan and Neem School initiatives, instilling values in children aged 3-10 *(Feb'24 - July'24)*
- Achieved honorable mention in Innovate-a-thon '24 by Blix for outstanding innovative solutions *(2024)*
- Represented Hostel 6 in Crossy GC, completing a 5.5 km marathon across campus *(2024)*