Pursuing a Minor In **Computer Science and Engineering**

Scholastic Achievements

- Cleared the **Zonal Informatics Olympiad** held by the Indian Association for Research in Computer Science *(2020)*
- Scored **1510/1600** on the Scholastic Assessment Test (SAT) and placed in the **Top 1 Percentile Globally** *(2019)*
- Among the **Top 50 Students Nationally** at Techkriti Open School Championship by Techkriti, IIT Kanpur *(2017)*
- **Led the district-level winning team** and qualified for the state level at the **National Children's Science Congress (NCSC)**, a program of the Department of Science and Technology, Government of India *(2017)*
- Awarded the school's **Badge of Distinction** for qualifying to and participating in state level NCSC *(2017)*
- Awarded the **Scholar's Badge** for consistently good academic performance (Delhi Public School Patna) *(2017)*
- Cleared the **Regional Mathematical Olympiad** to qualify for the Indian National Mathematical Olympiad *(2016)*

Development Projects

ResoBin
DevCom, IIT Bombay *(Dec '21 - Mar '22)*

- Worked as a **Front-end Developer** on ResoBin: a Progressive Web Application designed as an umbrella platform for academic resources and course management for the students of IIT Bombay, utilized by **2000+ daily users**
- Used state-of-the-art **React** libraries to develop a robust set of features for the portal's timetable page - including **UI/UX improvements**, slot clash warnings, timetable sharing, and **portability to Google Calendar**
- Designed the platform's **logo, light theme** and **promotional content** using **Adobe Illustrator** and **Canva**

Project Digipad *(June - Sept '21)*
DevCom, IIT Bombay

- Developed a pair of complementary, **fully cross-platform** mobile and desktop applications to allow a user to make use of their mobile phone as a replacement for a digital writing pad
- Designed, Tested and Deployed a desktop application via the **Electron.js** framework, **Node.js, HTML and CSS**
- **Ideated unique and original features** such as a user-controlled box to define a map from mobile to desktop screen
- **Programmed an API** to handle requests made by the mobile app, allowing the user to have smooth control over the cursor movement and box position/size/orientation on the desktop by using the mobile application

Digital SEC Filing Analyzer
10th Inter IIT Tech Meet *(Mar '22)*

- Part of a 9-member team creating an **Interactive Dashboard** capable of **analyzing SEC Filings** of all US Listed SaaS companies via Sentiment Analysis and Natural Language Processing; **won the silver medal among 10 IITs**
- Finalized the front-end technology stack and developed the initial UI draft following mockups provided by the designer
- **Built an Intuitive UI** for the company dashboard to display insights obtained from Sentiment Analysis and NLP

Machine Learning Projects

Heartbeat Classification
Prof. Abir De | Course Project - CS 419 *(Apr - May '22)*

- **Trained ML models** on the *Classifying Heart sounds Challenge (PHSC)* dataset published by Peter Bentley et al
- Preprocessed audio samples into an image format via the Mel-Frequency Spectrogram for data inspection and input
- Applied **SVMs**, **SGD**, **AdaBoost** to benchmark results. Decreased cross-entropy loss from 1.6 to 1.02 using **LSTMs**

Data Analysis of the Indian Premier League *(Dec '21 - Jan '22)*
Winter in Data Science | Analytics Club, IIT Bombay

- Performed Exploratory Data Analysis on IPL datasets for obtaining the best performing team, players etc. using **Pandas**, **Seaborn**, **Plotly** and **Matplotlib** in Python with Google Colab
- Implemented **Predictive Data Analysis** using Linear, RF, SVM and **Neural Network regressors**
- Applied **feature engineering** and curated Logit, SVM, Decision Tree Classifiers for predicting the match winner

Reinforcement Learning *(May - July '21)*
Summer of Science | Maths and Physics Club, IIT Bombay

- Studied the theory behind Reinforcement Learning i.e. **Markov Decision Processes** and the Bellman Equation
- Learnt the major approaches to solve an RL problem: **Dynamic Programming**, **Monte Carlo** and **T-D Learning**
- Applied the algorithms learned to **real-world problems** such as the k-armed bandits problem, developing a probabilistically perfect Blackjack AI, and computing electric fields via numerically solving Laplace's Equation

Research Projects

Lightsail Project (Ongoing)
Guide: Prof. Anshuman Kumar | Laboratory of Optics of Quantum Materials, IIT Bombay *(Mar '22 - Present)*

- Studying a **research problem** about optimizing broadband reflectivity of **nanophotonic crystal slabs** for the purpose of designing a laser-driven **light sail** capable of reaching relativistic speeds
- Used **S4**, a **Rigorous Coupled Wave Analysis** solver for **optical simulations** through scripts written in **Lua**.
- Ran simulation scripts on IIT Bombay's **High Performance Computing Cluster**, using MPI for parallelization
- Wrote Python scripts to extract variables of interest from raw simulation data in order to generate publishable results

MCGM Covid-19 Data Analysis *(July '21 - Jan '22)*
Prof. Mithun K. Mitra | Research Project

- Investigated **Covid-19 datasets** obtained from the Municipal Corporation of Greater Mumbai (MCGM) with **480,000+ entries** comprising of testing and contact tracing data files, recorded over the entire pandemic
- Reformatted and merged inconsistently formatted data files into coherent datasets via **Pandas**, **NumPy** and **Excel**
- **Visualized geospatial data** by implementing third-party APIs to perform geolocation on addresses
- Constructed stationary and **time-varying heatmaps**, **choropleth** and **cluster maps** using **Folium** and **Plotly** to help understand the spread of cases in a particular municipal ward

Positions of Responsibility

Core Member *(Mar '21 - Mar '22)*
DevCom, IIT Bombay

- Member of IIT Bombay's **largest developers' community** - DevCom - responsible for **ideating, developing and deploying** various applications for the institute; envisioned as a team of the institute's finest developers
- Designed **graphics, social media content, team t-shirts** and other merchandise for Web and Coding Club (WnCC) and Developers' Community (DevCom) in **Adobe Illustrator**, **Adobe Express** and **Canva**
- **Conducted a seminar** on Game Development using HTML5 and JavaScript with an OOP Paradigm and **mentored 4+ student teams** participating in GameDev Hackathon organized by DevCom

Technical Skills

- **Programming** C, C++, Python, R, JavaScript, Java
- **Development** HTML5, CSS, React, TailwindCSS, Bootstrap, Angular, Node.js, Electron.js, Django
- **Data Science** NumPy, Pandas, SciPy, Scikit-Learn, GeoPy, GeoPandas, Seaborn, Matplotlib, Plotly, ROOT
- **Software** Android Studio, Unity, Visual Studio, Adobe Illustrator, Arduino IDE, LTSpice, LaTeX

Relevant Courses Undertaken

- **Physics:** Basics of Electricity and Magnetism, Special Theory of Relativity, Classical Mechanics, Thermal Physics, Quantum Physics and Applications, Quantum Mechanics I, General Theory of Relativity, Waves Oscillations and Optics
- **Mathematics:** Linear Algebra, Differential Equations, Real Analysis, Complex Analysis, Numerical Analysis
- **Computer Science:** Introduction to Machine Learning, Computer Programming and Utilization, Logic for CS
- **Other:** Digital Systems, Introduction to Biology, Physical Chemistry, Introduction to Economics Data Analysis and Interpretation, Introduction to Electronics Data-Driven Astronomy (MOOC offered by The University of Sydney)

Extracurricular Activities

- **Stood 19th Nationally** at the World Programming Championship organized by TechFest, IIT Bombay *(2021)*
- **Placed 23rd** at the Inter-IIT CP Contest hosted by IIT Gandhinagar; **2nd** within IIT Bombay *(2021)*
- Bagged the **159th position Nationally** at Code Gladiators 2021; among the Top 500 Finalists for three years
- **Winner** of the Case Study event at the **National Students Space Challenge**, organized by IIT Kharagpur *(2021)*
- Trained **Vocalist** in **Hindustani Classical Music**: Passed the **Sangeet Prabhakar Examination** with Division I to conclude a 6 year long course; studied Folk and Devotional Music along with the **Harmonium**
- Successfully completed one year of training in Hindustani Classical Vocal under NSO Vocals, IIT Bombay *(2021)*
- **Placed 38th** in the **National Under-17** Chess Championship held by the All India Chess Federation *(2015)*
- **Placed 3rd** at the Freshmen Open Tournament held by Dark Knight - Chess Club, IIT Bombay *(2020)*