Shashwat Prakash **22B0678**
Mechanical Engineering **B.Tech.**
Indian Institute of Technology Bombay **Gender: Male**
DOB: 05/08/2004

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	
Intermediate	CBSE	S.R. Public Senior Sec. School	2022	95.00%
Matriculation	ICSE	Little Flower School	2020	98.80%

Pursuing **Dual Minor** degree in **Artificial Intelligence & Data Science** (CMInDS) and **Computer Science** (CSE)

SCHOLASTIC ACHIEVEMENTS

- Awarded the **Undergraduate Research Award (URA-01)** in recognition of exemplary research work *(2024)*
- Granted a **Change of Branch** to the Department of Mechanical Engineering out of **33/1400+** students *(2023)*
- Received **AP (Advanced Proficiency)** grade in **Computer Programming and Utilization** course *(2023)*
- Secured a position in **top 3 percentile** in **JEE Advanced** examination amongst 0.16 million candidates *(2022)*
- Secured **99.60 percentile** in **JEE MAINS** examination in a group of 1.02 million candidates *(2022)*

PROFESSIONAL EXPERIENCE

Modernisation of Land Records | Research Intern | Guide: Prof. Milind Sohoni *November 2023 - Present*

A collaboration between **Settlement Commissioner, Department of Land Records** *and* **Google Research**
- Working on a project that aims to generate **modified village maps** that respect farm boundaries on ground while ensuring minimum deviation in area and shape from the digitised paper maps, for all 44,000 villages across Maharashtra
- Developed GIS algorithms using **Python-PostgreSQL** to accurately georeference the survey maps by selecting some **anchor plots** that respect the farm boundaries as indicated by the **segmented** satellite images from Google Research
- Devised **clever metrics** such as farm rating, snap distance, relative scaling etc. to assess the georeferenced maps
- Represented the team at a workshop with **MNCFC Chairman** and **Google Research**, showcasing our project
- Prepared extensive **documentation** and participated in strategy meetings with **Govt. of Maharashtra** officials

RESEARCH AND DEVELOPMENT

Guidance Navigation and Control Subsytem | Student Satellite Program *May 2023 - December 2023*

A 40+ member student team with the vision of making IIT Bombay a centre of excellence in space technology
- Developed an estimator model using **Kalman filter** algorithm that improves the current **state vector estimate** by integrating sensor measurements and propagator predictions, accounting for both prediction and measurement losses
- Developed a sophisticated attitude estimation model utilizing the **Multiplicative Extended Kalman Filter**, effectively **preserving norm** by representing the estimated quaternion as a product of the true quaternion and noise
- Successfully reduced the effect of noise to an **impressive 0.6%** of the true quaternion measured on the test dataset

Common Admission Portal | Research Project: Prof. Sharat Chandran *December 2023 - April 2024*

- Brainstormed for improvements in the standard **deferred acceptance algorithm**, to maximize seat utilization
- Co-Created a prototype web interface for future integration with LLMs for **applicant decision-making process**

KEY PROJECTS

Hyperspectral Image Segmentation | Course Project: Advanced Methods in Satellite Processing *April 2024*
Guide: Prof. Mohan B. Krishna, Centre of Studies in Resource Engineering *IIT Bombay*
- Implemented **spectral clustering** and K-Means clustering algorithms for segmenting remote-sensed hyperspectral images, leveraging the **USGS hyperspectral image dataset** consisting of 242 bands of spectral information
- Studied mathematics of **optimal cluster determination** techniques, implementing them to enhance performance
- Achieved a notably high **average silhouette score of 0.86** using the optimal number of clusters identified
- Created a user-friendly **GUI interface** which enables the users to select image and the concerned region of interest

Lid-Driven Cavity Flow Simulation | Course Project: Data Science and Machine Learning *April 2024*
Guide: Prof. Alankar, Mechanical Engineering Deptartment *IIT Bombay*
- Implemented a **Physics-Informed Neural Network (PINN)** to solve the Navier-Stokes equation for a two-dimensional, steady-state, incompressible lid-driven cavity flow, accurately predicting velocity and pressure values
- Crafted a loss function incorporating both Navier-Stokes residuals and Mean Squared Error (MSE) loss on predictions
- Evaluated the performance of model by comparing results obtained using different **optimizers** (Adam and RMSProp) and varying **learning rates**, visualizing the velocity and pressure fields through contour plots against the coordinates

OTHER PROJECTS

Prediction & Dynamic Control of Features | Course Project: Programming for Data Science *November 2023*
Guide: Prof. Vinay Kulkarni, CMInDS *IIT Bombay*
- Conducted extensive **EDA** and **cleaning**, using **PCA** to reduce dimensionality and identify key features
- Created **ML model** to predict vibrations and specific energy using Random Forest regressor with **95% accuracy**
- Model obtained **94.7% accuracy** for **controlling equipment vibrations** through **parameter ranking analysis**

Assessment of Bond Valuation Methods | FinSearch *July 2024*
Finance Club, Undergraduate Academic Council *IIT Bombay*
- Studied the concept of bonds and valuation methods such as **Discounted Cash Flow** and **Yield to Maturity**
- Conducted **analysis** supporting Berkshire Hathaway's $ 300 million investment in Harley Davidson in 2009
- Made a **comparative analysis** of the outcomes of investing in bonds considering the factors affecting bond valuation

Sentiment Analysis on Amazon Reviews | Self Project *June 2024*
- Employed **NLTK library** and **VADER technique** for sentiment analysis, visualizing the results through bar graphs
- Used the pre-trained **RoBERTa model** from **Hugging Face**, comparing its results with the VADER model analysis

EdConnect, Full Stack Development | Seasons of Code *July 2023*
Web and Coding Club, Institute Technical Council *IIT Bombay*
- Created a web-app for an ed-tech portal, promoting efficent collaboration among students, TAs and Course Instructor
- Designed and implemented **backend** using the **Django framework**, frontend using **React.js** and used **PostgreSQL** database to optimize the storage and retrieval of data pertaining to courses, students, and teaching assistants
- Created **distinct dashboards** for Teaching Assistants (TAs) and students, seamlessly integrating functionalities such as **announcements, attendance tracking,** and used **GitHub** integration for version control and collaboration

Music Recommendation System | Course Project: Statistical ML and Data Mining *November 2023*
Guide: Prof. Asim Tewari, Mechanical Engineering Department *IIT Bombay*
- Created an advanced machine learning model to forecast and **pair users** with **similar music preferences**, utilizing an extensive dataset of listening histories and analyzing a vast number of tracks and artists to improve accuracy
- Developed a data processing workflow to handle missing values and created a one-hot encoding user preference matrix
- Applied PCA for 3D visualization and used **K-Means clustering** to organize users into 70 optimal clusters

Mountain Cargo Line Follower Bot | Course Project: Makerspace *May 2023*
Guide: Prof. Ankit Jain, Mechanical Engineering Dept. & Prof. Joseph John, Electrical Engineering Dept. IIT Bombay
- Developed an autonomous line-follower bot that could climb inclines upto **30 degrees** with a payload of **300 grams**
- Incorporated two **IR Sensors** with an **Arduino UNO** microprocessor, enabling it to **track and detect lines**
- Optimized design for operational efficiency, **lowering COM** to avoid toppling through precise positioning of payload

Impact Tester | Course Project: Solid Mechanics Lab *September 2023*
Guide: Prof. V. Kartik, Mechanical Engineering Department *IIT Bombay*
- Collaborated within a 5-member team to develop an experimental setup, reminiscent of the **Charpy test**, based on pendulum mechanics and the principle of energy conservation, to measure the **toughness of brittle substances**
- Used **image processing** to determine the change in angle and hence calculate the energy absorbed by the specimen

TECHNICAL SKILLS

Programming Languages	C, C++, JAVA, Python, JavaScript, PostGIS, SQL
Development	HTML, CSS, Django, React.js, Bootstrap, SQLite, Flutter,
Software Tools	Linux, Bash, Git, GitHub, Vim
Data Science	PyTorch, TensorFLow, Matplotlib, NumPy, SciPy, Pandas
Others	AutoCAD Fusion 360, 3D Printer Slicers, LaserCAD, QGIS, LaTeX

COURSES UNDERTAKEN

Data Science & Prog	Computer Programming and Utilisation, Programming for Data Science, Statistical Machine Learning and Data Mining, Advanced Methods in Satellite Image Processing
Mathematics	Linear Algebra, Differential Equations, Multiltivariable Calculus
Mechanical	Thermodynamics, Structural Materials, Solid and Fluid Mechanics, KDoM, Manufacturing
Others	Quantum Chemistry, Organic Chemistry, Quantum Physics, Sociology, Design, Biology, Engineering Mechanics, Special Theory of Relativity, Makerspace, Economics

EXTRACURRICULAR

Finance	Curated a comprehensive and detailed **Equity Research Report** on IDFC First Bank
Management	Completed a Learner's Space course on **Management and Business Development**
Culturals	Performed in the **Annual InSync Dance Show**, entertaining over **3000** attendees Performed, as a part of hostel team, in the annual dance general championship, **Gyrations**
Sports	Completed **yearlong** military training through **NCC**, fostering **discipline** and **resilience** Engaged in competitive sports as an active participant in the **Mixed Cricket League**
Sustainability	Created a sustainable toy robot from **electronic waste** and presented a puppet show at IDC