Harsh Shah | **200050049**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 18-05-2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	9.68
Intermediate	CBSE	Satyameva Jayate International School	2020	93.40%
Matriculation	CBSE	St. Kabir School	2018	95.40%

Pursuing **Honours** in **Computer Science** and Minor in **Data Science** and **Artificial Intelligence**

SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 11** in Joint Entrance Examination (Advance) among **150K**+ aspirants *(2020)*
- Secured **All India Rank 59** in Joint Entrance Examination(Mains) among **1 million**+ aspirants *(2020)*
- Recipient of **KVPY fellowship award** by Govt. of India upon securing **AIR 227** among **50K**+ candidates *(2019)*
- Among **Nation's top 1%** in National Standard Examination in Physics(NSEP) given by **50K**+ candidates *(2019)*
- Among **Nation's top 1%** in National Science Examination in Astronomy(NSEA) given by **17K**+ candidates *(2019)*
- Awarded **Advanced Performance(AP)** for BB101, Biology course, in the institute **37/1300**+ students *(2021)*
- Secured **AIR 13** in National Mathematics Talent Contest(NMTC) clearing **2 stages** of **nationwide** exam *(2018)*
- Qualified for **Indian National Maths Olympiad(INMO)** and **Regional Maths Olympiad(RMO)** *(2018)*

WORK EXPERIENCE

Junior Design Engineer

Mars Rover Tech Team | Image Processing and Vision subsystem

Key tasks/competitions undertaken:

- Reviewed **low-light image enhancement** techniques involving **Generative Adversarial Networks** and **Retinex algorithm** for **International Rover Design Challenge(IRDC)**
- Explored **video compression** codecs for transmission from rover (**codecs** reported **H.265** and **VP9** for IRDC)
- Programmed a real-time **arrow detection algorithm** for autonomous navigation of the rover (for **International Rover Challenge, IRC**) using image processing methods involving multi-scale template matching and thresholding

KEY PROJECTS

Image Captioning Research

Research & Development Project | Guide: Prof. Biplap Banerjee(IITB) | Ongoing *(Jan'-May 2022)*

- Applying **supervised deep learning** techniques aiming to produce **state-of-art** results for image captioning
- Using **cross-distillation** methods to train ResNet image encoder to produce **semantic** encodings in latent space
- Implementing **attention** based **LSTM** text decoder to construct **captions** from the image encodings
- Programming carried on **PyTorch** with **CUDA** tools to **accelerate** the process of training deep networks

Image Super Resolution using CNNs

Machine Learning Project | Guide: Web & Coding Club *(May-July 2021)*

- Worked in a team of 3 to build a **Convolutional Neural Network** (CNN) to enhance resolution of upscaled images
- Implemented a **3-layered CNN architecture** on Python library **Tensorflow** and trained using **Div2K** dataset
- Achieved Peak Signal to Noise Ratio (PSNR) value of ∼**28.9 decibels** with model trained on **100K** sub images

Probability and Statistics

Study Project | Guide: Maths & Physics Club *(May-July 2021)*

- Completed 8 weeks of **mentored** study project on Probability and Statistics from **MIT OpenCourseWare**
- Key concepts learnt involves **Markov chains, pollster problem, limit theorems**, and **sample data generation**
- Extrapolated the study to **data representation** and **analysis** aimed to analyse trained **neural networks**

COVID-19 Healthcare App

Android Development Course Project | Guide: Prof. Amitabha Sanyal(IITB) *(Oct'-Dec' 2021)*

- Worked in a team of 4 to build a **Healthcare application** motivated from **Aarogya Setu** android application
- Implementation of the application carried out on **Android Development Studio** using **Java**
- Key features include **contact tracing** (which involves notifying user when in **proximity** to high risk person), real-time **COVID updates** nationwide, and **user profile** with personal health data

OTHER PROJECTS

GitHub Extension Website

Web Development Course Project | Guide: Prof. Amitabha Sanyal(IITB) *(Sept' 2021)*

- Worked in a team of 2 to build a **Dynamic website** to display user's **Github data** (profile as well as repositories) in an organized fashion, fetched using **API** call to Github by Python's **'requests'** library
- Implementation carried out on **Django**, a Python framework, for both frontend and backend development
- Utilised **PostgreSQL** for setting up and storing database and **Heroku cloud application** for deployment

Gesture Controlled Robot

Robotics & Machine Learning Project | Guide: Electronics & Robotics Club *(Jan' 2022)*

- Worked in a team of 3 to build an Internet Of Things**(IOT)** model for controlling robot using **hand gesture**
- Implementation of **hand tracking** carried out in **Python** using pre-trained **hand tracking** module in **Mediapipe**
- Used **NodeMCU** micro-controller to build a **network pipeline** receiving data from **hand tracking** program

Mandelbrot Zoom Animation

Graph Rendering Course Project | Guide: Prof. Bhaskaran Raman(IITB) *(Oct'-Dec' 2021)*

- Developed an **animation** of zooming into a **fractal** formed by **Mandelbrot set** in complex plane
- Implementation carried out on **C++** with dependency on **SFML library** for rendering the **graphics**
- Handled user input events for interacting with rendered graph of the fractal for **Graphical User Interface(GUI)**

Scotland Yard

Java Concurrency Course Project | Guide: Prof. Amitabha Sanyal(IITB) *(Oct' 2021)*

- Developed a **Client-Server Model** to implement the game of Scotland Yard using **Concurrency** in Java
- Implemented **synchronisation** between various **threads** using **Semaphores** to handle **critical sections**
- Using **Java** in both Front-end and Back-end to listen for requests on the **Socket** to track the game state

Plot4 AI

Game Theory Self Project *(May 2021)*

- Developed a **two-player** game, Plot4, with hard coded **Artificial Intelligence (AI)** as the opposite player
- Implementation carried out on **C++** with dependency on **FLTK library** for Graphical User Interface **(GUI)**
- Employed **minimax algorithm** with depth **8** to **automate** the decision making process for the AI

TECHNICAL SKILLS

Programming Languages	C, C++, Python, Prolog, Java, Javascript, Bash, Awk
Softwares and Tools	Matlab, Git, LaTeX, Scilab, ROS, Arduino IDE, Unity Game Engine, Android studio
Libraries and Packages	PyTorch, TensorFlow, FLTK, Django, OpenCV, Scikit-Learn, Pandas, Numpy

KEY COURSES UNDERTAKEN

Computer Science	Advanced Image Processing*, Data structures and algorithms, Discrete Structures, Data analysis and Interpretation, Software and Systems Lab, Computer Networks*, Design and Analysis of Algorithms*, Digital Logic Design and Computer Architecture*
Mathematics	Linear Algebra, Calculus, Differential Equations
Industrial Engineering	Mathematical Optimization Techniques
Others	Quantum Physics and Application, Electrical and Electronic Circuits

**To be completed by April 2022*

EXTRACURRICULAR ACTIVITIES

Technical	• Volunteer in IITB's **Electronics and Robotics Club (ERC)** to spread tech culture • Attended **Arduino bootcamp** conducted by ERC with implementation on **TinkerCad** • Secured **National rank 4** in **Mimamsa science quiz** by **IISER Pune** (among **650**+ teams)
Sports	• Qualified for **Quarter-Finals** in a District level Table Tennis tournament conducted by **Ahmedabad Racquet Academy (ARA)** • Secured **3rd rank** in under 15 category Table Tennis tournament conducted by **Jain International Trade Organisation (JITO)** • Completed **one year** of training in **General fitness** under National Sports Organisation **(NSO)**
Miscellaneous	• Received certificate of participation for **trekking** in Shimla conducted by **ANALA Outdoors** • Attended a **certified workshop** by Bike-n-Hike for learning **photography** using DSLR • Worked for a **NGO**, **Bala Jaanagraha**, aiming to mend damaged roads in Ahmedabad