Shubham Hazra
Computer Science & Engineering
Indian Institute of Technology Bombay

210100143
B.Tech.
Gender: Male
DOB: 01/11/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	9.66
Intermediate	CBSE	K.V. Sector-8 R.K. Puram New Delhi - 110023	2021	98.60%
Matriculation	CBSE	K.V. Sector-8 R.K. Puram New Delhi - 110023	2019	92.60%

Pursuing a **Minor** degree in **Artificial Intelligence** and **Data Science** from **C-MInDS, IIT Bombay**

Scholastic Achievements

- Achieved **99.81 Percentile** in **JEE-Main** out of over 1 million candidates *(2021)*
- Secured **All India Rank 1207** in **JEE-Advanced** out of over 0.14 million candidates *(2021)*
- Secured **AP(Advanced Performer) grade** for excellent performance in **PH 108-Basics of Electricity & Magnetism**, awarded to 27 out of over 1300 students taking the course *(2022)*
- One of the **17 out of 1400+** students to secure a **Change of Branch** to the department of **Computer Science and Engineering** owing to excellent academic performance in first year at IIT Bombay *(2022)*
- Secured **All India Rank 275** in the prestigious **KVPY (Kishore Vaigyanik Protsahan Yojna)** SX and awarded fellowship by the Department of Sciences, **Indian Institute of Science(IISC) Bangalore** *(2021)*

Key Projects

FastChat
(Autumn 2022)

Guide: Prof. Kavi Arya | Ongoing Course Project : Software Systems Lab *IIT Bombay*

- Developing a messaging software by building a network of clients interacting via servers acting as mediators
- Focusing on obtaining **high throughput** while using only **limited resources** dedicated for the servers
- Ensuring **low latency** of individual message deliveries and **end-to-end encryption** between clients
- Using **python socket library** to develop the network, using **open source libraries** for authentication and communication, **PostgreSQL** database to store the data and **bash** for scripting and collecting results
- Adding flair to this web application by implementing an interactive frontend using **HTML, CSS and JavaScript**

Rail Planner
(Autumn 2022)

Guide: Prof. Supratik Chakraborty | Course Project : Data Structures and Algorithms Lab *IIT Bombay*

- Designed a simplified vesrion of a railway planner using various data structures and analyzed the space & time complexity and the efficiency to demonstrate the **properties of different data structures in C++**
- Stored trains as a dictionary using **Hash Tables** and devised algorithms for fastest possible journies
- Used **BSTs and then AVL trees** for quick searching using the journey codes and used **Tries** to implement the autocompletion feature while searching for station names and added a feature to accept reviews for journies
- Used **Quicksort** to order trains by day and time, implemented the **KMP-string matching algorithm** for allowing review searches by using keywords and implemented **Heaps** to allow filtering the reviews by their rating

Monte Carlo Analysis of Statistical Theorems
(Autumn 2022)

Guide: Prof. Suyash Awate | Course Project : Data Analysis and Interpretation *IIT Bombay*

- Studied various probability functions of various distributions like **Binomial, Poisson, Gaussian, Laplacian** etc. and computed their mean and variance **analytically** and **calculated deviations** from theoretical data
- Generated instances of random walker simulations and analyzed their **trajectories graphically** along with determining the form of the **histograms** of their final locations for varying number of walkers and steps taken
- Empirically verified various statistical theorems such as the law of large numbers, Poison thinning and Gaussian nature of the random walk by running appropriate random simulations using **MATLAB and Python numpy, matplotlib**
- Composed random variables by making appropriate functions to model a draw from the desired **transformed PDFs**

Multiplayer Tic-Tac-Toe
(Autumn 2022)

Guide: Prof. Kavi Arya | Course Project : Software Systems Lab *IIT Bombay*

- Used **Java Socket Programming** for **inter process communication** using the **peer-to-peer model**
- Created the tic tac toe game using this model and handled various newtork and **IOStream exceptions**

Generating Representative Images from a Sample *(Autumn 2022)*

Guide: Prof. Suyash Awate | Ongoing Course Project : Data Analysis and Interpretation *IIT Bombay*

- Used **MATLAB** to use a data set of images of various fruits and sampled random images to generate new representative fruit images using **Principal Component Analysis (PCA)**
- Used PCA to analyse images of handwritten digits from the **MNIST Database** and optimally reduce the dimensionality and reconstruct the image. Implemented hyperplane fitting of 2 random variables and sampled points in the Euclidean Plane according to a given multivariate distribution

Text File Editors *(Autumn 2022)*

Guide: Prof. Kavi Arya | Course Project : Software Systems Lab *IIT Bombay*

- Developed an analog to the Linux Command Line utility **wc command** using the **awk programming language** that counts the number of characters, words and lines in a text file and also accepts flags similar to wc command
- Developed a program to check for valid email addresses using **sed** with pattern matching using **regular expressions**
- Implemented a **csv file editor** that formats columns based on customisable properties such as date, time and name
- Developed a program which changes the base of the number to a different given base using **bash scripting and awk**
- Developed a program to **encrypt** a piece of text when the words to encrypt and their corresponding cipher is given

Personal Website *(Autumn 2022)*

Guide: Prof. Kavi Arya | Course Project : Software Systems Lab *IIT Bombay*

- Made a personal website to be hosted on the CSE department server using **HTML and CSS**
- Added various advanced **CSS** features animations, transitions, static scroll images, modals, checkboxes and slideshows
- Used **JavaScript** to make the website interactive, gauge user-choices and render web-pages accordingly and deployed the website on an SSH server; used **BootStrap** to impelement standard navigation bars, footers and other features

Bubble Trouble *(Autumn 2022)*

Guide: Prof. Parag Chaudhuri | Course Project : Computer Programming and Utilization *IIT Bombay*

- Designed an interactive single player retro style game which impelements a bubble shooter to shoot random floating bubbles on the screen to demonstrate the **Object Oriented Paradigm in C++**
- Implemented event-handling using **XEvent** object extensively used the **C++ STL** and the Simplecpp library that was developed in-house by the institute to add the various features of the game
- Handled various events, assigning multiple responses by the game and designed the game for many levels of difficulty

Technical Skills

Programming Languages:	C++, Python, MATLAB, Java, Bash, Solidity, Sed, AWK
Software & Tools:	Git, LaTeX, MySQL, NumPy, Pandas, Matplotlib, Doxygen, Sphinx, gdb
Web Development:	HTML, CSS, JavaScript, BootStrap

Courses Undertaken

Mathematics	Calculus, Linear Algebra, Differential Equations, Optimization Models*
Computer Science	Computer Programming and Utilization, Discrete Structures*, Data Structures and Algorithms*#, Data Analysis and Interpretation*, Software Systems Laboratory*, Computer Networks**#, Digital Logic Design**#, Design and Analysis of Algorithms**, Logic for Computer Science**
Miscellaneous	Introduction to Electric and Electronic Circuits*, Quantum Physics and Application, Basics of Electricity and Magnetism, Engineering Graphics and Drawing, Organic and Inorganic Chemistry, Physical Chemistry, Biology

(to be completed by December 2022)*
*(** to be completed by April 2023)*
(# Theory + Lab)

Extracurricular

- Successfully completed one year under **National Sports Organization(NSO)** in **Chess** at IIT Bombay *(2022)*
- Pitched a **Business Model Canvas** for a startup in the health sector which entailed making online ambulance bookings, for the EnB Buzz competition conducted by the **Entrepreneurship cell of IIT Bombay** *(2021)*
- Participated in a team of 3 and wrote a working script and successful submission in **Google Hashcode 2021** *(2021)*
- Worked in a team of 4 to make an ESP32 **WiFi-controlled bot** for XLR8 conducted by **ERC, IITB** *(2022)*