Chaitanya Garg | **210050039**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 05/08/2004

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	
Intermediate	CBSE	Maa Bharti Sr. Sec. School	2021	95.20%
Matriculation	CBSE	Holy Angel School	2019	95.50%

★ Scholastic Achievements

- Secured **All India Rank 66** in **Joint Entrance Examination Advanced 2021** among 260,000 candidates. *2021*
- Secured **All India Rank 203** in **Joint Entrance Examination Mains 2021** among 1 million candidates. *2021*
- Attended **OCSC** camp for International Olympiad of Astronomy and Astrophysics (**IOAA**) | Among **Top 102** in India. *2021*
- Qualified and stood among **National Top 1**% in **Indian Olympiad Qualifier in Astronomy, Part I** conducted by IAPT. *2020-21*
- Achieved **All India Rank 111** in **Kishore Vaigyanik Protsahan Yojana** conducted by **IISc, Banglore**. *2020*

</> Projects

FastChat
Course Project
Prof. Kavi Arya, IIT Bombay *November, 2022*
- Designed and implemented a **Network of Clients** that can send messages to each other through servers acting as mediators.
- Added the feature for users to have group conversations and send images and files.
- Implemented client authentication and communication using open source libraries, allowing users to sign-up and login.
- Ensuring low latency of message deliveries and **end-to-end encryption** between clients.
- Created a SQL server database to store information and messages for offline clients to be delivered when they come online.
- Added a load balancing system to evenly distribute client connections across multiple servers and improve performance.

Memory Hierarchy Optimization
Course Project
Prof. Biswabandan Panda, IIT Bombay *April, 2023*
- Integrated **exclusive, inclusive, and non-inclusive** memory structures using **Champsim** simulation framework.
- Implemented various replacement policies (**LIFO**, **FIFO**, **MRU**, **probabilistic MRU**) to assess system performance.
- Explored **prefetchers** and **cache properties** (block size, cache size, associativity) to optimize system efficiency.
- Benchmarked **IPC** and **miss rate** results for diverse traces, varying prefetchers, replacement policies, and cache properties.
- Tailored memory hierarchy parameters to achieve maximum speedup for **SAT solver specific traces**.

Modified Tiles Game SAT Solver
Course Project
Prof. Ashutosh Gupta, IIT Bombay *February, 2023*
- Developed **arithmetic and boolean encodings** for a modified tiles game using **Z3Py** library.
- Explored and compared efficiencies of different SAT solving methods, implementing **Conflict Driven Clause Learning (CDCL)**.
- Successfully solved the puzzle, demonstrating proficiency in **Z3Py** library and problem-solving skills in constraint solving.

Rail Planner
Course Project
Prof. Supratik Chakraborty, IIT Bombay *August-November, 2022*
- Developed Software which integrates viewing and managing Train Stations, Journeys and reviews for all Journeys.
- Implemented **multiple data structures** in C++, such as Lists, Maps, Trees, Heap, to store, access and update data efficiently.
- Pre-processed stored data and integrated algorithms such as **KMP, Quicksort and Breadth-First-Search** to search information efficiently and display it to the user in an organised manner.
- Implemented an admin Interface to modify Station and Journey Information and a User Interface to plan Journeys, look for reviews, and write reviews for past journeys.

Generating Representative Images from a Sample
Course Project
Prof. Suyash Awate, IIT Bombay *October, 2022*
- Implemented a program to use **Principal Component Analysis (PCA)**, to generate new representative images of the fruits, using the dataset of images of various fruits given.
- Used PCA to analyse images of handwritten digits from the MNIST Database stored as 28×28 matrix of numbers and optimally reduce the dimensionality to 84, such as to maximize the total dispersion of the original data, and reconstruct the image.
- Implemented Hyperplane fitting of 2 random variables and sampled points in the Euclidean Plane distributed in a region according to a given multivariate distribution.

Tic-Tac-Toe
Course Project
Prof. Kavi Arya, IIT Bombay *October, 2022*
- Implemented **Tic-Tac-Toe** game in **Java**, with the two players on different ports in **peer-to-peer network**.
- Learned **socket programming** and **inter-process communication** along with exception handling.
- Studied **multi-threading** fundamentals and concurrency ideas along with **synchronization** in Java.
- Implemented Servers for both clients and sockets for them to communicate the moves.

Bubble Shooter
Course Project

PROF. PARAG CHAUDHURI, IIT BOMBAY *February-March, 2022*

- Developed a Bubble Shooter Game using **C++** along with **Simplecpp** graphics library.
- Modularized the game components into the shooter, bullets and bubbles and implemented their functionalities.
- Implemented multiple levels of the game, which get harder as we proceed, along with health penalties and timer.

Monte Carlo Analysis of Statistical Theorems
Course Project

PROF. SUYASH AWATE, IIT BOMBAY *September, 2022*

- Used **NumPy** and **MatPlotLib** Python Libraries to implement a Monte Carlo Simulation of a given Probability Distribution.
- Empirically analysed properties of various statistical distributions such as the $Poisson$, $Laplace$, $Gumbel\ and\ Cauchy\ Distributions$ and visualised these using the MatPlotLib Library.
- Empirically verified various statistical theorems such as: $The\ Law\ of\ Large\ Numbers$, $The\ Poisson\ Thinning\ Effect$ and visualised the Probability Distribution of the displacement of a 1-D Random Walker.

The Simon Game
Course Project

PROF. RUSHIKESH K. JOSHI, IIT BOMBAY *May, 2022*

- Implemented the Simon Game in **C++** using **FLTK** graphics library.
- Created classes and structures to modularize tasks in the game and encapsulate the functionalities.
- Learned Class inheritance fundamentals along with **event handling** in fltk.
- Implemented the game to generate a random sequence of buttons and flashed them in that order, if the player clicks them in the same order, we increase the length of sequence and repeat, else game ends.

Personal Website
Course Project

PROF. KAVI ARYA, IIT BOMBAY *August, 2022*

- Studied HTML and CSS basics to design a Website, along with **Bootstrap** to make the website responsive to the device size.
- Created multiple web-pages linked through a navigation bar, added tables, images, buttons, added hover effect to images.
- Used JavaScript to make the Website interactive, made check-boxes and on submitting the response, details of only the topics selected was displayed.
- Hosted the Website at IITB CSE Server.

Image Classification using CNN
Winter Project

ANALYTICS CLUB, IIT BOMBAY *January, 2023*

- Gained an understanding of neural networks, optimization strategies and the calculations involved in backpropagation.
- Investigated the impact of normalization and various activation functions on the training of neural networks.
- Learned about the role of kernels in extracting features from input data for image recognition and classification tasks.

TECHNICAL SKILLS

Programming Languages & Utilities:	C, C++, Python, Java, VHDL, Assembly, Bash, Git, Matlab, LaTeX
Data Science:	Matplotlib, NumPy, SciPy, Pandas, TensorFlow, Keras
Development:	HTML, CSS, Bootstrap, JavaScript, PostgreSQL, AutoCAD
Exposure:	Docker, WireShark, NS3

RELEVANT COURSES

Computer Science:	Data Structures and Algorithms	Software Systems Lab
	Data Analysis and Interpretation	Discrete Structures
	Design and Analysis of Algorithms	Logic for Computer Science
	Computer Programming and Utilization	Digital Logic Design and Computer Architecture
	Abstractions and Paradigms for Programming	Computer Networks
	Automata Theory#	Operating Systems#
	Artificial Intelligence and Machine Learning#	
Mathematics:	Linear Algebra	Calculus
	Differential Equations	
Miscellaneous:	Quantum Physics and Application	Basics of Electricity and Magnetism
	Introduction to Electronics	Biology
	Organic & Inorganic Chemistry	Physical Chemistry
	Engineering Graphics & Drawing	Economics

≡ To be completed by November 2023 end.

EXTRA-CURRICULAR ACTIVITIES

- Volunteered for community service under Dhruv Initiative of Education Outreach, NSS IITB and **contributed 80+ hrs teaching** mathematics to children.
- Participated in the department trek to Kalsubai Peak conducted by CSEA, IIT Bombay.