Tushar Agarwal | **170050060**
Computer Science & Engineering | **B.Tech.**
Indian Institute of Technology, Bombay | **Gender: Male**
DOB: 02-01-2000

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2021	-
Intermediate	CBSE	Gyan Ganga International Academy	2017	91.60%
Matriculation	CBSE	St. Monfort School, Bhopal	2015	10

Pursuing **Honors** in Computer Science and Engineering

Scholastic Achievements

IIT-JEE:
- Achieved **AIR 13** in **JEE Advanced 2017** amongst 200 thousand candidates
- Achieved **AIR 62** in **JEE Mains 2017** amongst 1.2 million candidates

Scholarships:
- Awarded the prestigious **Aditya Birla Scholarship** given to **top 15 undergraduates across IITs** by India's premier business house Aditya Birla Group
- Awarded the **National Talent Search Examination** (NTSE) scholarship by NCERT
- Recipient of (KVPY) Fellowship-2015 by the Govt. of India with **AIR 31**

Olympiads:
- Received **Gold Medal** for being in the top 35 canidates at INChO 2017
- Amongst the **top 35** students at Indian National Mathematics Olympiad **(INMO)**
- Selected for Orientation-cum-Selection Camp **(OCSC)** of **Junior Science Olympiad**
- Awarded Certificate of Merit for being among the national **top 1%** in **NSEP** and **NSEA**

Professional and Research Experience

Momentum based Investment Strategies in Indian markets — *Ongoing*

Guide: Prof. Piyush Pandey — *Shailesh J. Mehta School of Management, IIT Bombay*

- Analysing existing machine learning techniques for momentum based trading in Indian Stock Market
- Extracting relevant features(market quotes, calculated technical indicators) from **CMIE Prowess** dataset
- Training a classification model to generate **buy-sell triggers** based on momentum and reversal techniques
- Comparing results with other statistical models in terms of **alpha generated, returns, sharpe ratio**

Computer Vision Solutions — *Summer 2020*

AWL Inc — *Sapporo,Japan*

- Created a joint depth and object detector to detect instances of object interaction using **Tensorflow**
- Trained **SSDlite MobilenetV2** models to create lite applications to be incorporated in mobile devices
- Implemented a **Densenet-169** based depth detector to detect distance between bounding boxes of objects
- Exemplified the model by creating a pipeline to detect hand sanitizer usage in retail shops for **Covid-19**
- Employed RGB-Infrared **cross modality** for person re-identification using cross-modal feature extraction

Hierarchical Classification of ICD codes — *Natural Language Processing* — *Summer 2019*

Guide: Prof. Marie-Francine Moens — *Katholieke Universiteit (KU) Leuven, Belgium*

- Worked on developing a **tree structure for the ICD codes** (International Classification of Diseases) focusing on the hierarchical aspect of ICD taxonomy to improve performance over pre-existing models
- Used **Mimic-III dataset** containing patient letters to train and test the model for different combination of CNN, LSTM and dense layers on various levels of the tree using **Tensorflow** library
- Compared results to determine the most suitable combination for the ICD code structure

Quantum Computing Algorithms — *Quantum Algorithms, Quantum Circuits* — *Winter 2018*

Guide: Prof. Igor Klebanov — *South Ural State University, Russia*

- Explored quantum algorithms to encode solutions of **non-homogeneous linear differential equations**
- **Efficient inversion of differential operators** that are polynomials in the variables and their derivatives
- Developing an algorithm for calculating exact value of **matrix exponential** to find the exact solution of system of linear differential equations

Key Projects

Protection Against Sophisticated DOS attacks — *Network Security* *Spring 2019*
Guide: Prof. Bernard Menezes | *Course Project* *IIT Bombay*

- Developed a security library that protects any C++ server with minimal code and performance overhead
- Modelled CPU usage through **function-level program profiling** and Detection using **statistical execution** model with probabilistic request termination for minimum false positive
- Implemented a **Python Daemon** that maintains real time profiles of each user and maintain a peer-to-peer communication with the server to block malicious users through two layer filtration

Snake Bot — *Reinforcement Leanning* *Autumn 2019*
Guide: Prof. Ganesh Ramakrishnan | *Course Project* *IIT Bombay*

- Implemented **Q-learning algorithm** to train an Artificial Intelligence bot of classic snake game
- Updated the Q-Table with **Bellman algorithm** in accordance with the current reward policy
- Calculated optimum rewards and reached score of 80 with mere 5 minutes of training on a 20x20 grid

Air Hockey — *Algorithm, Graphics* *Spring 2018*
Guide: Prof. Amitabh Sanyal | *Course Project* *IIT Bombay*

- Simulated Air Hockey game using **Object-Oriented and Functional programming** paradigms
- Implemented smooth collisions between puck-striker and puck-wall to simulate real gaming experience
- Implemented a **vector-based decision-making** algorithm to determine bot's strategy to attack or defend
- Tested the bot by playing it against other bots and calibrated the difficulty settings accordingly

Secure Personal Cloud — *Web Development, Cryptography* *Autumn 2018*
Guide: Prof. Soumen Chakraborty | *Course Project* *IIT Bombay*

- Implemented a **Cloud Based File System** where multiple clients can upload and share files
- Designed a Linux client with **Linux Daemons** that keeps the data on cloud and client in synchronization
- Used **Django** for building the server backend and implemented web client using **React** library

Technical Skills

Programming	C++/C, Python, Java, Bash, Racket, Prolog, AWK, Sed, VHDL
Data Science	Tensorflow, Keras, PyTorch, OpenCV, NumPy, Sklearn
Web Development	Django, HTML, CSS, PHP, Bootstrap, JavaScript, Android Studio

Courses Undertaken

Computer Science	Data Structures and Algorithms, Data Analysis and Interpretation, Software Systems Lab, Computer Networks, Advanced Network Security and Cryptography, Computer Architecture, Operating Systems, Artificial Intelligence and Machine Learning
Mathematics/ Economics	Game Theory & Economic Analysis*, Discrete Structures, Introduction to Number Theory and Cryptography*, Linear Algebra, Differential Equations

**to be completed by November 2020*

Position of Responsibility

Teaching Assistant *July 2018 - Nov 2018*
Under: Prof. S. Umasankar | *Course: Quantum Physics and Applicaion* *IIT Bombay*

- Appointed as Teaching Assistant for the course out of 48 applicants
- Tutored a batch of 50 first year students, cleared their doubts and evaluated their performance

Extracurriculars

- Attended **Vijyoshi Camp** organized by the Indian Institute of Science Education and Research (IISER), Kolkata for facilitating interaction among bright young minds and leading researchers *(2016)*
- **All India Mathematics topper** at Mimamsa quiz conducted by IISER, Pune representing IITB *(2018)*
- Completed 15 day long **Mountain Adventure Course** by Jawahar Institute of Mountaineering *(2018)*
- Achieved **3rd position** out of 256 teams participating in **Jigyasa Quiz**, Mumbai University *(2017)*
- Successfully completed one year long training in Yoga under National Sports Organization (NSO) *(2018)*