Adarsh Raj
Computer Science & Engineering
Indian Institute of Technology Bombay

190050004
B.Tech.
Gender: Male
DOB: 26-02-2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	
Intermediate	CBSE	Delhi Pubic School, Ranchi	2019	95.60%
Matriculation	CBSE	DAV Hehal, Ranchi	2017	10

Pursuing **Honors** in **Computer Science and Engineering**

Scholastic Achievements

- Secured **All India Rank 344** in JEE (Advanced) among 200,000 eligible candidates *(2019)*
- Secured **All India Rank 394** in JEE Mains out of 1.4 million eligible candidates. *(2019)*
- Secured **All India Rank 73** in KVPY and received prestigious fellowship from Govt. of India. *(2018)*
- Qualified for Indian National Astronomy Olympiad **(INAO)**, among 300 students. *(2019)*
- Among **National Top 1%** in National Standard Exam in **Astronomy** among 16000 students *(2018)*
- Amongst **the top 50 students** in NSO and IMO by Science Olympiad Foundation (SOF) *(2018-2019)*

Internships

Federated HealthLake Data Indexing *Summer 2021*
Philips Innovation Campus *Bangalore, India*

- Reviewed literatures on different market solutions for federated health datalake indexing like **Amazon RedShift** Federated Query, and DICOM Images Indexing on **Cloudera Hadoop Distribution by Intel**
- Implemented **HAPI JPA** Generic Client **REST API** using **Jetty** and **docker** for querying HAPI FHIR database
- Proposed an indexing schema in **PostgreSQL** utilizing **HAPI FHIR Database Schema**, **ORTAHNC DICOM** file format, **Master Patient Index**, **Disease Index** and **Registers** for FHIR, DICOM and Blob data

Virtual Trade Fair *August 2020 - September 2020*
Amanha Idealabs *Mumbai, India*

- Developed a **responsive framework** to support the functioning of an **online virtual trade fair** platform
- Worked with team to create a framework for Video Conference Call integration via **enablex API** in **PHP**
- Used **JavaScript** and **AJAX queries** to implement different user oriented functions
- Modularized **CSS** files for maximum flexibility and usability across a global application

Key Projects

Online Competetion and Development Environment *Autumn 2020*
Guide: Prof. Amitabha Sanyal | Course Project : Software and Systems Lab *IIT Bombay*

- Developed an **online programming environment** with secure authentication and personal workspace features
- Implemented an **Angular based web IDE** supporting multiple languages including **C++, Java** and **Python3**
- Utilized **PHP** along with **shell scripting** for compilation and execution of user code on a Unix based server
- Provided features for **online competitions** and real-time grading utilizing **MySQL** and **PhpMyAdmin**

RISC 16 Bit Processor in VHDL *Spring 2021*
Guide: Proj. Virendra Singh | CS226 Course Project *IIT Bombay*

- Devised an efficient 23 state **FSM** for an **8** register, **16 bit** multicycle processor having **4MB of RAM**
- Synthesized and assembled **Memory Unit**, **Datapath** and **Controller** in **INTEL Quartus Prime** using **VHDL**

Convolutional Neural Networks - Applications *Summer 2021*
Seasons Of Code, Web and Coding Club *IIT Bombay*

- Mentored a team of **12 developers** in implementing some practical applications of Convolutional Neural Networks
- Built a CNN model to predict **Covid-19/Pneumonia** diseases from chest radiographs with $>$ **92 %** accuracy
- Tried **Residual NNs**-based CNN models to **predict genres of movies** from the images of their posters
- Implemented a CNN model to **up-sample low-resolution images**, outperforming bicubic interpolation

Exposing Image Splicing with Inconsistent Local Noise Variances *Spring 2021*
Guide: Prof. Ajit Rajwade | Course Project *IIT Bombay*

- Decomposed images into K band-pass filtered channels from DCT and calculated integral images of different orders
- Computed variance and **kurtosis** for each local window in each band-pass filtered channel
- Estimated noise variances by evaluating equation of Global Noise Variance Estimation, for each local window across all band-pass filtered channels

Other Projects

CricInfo - IPL Web Application *Autumn 2021*
Guide: Prof. Umesh Bellur | Course Project *IIT Bombay*

- Developed a full stack web application similar to **Cricbuzz** for matches, players and venues statistics
- Utilized **NodeJS** for the backend server over a **Postgres** Database and implemented an **Angular** based frontend

Comparison of TCP variants *Spring 2021*
Guide: Prof. Vinay Ribeiro | CS252 Course Project *IIT Bombay*

- Implemented client and server using **Socket Programming in C**, to send files using different variants of **TCP**.
- Used **Bash** to **automate** experiments and generate plots for comparing **throughput**, **delay** and **packet loss**.
- Recorded network traffic using **Wireshark** and analysed **window scaling graphs** for **TCP Cubic** and **Reno**.

Mastermind Player *Spring 2021*
Guide: Prof. Ashutosh Gupta | CS228 Course Project *IIT Bombay*

- Encoded the moves of a Mastermind game into a **SAT problem** and solved using **conflict driven clause learning**
- Implemented a solver in **z3py library** which was robust to the other player lying upto **20%** of the time

Image Compression using Quad Trees *Autumn 2020*
Guide: Prof. Amitabha Sanyal | Course Project *IIT Bombay*

- Created a **quad tree** class in **C++** to store **binary images** with highly optimized space complexity
- Implemented **optimised algorithms** to allow for overlap, intersection, **resize**, complement and **extraction** of images

Graph Theory *Summer 2020*
Guide: Adwait Godbole | Summer Of Science *Maths and Physics Club, IIT Bombay*

- Studied graph-based **data structures and algorithms** in the context of analyzing time and space complexity
- Explored properties and theorems related to **graph colouring, matching** and **algebraic graph theory**
- Read and implemented various graph theory algorithms including **BFS, DFS**, **Kruskal's** and **Prim's Algorithm**

Permutations - Abstract Data Type *Autumn 2020*
Guide: Prof. Ajit A Diwan | Course Project *IIT Bombay*

- Created an **Abstract Data Type** representing permutations as both **bijective maps and collection of disjoint cycles** and implemented operations like **inverse, product and square roots**
- Used **Extended Euclidean Algorithm** along with **extension of Chinese Remainder Theorem** to implement logarithms for permutations in linear time by **automated congruence solving**

Technical Skills

Programming	Proficient in C++, Python | Familiar with Java, BASH, Typescript, SQL, VHDL
Web and App Dev	Android Studio, Angular, Django, PHP, JavaScript, CSS, HTML5
Softwares	MATLAB, Docker, AutoCad, Git, LaTeX, Wireshark, Solidworks, Quartus Prime
Libraries	NumPy, Matplotlib, OpenCV, Pandas, TensorFlow, Z3, fltk

Positions of Responsibility

Mentorship - Summer Of Science | *Maths and Physics Club, IIT Bombay* *Summer 2021*

- **DSA -** Guided **3** students to explore and read about data structures and algorithms
- **Graph theory -** Guided **one** student to research and prepare a report on **Graph Theory**

Core Member | *Developer's Community, IIT Bombay* *May 2020 - April 2021*

- Member of the **Development Community** responsible for **ideation** as well as the **implementation** of major services required for smooth conduct of **academic necessities** with focus on maximising digitization

Relevant Courses

- **Computer Science:** Data Structures and Algorithms, Data Analysis and Interpretation, Software Systems, Computer Networks, Operating Systems, Foundations of Learning Agents, Computer Architecture, Blockchains and Cryptocurrency, Digital Image Processing, Automata Theory*, Databases and Information Systems*, Implementation of Programming Languages*
- **Misc:** Discrete Structures, Calculus, Linear Algebra, Optimization Models*, Economics, Psychology*

** To be completed by April 2022*

Extracurriculars

- Successfully completed a **two semester course** under **National Service Scheme**, educating rural children and minorities, promoting sustainable development and practices that can be inculcated in daily life *(2019-2020)*
- Stood **First** in **Short Video Making** in **Freshiezza** organized by Silver Screen, IITB *(2019)*
- Made a **Remote Controlled Plane** having a foam body operating on **BLDC motor** and **Servo motors** for wing control, in **RC Plane competition** organised by the Aeromodeling Club, IITB *(2019)*
- Awarded **Student of the Year** award for good performance in Annual sports competition of my school *(2014)*