Harsh Poonia
Computer Science & Engineering
Indian Institute of Technology Bombay

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B.Tech.
Gender: Male
DOB: 28/11/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	9.6
Intermediate	CBSE	Lord Buddha Public School	2021	92.60%
Matriculation	CBSE	Gail DAV Public School	2019	96.60%

Pursuing a **Minor** in **Data Science and Artificial Intelligence**

Scholastic Achievements

- Awarded **AP grade** (20 out of 1400+ students) for excellent academic performance in **Physical Chemistry** *(2021)*
- Secured an **All India Rank 61** in **Joint Entrance Examination (Advanced)** among **150,000** candidates *(2021)*
- Achieved an **All India Rank 616** and **99.956 percentile** in **JEE (Main)** among **0.9 million**+ candidates *(2021)*
- Received the prestigious **KVPY Fellowship** with an All India Rank of **178** from the **Govt. of India** *(2020)*
- Qualified for the **Indian National Mathematical Olympiad** and an awardee of the **NTSE Scholarship** *(2019)*

Experience

Smart Contract Security Audit *December 2022 - January 2023*
Research and Development | Internship *Marsh McLennan*

- Researched smart contract security vulnerabilities like Re-entrancy, denial of service, integer overflow, timestamp dependance, common hacks and exploits like frontrunning, phishing and griefing and safeguards against them
- Tested security analysis tools **slither**, **mythril**, **manticore**, **securify** and built APIs for their use in the platform
- Created API wrappers around **AWS s3** buckets and **DynamoDB** for the backend using **FastAPI** and **Nodejs**

Key Projects

Applications of Machine Learning in Synthetic Chemistry *November 2022 - Present*
In-Semster Undergraduate Research | Prof. Debabrata Maiti *IIT Bombay*

- Studied **Gaussian Processes**, their kernels and **gaussian process regression** for predicting distributions of data
- Learnt about active learning and Bayesian Optimization with acquisition functions **PI**, **EI** and **Thompson Sampling**
- Working on maximising reaction yields by optimizing a GP **surrogate model** using **parallel expected improvement**

Rendering Natural Camera Bokeh Effect using Deep Learning *December 2022 - Present*
Winter in Data Science | Analytics Club, IITB

- Read the paper and attained knowledge of the **PyNET** CNN architecture, loss functions and **7 output levels**
- Working on preprocessing images from *Everything is better with Bokeh!* dataset using **RANSAC** and **SIFT** keypoints
- Using upsampling layers via transpose convolutions for multiple levels and skip connections for feature sharing

Classical and Modern Cryptography *Autumn 2022*
Year of Security | CyberSecurity Club (CSeC)

- Understood the working of and mathematics behind **RSA** public-key cryptosystem and **Diffie Hellman Key Exchange**
- Learnt up about **Digital Signatures** and **SHA** family of **cryptographic hash** functions (and vulnerabilities)
- Studied modern cryptography concepts of Block and Stream Ciphers and **Advanced Encryption Scheme (AES)**
- Explored classical Caesar, **Vignere** and Monoalphabetic Substitution ciphers, their **cryptanalysis** and attacks

Convolutional Neural Networks *December 2022*
Coursera's Deep Learning Specialization | Self - Learning

- Implemented the **YOLO** algorithm for object **classification** and **tracking**, understanding loss function from the paper
- Created a **UNet** for semantic **image segmentation**, using **skip** connections to incorporate **high resolution** features
- Coded an algorithm of **neural style transfer** using style and content **reconstructions** from intermediate conv layers
- Designed a **FaceNet** for face recognition and attained knowledge of **SIFT** for keypoint match and image preprocessing

Competitive Coding | *Seasons of Code* *Summer 2022*

- Explored various data structures, the **C++ STL containers** and implemented these for solving algorithmic problems
- Researched dynamic programming, sorting, searching, greedy and graphs algorithms to solve and model problems
- Practised **CSES** and **CodeForces Problem Sets** and scored **65/100** points in CodeJam Qualification Round

Generating Representative Images using PCA *Autumn 2022*
Prof. Suyash Awate | Data Analysis and Interpretation, CS215 *IIT Bombay*

- Visualized **principal modes of dispersion** of handwritten digits from the **MNIST** database using PCA in MATLAB
- Reduced dimensionality of 28×28 images to 84 by projecting on to the hyperplane that maximises dispersion
- Conceptualised and implemented a **MATLAB** program that took in an image dataset of various fruits, and using **PCA**, sampled random combination of **principal eigenvectors** to generate new, representative images of fruits

Railway Journey Planner *Autumn 2022*
Prof. Supratik Chakraborty | Data Strutures and Algortihms Lab, CS293 *IIT Bombay*

- Structured a railway planner in C++ using data structures such as **BSTs**, **Dictionaries**, **Heaps**, **Tries** and **AVLs**
- Revamped the search for stations and handling of queries related to available journeys with a **hash table**
- Optimized searching for station name using **Trie** data structure and searching for reviews using **KMP** algorithm
- Adapted quicksort on linked list to list departures sorted by time and **priority queue** to fetch list of top-rated trains

Other Projects

Analysing Solar Flares | *Computational Astronomy Bootcamp, Krittika* *September 2022 - ongoing*

- Working on an **automatic identification system** to identify flares in the X-ray energy band with varied burst durations and amplitudes from raw data, from the **Chandrayan-2 Orbiter's X-Ray Solar Monitor**
- Used the **AstroPy** framework to work with **lightcurve** data and identify flare characteristics analytically and visually

Multiplayer Pictionary Game
Prof. Kavi Arya | Software Systems Lab, CS251 *Autumn 2022*

- Designed an online multiplayer pictionary game using **ReactJS** in frontend and npm module **socket.io** for backend
- Supported multiple game channels, lobby codes, **live chat**, **leaderboards**, using **sockets** for client-server connections

Technical Skills

Programming	C++, C, Python, Java, Javascript, Bash, Awk, Sed, Prolog, Solidity
Software and Tools	Git, ReactJS, GNU Debugger, HTML5, CSS, Bootstrap, LaTeX, Doxygen and Sphinx
Data Science	Tensorflow, Keras, MATLAB, SciPy, NumPy, Matplotlib, Pandas, AstroPy

Positions Of Responsibility

Moderator, Gr-affable *(Hello FOSS, Web and Coding Club)* *October 2022*

- Moderated and maintained a repository for a **month-long** institute level **open source** contributive effort, incorporating optimised versions of **path planning** algorithms, the huffman coding scheme and cryptographic protocols like RSA

Session Speaker, Debriefing Data *(IIT Bombay)* *October 2022*

- Conceptualised and delivered a **90 minute** tutorial on NumPy, Pandas and Matplotlib for **200+** students, followed up with a hands on problem statement and set the learners up for endeavours in **Exploratory Data Analysis**

Courses Undertaken

Computer Science	Computer Vision*, Quantum Information & Computing*, Data Structures and Algorithms + Lab, Discrete Structures, Data Analysis and Interpretation, Software Systems Lab, Design and Analysis of Algorithms*, Digital Logic Design + Lab*, Computer Networks + Lab*, Logic for Computer Science*, Abstractions and Paradigms in Programming
Mathematics	Calculus I and Calculus II, Linear Algebra, Differential Equations, Optimization Models
Others	Introduction to Electrical and Electronics Circuits, Quantum Physics and Application, Basics of Electricity and Magnetism, Engineering Graphics and Drawing, Physical Chemistry, Organic and Inorganic Chemistry, Biology

**to be completed by April 2023*

Extracurricular Achievements

- Secured **5th place** in SciComp GC, a competitive programming contest with problems in domains of algorithms, mathematics, physics and computational astronomy *(2022)*
- Reached the top 8 in **CodeWars V1 - Virus Wars** and coded a game bot competing for resources, charging the enemy base while defending its own base in python *(2021)*
- Created a **Snake Game** in **Vanilla Javascript** for DevCom IIT Bombay's Game Dev Hackathon *(2022)*
- Secured **2nd place** in the state of Gujarat in the **Indian National Cartographic Association** Map Quiz, and qualified for the nationals *(2017)*