Arihant Vashista
Computer Science & Engineering
Indian Institute of Technology Bombay

22B0958
B.Tech.
Gender: Male
DOB: 14/03/2005

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	9.9
Intermediate	CBSE	Narayana E-Techno , Andheri	2022	98.40%
Matriculation	CBSE	AECS 1, Tarapur	2020	97.40%

Pursuing a **Minor degree** in **Machine Intelligence & Data Science**

Scholastic Achievements

- Awarded **Institute Academic Award** for stellar academic performance amongst 1400+ students *(2023)*
- Conferred with the prestigious **AP** (**Advanced Proficiency**) grade (given to the top **1%** of **1400**+ students) **twice**; in the courses **Multivariate Calculus** (MA111) and **Linear Algebra** (MA106) *(2022)*
- Secured **All India Rank 17** in **Joint Entrance Examination Advanced** out of 155k+ candidates *(2022)*
- Secured **All India Rank 54** in **Joint Entrance Examination Mains** out of 900,000+ candidates *(2022)*
- Amongst the **National Top 1%** candidates in the preliminary stages of **IOQP, IOQA, IOQC** *(2021)*
- Secured **All India Rank** of **121** in the **SX** stream examination of the Kishore Vaigyanik Protsahan Yojana (KVPY) examination, and was awarded the **KVPY fellowship** by the **DST, Government of India** *(2022)*
- Qualified for **Indian National Mathematics Olympiad(INMO)** conducted by **HBCSE**, India *(2020)*
- Recipient of **National Talent Search Examination(NTSE)** fellowship by NCERT, Govt of India *(2020)*
- Finished in the **top 50** teams at Limestone Data Challenge conducted by **Tower Research Capital** *(2022)*
- Honoured with **National 0.1% Merit Certificate** in **2 subjects** in CBSE 10^{th} Board examination *(2020)*
- Secured **All India Rank 18** in **National Mathematics Talent Contest** Junior Category *(2019)*

Key Projects

To the Quantum Future | *Season of Code* *(May 2023 - Jun 2023)*
Web and Coding Club (WnCC), IIT Bombay

- Designed **Quantum Circuits** for swap operations, full adders, multipliers, and **Hamming Weight** Calculator using **Qiskit**, and computed the measurement statistics of a **POVM** using Density matrices
- Studied the concept of **Quantum Entanglement** and applied it to implement **Quantum Teleportation**, Super Dense Coding and solving the **Greenberger-Horne-Zeilinger**(GHZ) Game
- Implemented popular algorithms such as **Deutsch-Jozsa**, Quantum Fourier transform, **Phase estimation**, Shor's Algorithm for prime factorization and **Grover's search algorithm** for a basic **SAT Solver**

Group Theory Reading Project | *Summer of Science* *(May 2023 - Jun 2023)*
Maths and Physics Club, IIT Bombay

- Learnt the fundamentals of **Group Theory**, which included the definitions of **group**, subgroup, cyclic group, generating set, **Cayley Digraph**, and studied examples of **homomorphism** and **isomorphism**
- Read about Groups of Permutations, **Orbits**, cycles, and cosets, and studied Cayley's theorem, the **theorem of Lagrange**, direct products, structure of **Abelian Groups**, and ended with **Plane Isometries**

Games with Reinforcement Learning | *Winter in Data Science (WiDS)* *(Dec 2022-Jan 2023)*
Analytics Club, IIT Bombay

- Explored the **Multi-Armed Bandits (MAB)** problem and **Finite Markov Decision Processes** while evaluating **exploration policies** such as ϵ-greedy, **Thompson Sampling**, Gradient Bandits and **UCB**
- Solved the **Mountain Car Game** using **Q-Learning** and designed a **Deep Q-Network** (DQN) that learns how to play **Atari Breakout** and increases its average performance **three folds** in just 4000 frames

Introduction to Cryptography | *Learner's Space* *(Jun 2023-Jul 2023)*
Cyber Security Community, IIT Bombay

- Explored the basics of cryptography and studied a few **Classical Ciphers** and methods to decipher them.
- Analyzed modern cryptographic schemes, including symmetric-key algorithms and **public-key cryptosystems**, and explored various factors affecting their security, such as factorization algorithms and key sizes
- Performed a cryptoanalysis of **Vigenère Cipher** using Index of Coincidence and **frequency analysis**
- Developed a script to generate **digital signatures** and verify them using **RSA** Digital Signature Algorithm

Text Processing and Compression | *Course Project* *(Sep 2023)*

Prof. Ashutosh Gupta - CS293 - Data Structures & Algorithms

- Designed a **context-based** autocomplete system using **Prefix Trie** and **KMP** based on user text history
- Implemented the **Lempel-Ziv'77 (LZ77)** algorithm performing **compression** using **back-referencing**
- Implemented the **DEFLATE algorithm**, resulting in a compression ratio of **3.4:1** on large text files.

Bash Organizer | *Course Project* *(May 2023 - Jun 2023)*

Prof. Kameshwari Chebrolu - CS104 - Software Systems Lab

- Designed a **Bash script** to efficiently **organize a directory** based on **file extension** or date of creation
- Incorporated features like **name conflict resolution**, managing zip files, and duplicate file elimination
- Implemented **exception handling** and crafted a **user-friendly interface** featuring a progress bar

Path Optimizer | *Course Project* *(Sep 2023)*

Prof. Avinash Bhardwaj - IE501 - Optimization Models

- Formulated a **Linear Program** to find the **longest path** on IITB Map such that **no road is repeated**
- Mapped the IITB map to a **weighted graph** and ran a **modified DFS** algorithm maintaining a stack and concluded that the longest path is **8713 m**, which is just 1.3 km short of the total length of the roads

Data Analysis | *Course Project* *(Sep 2023)*

Prof. Ajit Rajwade - CS215 - Data Analysis & Interpretation

- Analyzed the **Quadratic Mutual Information(QMI)** and **Correlation Coefficient** of two images
- Analyzed **Kernel Density Estimation** results and conducted **cross-validation** for a known distribution.

Assembly Programming | *Course Project* *(Sep 2023)*

Prof. Biswabandan Panda - CS231 - Digital Logic Design & Computer Architecture

- Reverse engineered **binary executables** by analyzing their underlying **assembly code** in **x86 ISA**
- Implemented **Heapsort** and **Binary Search** algorithms in assembly using **MIPS** instruction set

Positions of Responsibility

Teaching Assistant | *Mathematics Dept* *(Aug 23-Present)*

Calculus

- Conducting **weekly tutorial sessions** for a class of **40 students** and solving selected problems
- Conducting **extra doubt sessions** for students who face difficulty in following the class content

Major Courses Undertaken

Computer Science	Introduction to Programming, Software Systems Lab, Data Structures and Algorithms(& Lab)*, Discrete Structures*, Data Analysis and Interpretation*, Digital Logic Design and Computer Architecture(& Lab)*,Operating Systems**, Logic and Theory of Compilers**, Artificial Intelligence and Machine Learning**
Mathematics	Calculus I and II, Linear Algebra, Differential Equations
Others	Optimization Models*, Introduction to Management, Introduction to Philosophy, Classical Physics and Special Theory of Relativity, Quantum Physics and Application, Physical Chemistry, Organic and Inorganic Chemistry, Biology

** To be completed by Nov 2023* *** To be completed by Apr 2024*

Technical Skills

Languages/Software	C++, Python, Bash, Make, MATLAB, Git/Github, LaTeX, VHDL, AutoCAD
Python Libraries	NumPy, Pandas, Matplotlib, PyTorch, TensorFlow, SciKit-Learn, Pygame, Keras
Web Development	HTML, CSS, JavaScript, Bootstrap

Extracurricular Activities

NSS Volunteering	Volunteered in Educational Outreach, and taught a class of **underprivileged high school** students aiding in their preparation for JEE Advanced *(Oct-May 2023)*
Competitive Programming	Actively involved in **Competitive Programming** contests on Codeforces (**Pupil**) and 1694 rating on Codechef and regularly solve CSES Problem set
Football	Participated in the intra-department football tournament and played a key role in our team, which was placed first amongst the fresher teams *(Dec 2022)*
Beatboxing	Performed **vocal percussion** at the CSE department's fresher welcome *(Jan 2023)*