Aayush Singh

Fourth Year Undergraduate
Double Major in Computer Science and Electrical Engineering
Indian Institute of Technology Kanpur

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Examination	Degree/Certificate	Institute	Year	CPI/%
Graduation	B.Tech (Double Major)	IIT Kanpur	2027	**9.4**/10.0
Intermediate/+2	AISSCE(XII)	Kanha Makhan Millenium School, Mathura	2022	98.0%
Matriculation	ICSE(X)	Sacred Heart Convent Hr. Sec. School, Mathura	2020	95.4%

Scholastic Achievements

- Received the **O.P. Jindal Engineering and Management Scholarship**, awarded to **100** engineering students in Oct '23.
- Awarded the **Academic Excellence Award** at IIT Kanpur for academic excellence in three consecutive years ('22, '23, '24).
- **All India Rank 1368** in **JEE Advanced 2022** (among 1.6 lakh shortlisted candidates who qualified JEE Mains).
- **All India Rank 279** in **JEE Mains 2022**, among 10.2 lakh applying candidates (top 0.03 percentile).
- Qualified Indian Olympiad in Physics, Chemistry, and Astronomy **(IOQP, IOQC, IOQA 2022)**, conducted by the Indian Association of Physics Teachers (IAPT).
- Placed in the **National Top 1%** of students in the Indian Olympiad Qualifiers **(IOQC and IOQA 2022)**.
- **All India Rank 344** in **Kishore Vaigyanik Protsahan Yojana (KVPY) 2021**, awarded the **SX** fellowship by IISc.

Work Experience

Research Intern: Exploring Algorithmic Collusion by Q-Learning Models — SURGE *May'24 – July'24*

Mentor: Prof. Srinivas Arigapudi, Dept. of Economic Sciences, IITK

- Investigated if algorithmic pricing agents can exhibit **collusive behavior** by simulating them as **agents** in a simple scenario.
- Implemented **Q-learning** (a **reinforcement learning** technique) in Python to simulate market interactions.
- Modeled and tested simplified scenarios like the **Prisoner's Dilemma** and other simple **game-theoretic** scenarios.

Programming Achievements

- Active participant in Codeforces contests, rated **Expert**, with a peak rating of **1621**; handle: *maejik*
- Active participant in CodeChef contests, rated **3-Star**, with a peak rating of **1793**; handle: *aayushs22*
- Attained **Gold level** in the **WorldQuant Brain Challenge 2022** and received a **Brain Research Consultant** offer.

Skills

- **Languages:** C, C++, Python, JavaScript, MATLAB, Verilog HDL, SQL, MIPS Assembly
- **Utilities and Libraries:** Git, Bash, LaTeX, Markdown, Numpy, Matplotlib, NodeJS, Express.Js, REACT

Extracurricular Activities

- Guided and mentored **5 freshmen** students in acclimatizing to the Institute as a student guide in the counselling service.
- Won **First** Place in Solve The Biz, a competition solving problems of businesses in campus Organized by E-Cell, IITK.
- Secured Campus Rank **24** among more than 300 participants on campus in the **Tradeathon** conducted by **Optiver** at IITK.

Projects

IITK-MINI-MIPS *Jan'25 – Apr'25*

Course Project: — CS220: Computer Architecture

- Designed a 32-bit **single-cycle processor** with custom instruction set using **Verilog** Hardware Description Language
- Processor supports over 50 instructions: including **branches**, **arithmetic**, **jumps**, **loads**,**stores** and **immediate** types.
- Implemented instruction encoding for **R-, I-, and J-type** formats, ALU, control FSM, and memory architecture.
- Executed complete pipeline: **fetch, decode, execute, branching**; validated with **MIPS-based Bubble Sort**.

TRACKit *Jan'25 – Apr'25*

Course Project: — CS253: Software Development and Operations

- TRACKit (Testing Reporting Academic Comprehensive Kit) is a college course information portal that provides a centralized system for managing courses, users, and academic information.
- Utilized **Node.js** and **Express.js** for server-side logic and API development, with **SQLite** for database management, **REACT** for frontend, and hosted on Linux Servers on IITK Intranet.
- Worked with a team of **11** using GitHub for source control, pull requests, and code reviews to maintain code consistency.

IITK-Flix *Dec'23 – Jan'24*

Project: Webmail-less Mailing & Designing — EEA, IIT Kanpur

- Explored Network Layers & Protocols used in E-mail and video streaming systems such as **TCP**, **UDP**, and **SMTP**.
- Built a **UDP-based chat application** in Python for communication within a Wi-Fi network using **Sockets**.
- Developed a Python-based mail client supporting send/receive functionality using **TCP** and **SMTP** protocols.

Federated Learning *Aug'24 – Nov'24*

Course Project — CS771: Introduction to Machine Learning

- Implemented and fine-tuned ML models including **Random Forest**, and **SVMs** achieving up to **99.39%** accuracy on a **binary classification** task.
- Boosted performance via **Feature Extraction** and **Principal Component Analysis**.

Continual Learning *Aug'24 – Nov'24*

Course Project — CS771: Introduction to Machine Learning

- Implemented **Learning With Prototypes** using **ResNet50** for feature extraction in a continual learning setup
- Reduced **catastrophic forgetting** by integrating a **distillation loss** in sequential dataset training

Library Management System *Jan'25 – Apr'25*

Course Project — CS253: Software Development and Operations

- Designed and implemented a role-based Library Management System in C++ using core **OOP** principles — inheritance, polymorphism, abstraction, and encapsulation
- Integrated **file persistence** to serialize library state across sessions, maintaining books, users via C++ file handling.

Relevant Courses

A^*: Grade for exceptional performance, i: Ongoing

Computer Organization A	Probability and Statistics A^*	Data Structures & Algorithms
Operating Systems i	Software Development and Operations A	Introduction to Machine Learning A
Ordinary & Partial Differential Equations	Fundamentals of Computing A	Theory of Computation i
Digital Electronics A^*	Signals, Systems & Networks	Complex Variables A
Economics, Society and Public Policy	Communication Systems A	Principles of Communications A