Arya Agarwal | **210070012**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 29/05/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	
Intermediate	CBSE	ARMY PUBLIC SCHOOL, KIRKEE	2021	
Matriculation	ICSE	THE BISHOP'S CO-ED SCHOOL, PUNE	2019	

Pursuing a minor in **Computer Science and Engineering** from the Department of CSE, IIT Bombay

Scholastic Achievements

- Secured percentile of **99.83** in **JEE Main** among a pool of **1 million** students appearing across the nation *('21)*
- Acheived percentile of **99.52** in **JEE Advanced** out of over **0.25** million candidates appearing nationwide *('21)*

Professional Experience

Research Intern | Datsons Electronics Pvt. Ltd. | Research and Development Department *(May '23 - Jul '23)*

Datsons specializes in power conditioning equipment including smart ***Power Distribution Unit (PDUs)***

Temperature Controlled Fan and Fan Failure Detection Using Microcontroller

- Developed a system using **Arduino UNO(ATmega 328)** to control and detect fan failure in **PDUs**
- Incorporated a **PT100 sensor**, a resistance thermometer, to accurately sense temperature variations and validated the circuit on **Proteus Software** and **Breadboard** to ensure functionality and feasibility
- Established communication using **RS485-Modbus protocol**, enabling interaction with Arduino acting as a slave and utilizing a **relay module** to send control signals to the fan based on temperature thresholds
- Implemented a circuit to detect fan failure, consisting of a **10-ohm 2W resistor**, **rectifier**, and used Arduino which analyses resistor current and sends output signals triggering an **LED indicator**
- Integrated a **20x4 LCD Panel** to display real-time temperature readings and fan on/off status

Key Projects

IITB-RISC-2023 | Course Project | Prof Virendra Singh, IIT Bombay *(Apr '23)*

- Designed a **16-bit** Reduced Instruction Set Architecture (RISC) to execute **17** different instructions using VHDL
- Contributed in constructing digital components such as **ALU, register, encoders, memories, sign extenders** and designed the **flowcharts** ,**control logic** and **datapath** in a team of 4, deploying the processor in **Quartus**
- Designed a **6 stage pipeline architecture** for better performance and added **stalling** to avoid **data hazards**
- Developed hazard detection mechanisms to ensure proper handling of **control hazards** and integrated **data forwarding** and **clock freezing** techniques to tackle these hazards to optimize data flow within the microprocessor
- Implemented a memory system and 8 General Purpose Registers to facilitate data storage and retrieval operations

Microprocessors Laboratory | Prof. S. Vijayakumaran | Prof. Nikhil Karamchandani *(Jan 23'-Apr 23')*

- Interfaced **PT-51 board** with a keypad and used Embedded C to authenticate the password typed on the keyboard
- Established serial communication between Pt-51 microcontroller and a computer using a **USB-UART** module
- Interfaced an analog-to-digital converter **ADC MCP3008** as a slave with **8051 microcontroller** as a master using the **Serial Port Interface (SPI)** protocol to measure the real time voltage readings across a potentiometer
- Built a **stopwatch** using timers and interrupts and displayed execution time between two events on an LCD screen

Digital Logic Design in VHDL | Course Project | Prof. Maryam Baghini *(Aug '22 - Nov 22')*

- Implemented digital circuits using **Intel Quartus Prime** and **VHSIC Hardware Description Language (VHDL)**, focusing on Finite State Machines based **sequence generators, multiplexers** using structural modelling
- Used **UrJTAG** and **ScanChain** for successful implementation of digital logic on **Xenon FPGA Board**
- Developed and designed structural models in VHDL for various components, including a **multiplier circuit** to multiply a 4-bit input with a 3-bit input, a **4-bit adder-subtractor** circuit, and a signed **3-bit comparator** circuit

Analog Circuit Design | Course Project | Prof. Anil Kottantharayil *(Jan 23'-Apr '23)*

- Designed and implemented active filters and **instrumentation amplifier** using **LM741, TL084, INA128** ICs
- Studied and implemented a **logarithmic amplifier** which can be used for direct conversion of analog values to decibels and assembled the circuit using a **TL084 opamp**, diodes and resistor values as obtained from simulation
- Synthesized netlist, devised **Ngspice commands** to perform the simulations to obtain desired parameters

Handwritten Text Recognition and Conversion | Course Project | Prof. Biplab Banerjee *(Apr 23')*

- Collaborated in a team of three to implement a model for recognizing **handwritten text** and converting them into **digital text** using **Deep Learning Models**, specifically **Convolutional Neural Networks (CNN)**
- Utilized Python libraries including **OS, Numpy, OpenCV, TensorFlow**, and **Matplotlib** for efficient solutions
- Employed **Recurrent Neural Networks (RNNs)**, such as **Long Short Term Memory (LSTM)** to understand the sequential nature of words and the variability in character positions for the given word in human handwriting
- Utilized **Connectionist Temporal Classification (CTC)** loss function to tackle the challenge of varied character dimensions and positions, by considering all possible placements of characters and calculating the sum of probabilities

Miscellaneous Projects

Data Structures and Algorithms | Summer Of Science Project | Math and Physics(MnP) Club *(Ongoing)*

- Developed and implemented an algorithm to solve **Sudoku puzzles** of varying difficulty levels using **C++** by applying **backtracking** technique and using a **multidimensional array** to store the numbers in a grid-like fashion
- Implemented the **Dijkstra's algorithm**, which efficiently calculates the shortest path from a given source vertex to all other vertices in the **graph** and optimized the algorithm by incorporating a **priority queues** like a **min-heap**

Multispectral Image Seperation | Course Project | Prof. B.K Mohan, IIT Bombay *(Apr 23')*

- Utilized **PCA(Principal Component Analysis)** for efficient **dimensional reduction**, **increasing interpretability**, **minimizing information loss** and collaborated in a team of three to achieve the project goals
- Employed **GLCM(Gray-Level Co-occurrence Matrix)** to extract informative features from the image
- Applied **K-Means** method to segregate images using GLCM feature extraction, improving image classification

Snake Game | Self Project | Python Programming *(Aug 22')*

- Developed and implemented a Snake Game using **Python**, including the **snake movement, food generation, score updation** and **collision detection**, ensuring smooth gameplay and an interactive gaming experience
- Redesigned the game using **Object Oriented Programming(OOP)** to make it compatible to run on a laptop
- Used various in-built Python libraries such as **Turtle and time** for the movement of the snake and used the concept of **Class Inheritance** to detect its collision with the wall, updating the current score and regenerate the food

Fully Fledged Blog Website | Self Project | Python Programming | UDEMY *(Aug 22')*

- Designed a responsive and visually appealing blog website using Bootstrap and used **Hper Text Markup Language (HTML)** to create the structure of the website and **Cascading Style Sheets (CSS)** for designing
- Implemented **Bootstrap's carousel component** to create an engaging and captivating **slideshow** of images
- Developed a navigation system using **navbar component**, to provide easy access to different sections of the blog
- Customized Bootstrap's pre-built **CSS classes** to create a unique design that aligns with the style of the blog

Positions of Responsibility

Events Manager | Aavhan, IIT Bombay *(May '23 - Present)*

*Aavhan is the IIT Bombay's premier sports organization which takes immense pride in organizing and executing the highly anticipated IIT Bombay Half Marathon and Aavhan Fest, backed by an ample budget of **INR 1 Cr***

- Playing an integral role as a key member of a **16-person team** responsible for organizing events with a footfall of over **50,000 attendees**, ensuring smooth execution and exceptional attendee experience throughout the year
- Organizing **IIT Bombay Half Marathon**, **India's first-ever carbon-neutral marathon** witnessing a participation of over **5000 dedicated runners**, implementing **sustainable practices** and raising awareness
- Contributing to the success of **India's largest collegiate sports tournament**, attracting a massive participation of **4000+** enthusiastic athletes **over 20 sports** in a span of **4 days** events during the **Aavhan Sports Fest**

Sports Secretary | Hostel 2, IIT Bombay *(Nov '22 - Apr '23)*

Member of a 3-tier Hostel 2 council consisting of 37 members selected after rigorous groundwork interviews

- Responsible for **ideation, execution and management** of all sporting events organised by the Hostel Council
- Initiated offline Sports tournaments like **Intra-Hostel Football** to improve and revive hostel sports culture

Key Courses Undertaken

Electrical Engineering	Analog Circuits, Digital Systems, Signal Processing, Probability and Random Processes, Power Engineering, Microprocessors, Electronic Devices, Control Systems,
Mathematics and Data Science	Introduction to Machine Learning, Advanced methods in satellite image processing, Probability and Random Processes, Complex Analysis, Linear Algebra
Laboratories	Microprocessors, Digital Circuits, Analog circuits, Power Engineering Laboratory

Technical Skills

Programming	VHDL, Python, Embedded C, HTML5, CSS, C++
Software & Packages	Keil, Quartus, Matplotlib, Atom, Proteus, Arduino IDE, Pycharm

Extracurriculars

- Selected as one of the top **16 players** to represent the IIT Bombay Football Team at the 55th **Inter-IIT Sports** Meet held at **IIT Roorkee** leading the team to an impressive **3rd place** finish in the tournament *(22')*
- Secured **2nd** and **1st** position in the inter-hostel Football GC and Institute Football League respectively *(23')*
- Completed a comprehensive year long course on **YOGA** at National Sports Organisation,IIT Bombay *(22')*