Sarthak Verma

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Indian Institute of Technology, Madras

EDUCATION

Program	Institution	CGPA/%	Year of Completion
B.Tech in Electrical Engineering	Indian Institute of Technology Madras	9.08/10	2025
Std. XII (CBSE)	Holy Mission Secondary School, Patna	96.8%	2023
Std. X (CBSE)	Loyola High School, Patna	98.2%	2021

SCHOLASTIC ACHIEVEMENTS

- Achieved an All India Rank of 714, ranked among the top 0.4% percentile in JEE Advanced 2023.
- Achieved an All India Rank of 678 and a percentile of 99.94(**top 0.06% percentile**) in JEE Mains 2023.
- Achieved an All India Rank of 163 in **KVPY, 2022** conducted by the **IISC, Bangalore** among 50k+ aspirants.
- Recipient of the prestigious **NTSE** Fellowship by the **Govt of India** in the year 2021.
- Ranked in **National Top 1%** in NSEC 2023 and **State Top 1%** in NSEJS, NSEP and NSEC conducted by **Homi Bhabha Centre for Science Education (HBCSE)**.
- Was awarded the position of **State rank 1** in the state level Maths competition conducted by **Connectech - UEM Technical Bonanza** in collaboration with the state government called **Pythogoras star**.
- Secured a position in **top 5** in the IMC Trading simulation which was an algorithmic trading competition among 150+ teams at IIT Madras.
- Secured a positoin in **top 30** in Optiver tradeathon with 300+ participants at IIT Madras.

COURSE WORK & SKILLS

Specialization in Machine learning by Andrew NG	Machine Learning Foundations	Numerical Methods with C
Probability Foundations for Electrical Engineers	Microprocessor theory and lab	Digital Signal Processing
Linear Algebra & Multivariable Calculus	Applied Programming Lab	Digital Systems and Lab

- **Languages, Libraries and Tools :** C/C++ , Python, Verilog, Assembly, Numpy, Scipy, Pandas, Sci-Kit-Learn, Matplotlib, Cython , Oops; MATLAB, LaTeX, Git, LTSpice, Altium, ROS, Gazebo, Microcontroller Programming.

INTERNATIONAL EXPERIENCE

- **Research Internship | University of Adelaide, Australia** *May '25 – Jul '25*
  - **Centre of Light for Life and Institute of Photonics and Advanced Sensing (IPAS)**
  - **Only student from IIT Madras** selected to work on Photonics and Signal Processing in Light Sheet Microscopy.
  - Participated in lab activities, attended expert seminars, and engaged in discussions on **Optics and Photonics**.
- **CYBATHLON Competition | Zurich, Switzerland** *October 2024*
  - Represented IIT Madras and the **R2D2 Lab** at an international competition focused on assistive technologies for individuals with physical disabilities.
  - Achieved a **global rank of 8**, marking the first Indian student-led team to compete in this domain.
  - Contributed to the design of real-time control systems and embedded solutions for assistive devices, with a focus on above-knee amputees.

PROJECTS

- **Deep learning and Python-based software development** *Jan '25 – Present*
  - Worked under the guidance of **Prof. Shanti Bhattacharya** for development of a **Metaoptics software** that contributes to fast and efficient generation of GDS files for Metamaterial fabrication.
  - Initially updated an existing version of software to incorporate formation of hexagonal lattice generation, Dual wavelength handling with two or four different radii nano pillars in the fabricated material.
  - Working towards incorporating Deep Learning and Physics informed Neural Networks to make the software usable for all wavelengths of light.
- **Trading Strategy Arena** *May '25 – Present*
  - Built a Python-based Simulated Trading Tournament Environment to systematically evaluate and compare agent-based trading strategies on historical market data.
  - Implemented a suite of agents including momentum, mean-reversion, and ML-based models, benchmarking them on key metrics such as Sharpe ratio, alpha, beta, and max drawdown.
  - Developed a modular backtesting framework supporting daily execution, slippage modeling, and capital constraints, enabling rigorous evaluation of strategy robustness.
  - Analyzed agent behavior under varying market regimes using time-series diagnostics and statistical tests, providing insights into conditions for alpha generation.

- **Modern Computer from first principles - Nand2Tetris** *May '25 – Present*
  - Designed a modern Hack computer built using only NAND gates and implemented in its own HDL.
  - Implemented necessary comnponents like RAM, ALU and CPU starting from NAND gates and D flip flops. Wrote an Assembler capable of translating Assembly to machine code.
  - Working on Implementing a Stack-based Virtual Machine and a compiler for the Hack computer.
- **Analog Systems and Lab (Course Project)** *Jan '25 – May '25*
  - Designed a sound and light system to control LED brightness based on input sound frequency
  - Designed, simulated and implemented a buck converter-based LED driver, bandpass filters, adder, peak detector and Class-D audio amplifier modules.
  - Simulated these modules on LTSpice to analyse the output waveforms and the stability of the feedback loops.
- **Simulation and Optimization in Python (Course Project)** *Jul '24 – Nov '24*
  - Applied Programming Lab course with a strong focus on scientific computing and optimization using Python.
  - Developed advanced projects including a **SPICE circuit simulator** and **keyboard layout optimizer using simulated annealing**.
  - Leveraged **Cython** to accelerate performance-critical components, showcasing efficient use of Python for high-complexity tasks.
- **Microprocessor Lab (Course Project)** *Jul '24 – Nov '24*
  - Implemented Wallace Multiplier, Johnson Counter and (Full and Half) Adders using Verilog.
  - Implemented serial communication and an Analog – Digital Converter using ARM in Keil MicroVision.
  - Implemented Interrupts, Division, using AVR in Microchip Studio and verifying the data stored in the memory.
- **Digital Systems Lab (Course Project)** *Jan '24 – May '24*
  - Designed a circuit for displaying a four-bit binary number as a decimal number in 2 seven-segment displays.
  - Realized a traffic signal decimal counter with a single 555 timer, 2 four-bit binary counters, 2 seven-segment displays and a single seven-segment driver. Integrated all modules for one live 5V line and ground input.
- **Numerical Methods with C (Course Project)** *Jul '23 – Nov '23*
  - Implemented Bracketing and Open methods for **polynomial root finding** and performed curve fitting on noisy data using Gaussian, Lagrangian, and cubic spline interpolation.
  - Built **simultaneous equation solvers** employing Gaussian Elimination and LU Decomposition.
  - Generated pseudo-random bit sequences, calculated Hamming distances, and assessed randomness using the **NIST Test Suite**.
  - Applied Runge-Kutta, Heun, and Euler-Cauchy techniques to solve the **Landau-Lifshitz-Gilbert differential equation** for analyzing magnetic switching in spherical magnetic particles.
- **Cubitect - Project under Electronics Club, CFI, IITM** *Jul '24 – May '25*
  - Designed a system of modular cubes capable of autonomously rearranging themselves into user-defined structures, communicated through code-level instructions.
  - Contributed to simulation and proof-of-concept development using **ROS2** and **Gazebo**, ensuring the feasibility of coordinated cube movement in a virtual environment.
  - Focused on hardware realization by programming microcontrollers to enable physical actuation and behavior aligned with the simulation model.

Position Of Responsibility

- **Coordinator, Placement and Internship Cell**
  - Leading a team of 9 for the upcoming placement and internship for the EE department at IITM.
  - Coordinated 12+ Companies and 30+ Profiles as Primary/Secondary POC during the 23-24 Placement & Internship season.
- **Coordinator, Electronics Club, CFI, IITM**
  - Organized national-level workshops including a Signal Processing Summer School for over **500 participants across India**.
  - Oversaw the club's public relations and inventory management, while contributing to technical initiatives such as project mentorship and event planning.
- **Deputy Coordinator, Programming Club, CFI, IITM**
  - Appointed as Deputy Coordinator, Programming Club, CFI IIT Madras, leading initiatives to foster interest in data structures, algorithms, and competitive programming.
  - Engaged in competitive programming contests conducted by the club, emphasizing collaborative learning through hands-on implementation sessions and discussions.

Extra Curriculars

- **Mentor, Tensors**
  - Served as a teaching mentor at Tensors, an IIT Madras student-run NGO, guiding underprivileged students in JEE preparation through targeted coaching and practice question sets.
  - Assisted students throughout the JOSAA counselling process by providing personalized support and clarifying doubts to help them make informed choices.
- **Product Management**
  - Competed in the Product Construct competition by E-Cell IIT Madras, advancing to the finals as the only freshman team from IITM among 50+ nationwide teams.
  - Conducted in-depth analysis of the **Honda problem statement** to develop innovative product solutions during the competition.