Soham Nivargi | **21D070074**
Electrical Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology Bombay | **Gender: Male**
Specialization: Microelectronics and VLSI | **DOB: 04/11/2003**

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	
Intermediate	HSC	S.E.S. Junior College, Solapur	2021	90.83%
Matriculation	SSC	St. Joseph High School, Solapur	2019	93.60%

Pursuing a **minor** degree in **Computer Science and Engineering**, IIT Bombay

Scholastic Achievements

- Acquired an **All India Rank 769** out of 150 thousand candidates who appeared for **JEE Advanced** exam *[2021]*
- Secured an **All India Rank 454** out of **1.5** million candidates who appeared for **JEE Mains** exam *[2021]*
- Awarded Kisore Vaigyanik Protsahan Yojana **(KVPY)** fellowship by IISC with **All India Rank 374** *[2021]*
- Attained **Maharashtra State Rank 37** (**99.98** percentile) in MHT-CET engineering entrance exam *[2021]*
- Cleared NSEP and qualified and appeared for the **second level** of **InPHO** (International Physics Olympiad) *[2021]*

Key Projects

Architectural Simulations with SimPoint | Research Project *[Jul'23 - present]*

Guide: Prof. Virendra Singh | IIT Bombay

- Explored **Valgrind** that generates **basic block vectors** which are unique **signatures** for large benchmark program **intervals**, thereby representing sections of continuous execution within the **benchmark C++ programs**
- Assessed **k-means clustering** algorithm, used by **SimPoint** to logically group similar intervals into **distinct phases**
- Leveraging **SimPoint**, a tool extensively used for **efficient program analysis** that strategically selects **simulation point intervals** which represent the **mean phase behaviour**, thereby used to evaluate full program behaviour
- Working on **generating traces** for **ChampSim** using the representative set of instructions received from SimPoint

IITB-RISC-Pipelined | EE309 Course Project *[Apr'23 - May'23]*

Guide: Prof. Virendra Singh | Course: Microprocessors | IIT Bombay

- Designed a functional, multi-purpose **16-bit RISC processor** with **pipelined architecture** to maximize efficiency
- Developed a **6-stage pipeline**, including stages such as Instruction Fetch, Instruction Decode, Register Read, Execute, Memory Access, and Writeback, to enhance instruction processing **throughput** and maximise **cycle frequency**
- Implemented advanced features, such as a 2-level **data forwarding logic** and a **history bit-based branch predictor**, to **minimize data hazards** and **improve branch prediction** accuracy, ensuring smooth operation without stalls
- Integrated **hazard mitigation units** to ensure smooth operation and optimize performance of the pipeline processor
- Utilized **VHDL Behavioral Modeling** to implement the datapath design and control unit, which was subsequently simulated on **Quartus Environment**, followed by verification of instruction execution on **FPGA** board

IITB-CPU-Multicycle | EE224 Course Project *[Nov'22]*

Guide: Prof. Virendra Singh | Course: Digital Systems | IIT Bombay

- Designed a multi-purpose 16-bit CPU, implementing a **multicycle architecture** inspired by the **MIPS-type processor**
- Developed **state-flow diagrams** for a total of **14** instructions including arithmetic, logical, branch, and jump instructions
- Implemented a **dynamic RAM** module of 64 kB, interfacing between the CPU control unit and external memory
- Proficiently coded essential components like decoders, priority encoders, shifters, sequence extenders, and comparators

Image Cartoonifier *[May'23 - present]*

Summer of Code | Web and Coding Club, IIT Bombay

- Conducted an in-depth review of essential Machine Learning concepts, including **Supervised Learning**, **Activation Functions**, **Regression Techniques** through the esteemed Machine Learning Specialization offered by **DeepLearning.ai**
- Acquired expertise in **Neural Networks and Deep Learning**, implementing models using **TensorFlow** and **PyTorch**
- Employed **gradient descent** to update parameters while training a **logistic regressor** model, using only NumPy
- Trained a deep learning model with multiple hidden layers to **recognize digits** using the **digit recognizer dataset**, applying **forward propagation, backward propagation** and **gradient descent** using only **NumPy** & **Pandas**
- Reviewed the research paper on **Neural Algorithm of Artistic Style** which focuses on **content reconstruction** and **style reconstruction**, employing deep learning techniques that utilizes a **cost function** that blends both reconstructions

Modified-Mini-8085 | EE309 Course Project *[Apr'23]*

Guide: Prof. Virendra Singh | Course: Microprocessors | IIT Bombay

- Employed hardware flow-chart methodology to meticulously design a **16-bit CISC** microprocessor similar to **Intel 8085**
- Designed the **data-path** for a comprehensive set of **18 instructions**, crafting control store through microcode architecture

Bubble Trouble | CS101 Course Project *[Mar'22]*

Guide: Prof. Parag Chaudhari | Course: Computer Programming | IIT Bombay

- Utilized **Object Oriented Programming** using efficient **C++** libraries to analyze the score and time variables
- Implemented 3 levels of difficulty and a user friendly interface using **Simplecpp** to enhance the gaming experience

Artificial Intelligence and Machine Learning *[May'23 - present]*

Summer of Science | Maths and Physics Club, IIT Bombay

- Surveyed **various AI techniques** and uses, and widespread **improvements** in AI in industry over the years
- Reviewed Machine Learning models, Neural Networks & **Deep Learning** which are basic blocks of development of AI

Digital Logic Design | EE214 Digital Circuits Lab *[Jul'22 - Nov'22]*

Guide: Prof. Mariyam Shojaei Baghini | IIT Bombay

- Designed a **BCD subtractor** circuit for subtraction of 2 BCD numbers using **4 bit binary adder/subtractor**
- Implemented a **ALU Circuit** using 4X1 Multiplexer which can do different tasks based on the select line
- Used Structural and Behavorial description; simulated the design using a generic **testbench** and ran **RTL simulation**
- Used **Xenon** digital circuit board for the implementation of the circuit and performed **Scan chain** using the same

8051 Microprocessor | EE337 Microprocessors Lab *[Jan'23 - Apr'23]*

Guide: Prof. Saravanan Vijayakumaran | IIT Bombay

- Designed a program to **match password** for which input is taken from interfacing keyboard to 8051 using **interrupts**
- Implemented **serial data communication** between slave and master devices using **SPI**, Serial Peripheral Interface
- Implemented serial data communication between **UART** and **PT-51** using FLIP and **RealTerm** software tools
- Utilized the **PT-51 board** and **FLIP** software for program execution and comprehensive testing of **design correctness**

Position of Responsibility

Media Secretary | Electrical Engineering Students' Association *[Oct'22 - Apr'23]*

Department of Electrical Engineering | IIT Bombay

- Responsible for the **photography and videography** duties along with photoshop & **collage-making** requirements
- Coordinated with the department council to ensure seamless execution of numerous **EESA** events

Media Manager | Core Team Member, Impulse, IIT Bombay *[Mar'23]*

Department of Electrical Engineering | IIT Bombay

- Handled the **digital marketing** responsibilities of the first ever **Impulse**, the Electrical Engineering Department Fest
- Managed the **social media** accounts of **Instagram** & **LinkTree** of Impulse and EESA to effectively market the fest
- Assumed responsibility for **photography** duties, capturing and documenting events during the weekend-long fest

Mentor | Data Structures and Algorithms, Summer of Science *[May'23 - July'23]*

Maths N Physics Club | IIT Bombay

- Mentored a group of **6 students** on data structures and algorithms and provided them with reliable resources
- Cleared doubts of the mentees regarding the theoretical part of DSA and offered constructive feedback on their reports

Key Courses Undertaken

Electrical Engineering	Microprocessors | Digital Systems | Analog Circuits | Signal Processing | Probability and Random Processes | Power Engineering | Control Systems | Electro-Magnetic Waves* | Communication Systems*
Computer Science	Data Structures and Algorithms | Linear Algebra | Complex Analysis | Partial Differential Equations | Computer Programming and Utilization
Miscellaneous	Quantum Physics and Application | Basics of Electricity & Magnetism

(: To be completed by Nov'23)*

Technical Skills

Programming	Python | C++ | LaTeX | VHDL | Assembly | Embedded C
Python Libraries	Tensorflow | Pytorch | Pandas | Matlplotlib | Scikit-Learn | Numpy | OpenCV
Software	Quartus | GNU Radio | Keil μVision Studio | NGSpice | Canva

Extracurriculars

- Currently enrolled in **Neural Networks and Large Language Models** course in Learner Space, UGAC IITB *(2023)*
- Clinched **1st** position in the **District** level Basketball Championship (Inter School) with a team of 12 players *(2017)*
- Represented **district basketball** team under Solapur District Basketball Association for 3 consecutive years *(2017-19)*
- Completed **1** year of **professional** Basketball training under **NSO** (National Sports Organisation), IIT Bombay *(2021-22)*
- Secured **2nd Runner-Up** trophy in RC Plane Competition held by the **Aeromodelling Club**, IIT Bombay *(2022)*
- Innovated a **RC Car** in the **Robotics summer camp** conducted by Robotics and Aeromodelling Club, Solapur *(2016)*
- Attended the 3-day **NASA**'s Camp KSC at **Kennedy Space Center**, Orlando, Florida, USA *(2017)*
- Well-versed with the knowledge of **music theory** & **guitar** through a few courses and online resources *(2022)*