



**Shubham Singhania**  
**Electrical Engineering**  
**Indian Institute of Technology, Bombay**  
**Specialization: Electronic Systems**

**183079025**  
**M.Tech.**  
**Gender: Male**  
**DOB: 19-12-1995**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2021	8.5
Graduation	MAKAUT, West Bengal	Haldia Institute of Technology	2018	9.1
Graduation Specialization: Computer Science & Engineering				

## AREA OF INTEREST

- Algorithms
- Database Management
- Operating System
- Machine Learning
- Deep Learning

## SCHOLASTIC ACHIEVEMENTS

- Secured an All India Rank **475 (99.56 percentile)** in **GATE** in **Computer Science and Information Technology**. (2018)
- Talk on **Edge Computing and its Challenges** in Fourth **Indo-Japanese Joint Research Laboratory** (Nov'19) Project (2017–2022) Workshop on Intelligent Cyber Physical Systems held at IIT Bombay.
- Got half **freeship** as **Department Topper** (AY 2014-2015) in 3rd and 4th semester (BTech).

## MAJOR PROJECTS AND SEMINAR

- **M.Tech Project: Machine Learning based Task Scheduling approach for Edge Computing Systems.**  
*Guide: Prof. Virendra Singh, IIT Bombay* (Jul'2020 - Ongoing)
  - **Objective:** Design of a Machine learning-based task scheduling algorithm in Edge Computing Systems taking into consideration **task deadline, optimal resource utilization**, energy requirement and other dynamic system constraints.
  - Explored various literature using heuristic as well as Machine Learning-based approaches for Scheduling tasks at Edge.
  - Investigating scheduling using **Deep Reinforcement Learning** where the system learns from experience.
  - Future Work: **Deploying** the Machine Learning-based algorithm on **real-time Edge Computing System and comparing the performance** with existing heuristic based and other scheduling approaches.
- **Seminar: Edge Computing and its challenges** (Jul'19 - Dec'19)  
*Guide: Prof. Virendra Singh, IIT Bombay*
  - Conducted an extensive literature survey on Edge computing and its various computing paradigm and how it is different from existing **Cloud Computing approach**.
  - Explored various security challenges in **secure data analytics in Edge**, Computing and task Scheduling challenges for heterogenous tasks in the Edge requiring real-time response, Quality of Service, and Verifiable Computation.

## WORK EXPERIENCE

- **System Administrator | Electrical Department, IIT Bombay** (Jul'18 - Present)
  - **Development** and maintenance of EE department website, Dashboard, and other internal portals like faculty search committee, meeting room booking system, and other portals.
  - Provide mail service, storage space, computing, and network facilities to the Department.
  - **Automation** of M.Tech/PhD admission process for Electrical Engineering Department for 800+ candidates.

## KEY COURSE PROJECTS

- **Implementation of PAXOS algorithm in Python | Principles of Concurrent & Parallel Programming** (Jul'19-Dec'19)  
*Instructor: Prof. R.K. Shyamsundar, IIT Bombay*
  - Ensures **consensus** is reached from a bunch of proposed values in a distributed system.
  - The algorithm uses three roles, **proposers, acceptors & learners** and does not need a centralized coordinator node.
- **Document Scanner Application in Python | Computer Vision** (Jan'20)  
*Instructor: Prof. Sharat Chandran, IIT Bombay*
  - Implemented a document scanner to obtain the undistorted image of the largest convex quadrilateral object present in the input image and to **automate the task** of choosing the largest convex quadrilateral.
  - A set of image operations such as Edge and **Contour Detection, Corner Point Extraction** and **Perspective Transformation** was carried out to obtain an undistorted rectangular image of the convex quadrilateral.
- **Real Time Target Tracking | DSP -System Design & Implementation** (Jul'19 - Nov'19)  
*Instructor: Prof. Rajbabu Velmurugan, IIT Bombay*
  - Designed and developed an object tracking system using **image segmentation** in TI DSP EVM 6678.
  - Video signal obtained from USB camera was sent **frame by frame** to the DSP board using **UDP** connection.
  - Target was tracked with a laser pointer mounted on a base with 2 DOF and controlled via Tiva C board.

- **Augmented Reality: Augmenting a book on the wall surface** | *Computer Vision* (Feb'20)  
Instructor: Prof. Sharat Chandran, IIT Bombay
  - The aim of the project was to stick a book on the wall surface which represents reality being augmented.
  - A set of image operations such as **Projecting 3D points on the 2D image plane**, **Perspective Transformations** and **Mask Generation** was carried out to stick the book on the wall surface.
- **Implementation of Fiduccia Matthyses Partitioning Algorithm in Python** | *VLSI CAD* (Jul'18 - Nov'18)  
Instructor: Prof. Virendra Singh, IIT Bombay
  - Implemented Fiduccia Matthyses partitioning algorithm to **partition a circuit** assuming **distributed** systems, such that the number of connections (external wires) is minimized.
  - Inputs are netlist along with area information needed by the sub-circuits, and the outputs are mapping of the subcircuits to nodes and the number of crossings.
- **Image Sticking** | *Image Processing* (Jul'18 - Nov'18)  
Instructor: Prof. Amit Sethi, IIT Bombay
  - Developed a feature based image sticking GUI application in python.
  - Applied Scale Invariant Feature Transform (**SIFT**) algorithm for feature detection, Fast Library for Approximate Nearest Neighbors (**FLANN**) for matching and RANdom Sample Consensus (**RANSAC**) for homography computation.
- **Vowel Detection: Feature Extraction and Multi-Class Classification** | *Machine Learning* (Jan'19 - Apr'19)  
Instructor: Prof. Biplab Banerjee, IIT Bombay
  - Trained a **multi-class classifier** using **Softmax** function from features obtained from input voice samples.
  - Obtained a mean test accuracy of 68% on five classes classification.
- **Clustering Images using Metric Learning** | *Computer Vision* (Mar'20)  
Instructor: Prof. Sharat Chandran, IIT Bombay
  - Trained a **Siamese** network with **Contrastive Loss** to better separate and visualize the two-dimensional embeddings of two classes of the MNIST Dataset.
  - Analysed performance of the obtained model on augmented dataset i.e., images augmented using Euclidean transformations and trained a **new model robust to such data augmentations**.
- **Design of 6 Stage Pipelined Processor using VHDL** | *Processor Design* (Jan'19 - Apr'19)  
Instructor: Prof. Virendra Singh, IIT Bombay
  - Designed **RISC** Architecture processor using 8 registers to execute 15 instructions of type R, I and J.
  - Implemented **hazard mitigation** technique and **data forwarding** to optimize performance. Design also includes some advanced instructions like **Load multiple** (LM) and **Store multiple** (SM).

## TECHNICAL SKILLS

<b>Languages</b>	:	C, Python, VHDL, PHP, Java, SQL, HTML/JS/CSS, Bash.
<b>Tools</b>	:	Git, L <sup>A</sup> T <sub>E</sub> X, Code Composite Studio, Altera Quartus II.

## RELEVANT COURSES

- Principles of Concurrent & Parallel Programming
- Machine Learning for Remote Sensing -I
- Computer Vision
- Processor Design
- Embedded System Design
- VLSI CAD

## POSITIONS OF RESPONSIBILITY

- **Mess Secretary** | *Hostel 1, IIT Bombay* (Jul'18 - Jun'19)
- **Interview Coordinator** | *Placement Cell, IIT Bombay* (2018)
  - Coordinated with a team of 250+ members for interviews of 1600+ students
  - Assisted in conducting Pre-placement Talks and Tests for 15+ firms.
- **Web Nominee** | *Post Graduate Academic Council, IIT Bombay* (2019 - 2020)
- **Maintenance Councillor** | *Hostel 1, IIT Bombay* (Jul'19 - Present)
  - **Lead** 5 Secretary and 15 working staffs to carry out the maintenance activity of the hostel.
  - Started **2 dustbin approach** to segregate waste generation at source.
- **Web Coordinator** | *Students' Reading Group, Electrical Department, IIT Bombay* (Jul'19 - Present)

## OTHER ACTIVITIES & INTERESTS

- Completed 4 out of 5 courses in **Deep learning Specialization** authorized by **deeplearning.ai** in Coursera.
- Ongoing course in **Reinforce learning Specialization** authorized by the **University of Alberta** in Coursera.
- **Trained** students in a 1-day solar lamp assembly **world record event** conducted at IIT Bombay. (2 Oct'18)
- **Volunteered** for **Linux** workshop for Electrical Department PG Bridgecourse, IIT Bombay. (Jul'19)
- **Volunteered** for **Phonathan** event of reaching out alumni for Student Alumni Relation Cell, IIT Bombay. (Jun'19)
- Active Blood Donor, **Hobbies**: Watching TV series, Gardening, Cooking