



Navnit Kumar  
Electrical Engineering  
Indian Institute of Technology, Bombay

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Dual Degree (B.Tech. + M.Tech.)  
Gender: Male  
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Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2021	null
Intermediate	CBSE	Delhi Public School, Bokaro Steel City	2016	92.60%
Matriculation	ICSE	Don Bosco Academy, Mccluskieganj	2014	95.60%

## Scholastic Achievements

- Nationwide **top 1.5%** in **JEE Main** among 1.5 million candidates with **AIR 418 (SC)** [2016]
- Secured **AIR 172 (SC)** in **IIT JEE Advanced**, top 4.7% in general category (among 0.2 million) [2016]
- Qualified for **interview stage** of the Kishore Vaigyanik Protsahan Yojana (**KVPY**) (among 50 thousand) [2015]
- Recipient of **Scholar Badge** given to **high-performing** class 12 students of **DPS Bokaro** (among 600) [2015]
- Achieved **International Rank 634** in the 16th National Science Olympiad, 2013 conducted by **SOF** [2013]

## Internships and Research Project

### Ubisoft India Studios | Automation Intern

May 2019-July 2019

Quality Control Team | **Project:** Bug detection in graphic images

- Researched on **Deep Learning** algorithms: R-CNN, faster R-CNN and Mask R-CNN, to **detect clipping** bugs
- Implemented** a Mask R-CNN based model for **detection** and **segmentation**, achieved **77%** accuracy
- Reduced false positives by using **data augmentation**, test time augmentation and improved model performance

### Hopfield Network for Optimization Problems

Autumn 2019

Supervised Research Project | **Guide:** Prof. Udayan Ganguly

- Understanding** the capability of Hopfield networks to find **optimal** solution to the **traveling salesman** problem
- Investigated** the mapping of graph to **network** of sinusoidal oscillators and performed circuit simulations
- Explored the **phasor arithmetic method** for phase evolution to ensure energy **function minimization**

## Key Academic Projects

### Authentication system for Vehicle Identification

Spring '19

Digital Signal Processing

Course Project

- Extracted** number plate of malefactor car using **image processing**, under Make in India programme
- Used **bounding box detecting** techniques and alphabet dataset **correlation** to read the text in the plate

### Latency and Scheduling using Graph Algorithms

Autumn '18

Foundations of VLSI CAD

Course Project

- Used **Topological Sort** to find optimal ordering of circuit elements in a combinational multi-level **Boolean network**
- Implemented resource scheduling with time constraints, estimated latency using **longest path** algorithm in a DAG

### Analog Audio Equalizer

Spring '18

Analog Laboratory

Course Project

- Built a **6-channel tunable** audio equalizer to adjust the frequency components within an **audio signal** input
- Implemented** features to **boost** and **cut** the energy of specific frequency bands using **Bandpass filters**
- Added **LM386 amplifier** to amplify output signal and introduced **volume controller** for Equalizer

### Design and Verification of 16 Bit Dadda Multiplier

Autumn '19

VLSI Design

Course Project

- Designed** and tested **16-bit Dadda multiplier** in **VHDL** for multiplication of two 16-bit unsigned integers
- Used **Brent Kung Logarithmic Adder** as **final stage** and identified, computed **critical path delay** in simulation

### Movie Recommendation System

Spring '20

Source: Kaggle

Self Project

- Explored candidate generation methods : **content-based** and **collaborative filtering** to build recommender system
- Represented** items and queries as **embeddings**, built a regularised **Matrix Factorization** model and trained it
- Implemented a **softmax** model and inspected its learned embeddings by looking at **nearest neighbours** and **norms**

### Intelligent Power Board

Spring '19

Electronics Design Laboratory

Course Project

- Developed power board prototype capable of **logging** voltage, current and power consumption on a remote computer over bluetooth, to **monitor power surges** (achieved 1V resolution over 150-250V and 10mA resolution above 30mA)

## Employee Attrition Analysis and Prediction

Introduction to Machine Learning

Spring'20

Course Project

- Built a **machine learning** pipeline to predict employee attrition on the basis of their performance
- **Analysed data**, employed supervised classification algorithms viz. **Random Forest**, **SVM**, achieved **87%** accuracy

## IITB RISC Microprocessor

Microprocessors

Autumn'18

Course Project

- Designed **multi-cycle processor**, capable of implementing **15** instructions using Hardware Flowchart method in VHDL and implemented **microcoded based architecture** with **control store** for storing encoded control signals
- **Optimized flowcharts** of instructions for reducing size of **control words** and generated required **control signals**

## Reaction Game

Digital Circuits Laboratory

Spring'18

Course Project

- **Implemented** a game on Krypton board which uses **Altera's Max V CPLD** device
- Added feature for **score calculation** based on time difference between LED 'ON instant' and **reaction time** of player for eight iterations to display **total delay** as score on LCD Display
- Designed **RTL** machine in **VHDL** to meet game specifications, simulated and tested implementation on **ModelSim**

## Digital Stopwatch

Introduction to Electronics

Spring '17

Course Project

- **Developed** a basic **prototype** of digital stopwatch with **pause**, **play**, **record** features for **tracking time**
- Used **LM555 timer**, MOD-6 **counter** and 7-segment **decoder** and displayed output on a set of 7-segment display

## Technical Skills

<b>Programming</b>	C, C++, Python, VHDL
<b>Software Tools</b>	Git, NumPy, Pandas, Matplotlib, TensorFlow, MATLAB, L <sup>A</sup> T <sub>E</sub> X
<b>Design Tools</b>	Cadence Virtuoso, Intel Quartus, NGspice, TCAD, TI CCS

## Relevant Coursework

<b>Digital</b>	Digital Systems, VLSI Design, Systems Design, Testing & Verification of VLSI Circuits, VLSI CAD, VLSI Design Lab, Microprocessors, VLSI Technology
<b>Electives</b>	Machine Learning, Data Analysis & Interpretation, Probability & Random Processes, Digital Signal Processing, Image Processing & Remote Sensing, Linear Algebra, Calculus
<b>Computer Science</b>	Computer Programming and Utilization, Data Structures*

\* Online Course

## Positions of Responsibility

**Teaching Assistant** | Introduction to Electrical and Electronic Circuits Aug'20 - Present

- Responsible for setting assignments, organising tutorials and evaluating answer sheets for a batch of **28** students

**Class Representative** | Electrical Dual Degree Batch 2016-21 July'17-July'18

- Represented a batch of **64 students** for a year, acting as a link between professors and students
- **Handled** logistical issues faced by students in courses offered by **Electrical Department, IIT Bombay**

**Coordinator, Team Pronites** | Mood Indigo 2017 May-Dec'17

*Asia's largest college cultural festival with 141,000 footfall, 210+events, 160+international artists, 30+venues*

- Worked in **team** of **20** and responsible for execution of concerts with footfall **20,000**
- **Ideated** and revamped the structure for **LiveWire**, India largest and oldest semi-professional band event
- Lead a team of **20+** to execute India's largest student organized concerts attended by a crowd of **20,000**

## Extra-Curriculars

- Volunteered for **Green Campus, IIT Bombay** under the **National Service Scheme (NSS)**, IIT Bombay [2016]
- Conducted **Bio-Diversity Mapping** along Main Gate Road in association with **NSS**, IIT Bombay [2016]
- Participated in **RC Plane** and **Line Follower Bot** Competition organised by the **STAB**, IIT Bombay [2017]
- Attended **workshops** on Arduino and AVR microcontroller, conducted by **Electronics Club**, IIT Bombay [2018]
- Attended and successfully completed **Communication Workshop** by **Indian Training Co.** [2020]
- Contributed to **Open source** projects and successfully completed the **Hacktoberfest challenge** [2019]