Pursuing a **Minor** in **Artificial Intelligence** & **Data Science** from **C-MInDS**, IIT Bombay

Scholastic Achievements

- Achieved **All India Rank 3** in **ICSE Class 10** board exams out of **200,000+** students with **99**% *(2017)*
- Secured **All India Rank 424** in **JEE (Advanced)** out of **200,000+** candidates *(2019)*
- Secured **All India Rank 225** in **JEE (Mains)** out of **1.5 million+** candidates *(2019)*
- Received the prestigious **KVPY** scholarship to promote research, with an **All India Rank 265** *(2019)*
- Among the **top 30** students from West Zone to clear the **NSEC**, hence qualifying for **INChO** *(2019)*

Research Experience & Internships

Low Power Mixed Signal Circuit Design for ML Applications *(Jul '21 - Present)*
Advisor: Prof. Maryam Shojaei Baghini, Integrated Systems Lab, IITB | RnD Project (EE 691)

- Contributing to the design of a **Neuromorphic ML ASIC** for **energy efficient edge computing**
- Analysing **Quantization-Aware Training** of **DNN** architectures under accuracy and energy constraints
- Incorporating **process variation effects** through simulations in the training of the DNN models for enhancement of robustness to analog non-ideal variabilities using in-house developed protocols

ML Based Floorplan Estimation & **Generative Design** *(Jun '21 - Jul '21)*
Summer Intern | Utec, Aditya Birla Group

- Used **Image Segmentation** techniques to build a custom **U-Net** model for wall detection from a floorplan
- Built a 100 image dataset with **VGG Annotator**, observing >**90**% **precision** & **recall** inspite of less data
- Developed an algorithm to estimate wall features with high accuracy, using data extracted from CAD file
- Analysed various **generative modeling** methods incorporating DNNs, for automated floorplan generation

High-Performance BTB and I-Cache *(May '21 - Jul '21)*
Advisor: Prof. Biswabandan, Computer Architecture for Security & Performance Lab, IITB | Research Project

- Explored **predictive replacement policies** for **I-Cache** and **Branch Target Buffer** (BTB) under the timing and area constraints, to reduce BTB and L1I misses, by increasing the storage density of the BTB
- Studied methods to **mitigate pipeline stalls** for boosting store buffer efficiency, including **prefetching** strategies to minimize **store-buffer** induced stalls and to hide store latency

Technical Projects

Computer Vision as an Assistive Technology for the Blind *(May '20 - Jul '20)*
Institute Technical Summer Project, IIT Bombay

- Ideated a technique using **Convolutional Neural Networks** and **Computer Vision** algorithms in **Tensorflow**, capable of assisting the visually impaired, as a **cost efficient** alternative to current solutions
- Implemented **YOLOv3** and **Tesseract OCR**, and applied **Transfer Learning** on a pretrained **VGG 16** model to provide object detection, surrounding classifier (**87**% accuracy) and text reader functionalities

Junior Design Engineer | Software Subsystem *(Aug '20 - May '21)*
Team Rakshak, An IIT Bombay tech team developing a fleet of Unmanned Aerial Vehicles

- Part of the **Deep Learning** team tasked with improving object detection & recognition tasks through development of image **Super-Resolution** models, for the **AUVSI SUAS**, world's largest UAV competition

- Implemented **Residual Dense Network** for Super-Resolution, in **Tensorflow**, on images from the UAVs

Digital Logic Design in VHDL | **Digital Systems** *(Feb '21 - Apr '21)*
Instructor: Prof. Maryam Shojaei Baghini | *Course Project*

- Utilized **Behavioural** modelling to design an **FSM** to play music notes on the Krypton Board
- Optimized combinational circuits and programmed their architectures using **Structural VHDL**
- Designed a **Kogge-Stone** fast adder with XOR, MUX and NAND components to build a 16-bit **ALU**
- Implemented and tested all designs, using a testbench, on the Altera MAX3000A **CPLD** with **Quartus**
- Verified designs by performing simulations on all possible inputs using **scan-chain** on the Tiva-C board

Movie Recommendation Systems | **Introduction to Machine Learning** *(Apr '21 - May '21)*
Instructor: Prof. Abir De | *Course Project*

- Implemented a recommendation system using a user-user based **collaborative filtering KNN** algorithm built from scratch with **Pearson's correlation** as a similarity measure, and achieved a RMSE score of **0.85**
- Performed cross-validation analysis of various algorithms on python using the **Surprise** library, used the **baseline estimates** and **KNN with means** item-item based algorithms to get a RMSE test score of **0.75**
- Built a **content-based** filtering system from the metadata encoding using the **sklearn** library

Analysis of Covid-19 in India | **Programming for Data Science** *(Nov '20 - Dec '20)*
Instructor: Prof. Amit Sethi | *Course Project*

- Performed insightful and detailed **Exploratory Data Analysis** and **Data Visualization** of Covid-19 in India highlighting the rural-urban divide, testing capabilities and the impact of GDP in distribution of healthcare
- Performed data-cleaning of **12** datasets using pandas, created **animated progression trends** to analyse facets including doubling time and **visualised geospatial data** of testing facilities using **plotly** and numpy

Cricket Scoreboard Simulator | **Microprocessors Lab** *(Mar '21 - Apr '21)*
Instructor: Prof. Saravanan Vijaykumaran | *Course Project*

- Implemented a cricket scoreboard simulator for a 20 over game in **Embedded C**, using **Keil**
- Configured the **Universal Asynchronous Receiver-Transmitter** (UART) for serial data transfer using **timers** and **serial interrupts**, and displayed the score on a LCD connected to the Pt-51 board
- Implemented assembly language programs of keyboard scanning for a 4x4 keyboard, using **FSMs** coded as callable functions, for both the **MIPS** ISA and **8051** microcontroller, in **QtSpim** and Keil respectively

Technical Skills

Languages	Python, VHDL, Embedded C, C++, MATLAB, Julia, Assembly, GNU Octave
Softwares	Quartus, Keil, Git/Github, AutoCad, GNURadio, LaTeX, Microsoft Office
Libraries/Frameworks	TensorFlow, Keras, Scikit-Learn, Numpy, Pandas, Matplotlib, Plotly

Key Courses

Electrical Engineering	Neuromorphic Engineering*, Signal Processing, Analog Circuits, Digital Systems, VLSI CAD*, Microprocessors, Probability & Random Processes, Communication Systems*, Control Systems, Electronic Devices, EM Waves*, Power Engineering
Computer Science	Programming for Data Science, Machine Learning, Computer Programming
Mathematics	Calculus, Linear Algebra, Complex Analysis, Differential Equations
Miscellaneous	ML for Remote Sensing*, Quantum Physics, Biology, Engineering Drawing, Economics
MOOC's	Deep Learning Specialization, Machine Learning, Python 3 Specialization

(*To be completed by Nov '21)

Extracurricular Activities

- Represented Pune in the **Maharashtra Zonals Basketball** Tournament and finished **runner-up** *(2016)*
- Among the **18** players to be selected for the **Inter-IIT Pre Camp** for **Basketball** *(2019)*
- Secured **gold medal** in the Under-17 **Zilla Parishad Basketball** Tournament (Pune District) *(2016)*