Shaan Shah

Curriculum Vitae

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Education

2019 – 2023 **BTech**, *Electrical Engineering*, *Indian Institute of Technology, Bombay* *CGPA 8.3*.

Publications

- Rathore A., Sharma A., **Shah S**., Sharma N., Torney C., Guttal V. (2022). Multi-Object Tracking in Heterogeneous environments (MOTHe) for animal video recordings. [In Revision]

Professional Experience

May-July'22 **Barclays Investment Bank** | **Delta-1 Trading Desk** | **Intern**

Developed models to predict changes in the composition of Swiss and Italian benchmark indices

- Forecasted index rebalances for the FTSE MIB index and the Swiss Market Index with 100% accuracy
- Estimated the probabilities of stocks being removed/added to indices using Monte Carlo simulations
- Implemented a tool in Python to calculate the impact of forecasts on the index forward prices

Feb-Aug'21 **TruckX Inc.** | **Software Engineering Intern**

Fleet Management, IoT and Electronic Logging Devices Platform

- Implemented software support for key user-facing features and IoT device data management pathways
- Developed a debugging tool to interact with user accounts without affecting the production environment
- Streamlined the backend user authentication pathway by implementing a central service and integrated caching into it

Research Experience

Nov'21 **Liquid State Machines [Ongoing]**

Guide *Prof. Udayan Ganguly*, *Department of Electrical Engineering, IIT Bombay* | Slides

A reservoir computation-based spiking neural network learning model

- Trained liquid state machines on the TI-10 spoken digit dataset, having 10 spoken digits and 8 speakers, achieving an accuracy of 96%
- Implemented the setup on Loihi, Intel's state-of-the-art neuromorphic chip, to scale up the reservoir
- Developed a GPU-compatible version on Pytorch, reducing the simulation time by a factor of 20
- Implemented novel visualization techniques and metrics to interpret the reservoir's working

Spring'22 **Multi-Object Tracking in Heterogeneous environments (MOTHe) for animal video recordings**

Guide *Prof. Vishwesha Guttal*, *Centre for Ecological Sciences, Indian Institute of Science, Bengaluru*

An open-source GUI software package to help ecologists track animals in heterogeneous environments

- Optimized the software package to allow for efficient scaling with an increase in size of the dataset
- Evaluated the package's performance on animal recordings shot in the wild on a variety of metrics
- Tested and debugged the package for porting to multiple operating systems and environments

Key Projects

Sep'20 **Sentimeter** | Slides

A tool to measure sentiment for a keyword factoring in content from social media and news outlets

- Mined data from Twitter, Reddit and news outlets and analysed it using Flair & NLTK packages
- Calculated the sentiment using the mined data factoring in the content, popularity and origin location
- Visualized the obtained data using interactive charts and maps for temporal and geospatial analysis
- Pitched it to major news channels, iteratively developing data acquisition and visualization methods

2021-22 **Snippetizer - A Chrome Productivity Extension**

Guide *Dr. Parthasarathy Ranganathan*

A browser extension to seamlessly capture digital streams of thoughts

- Analyzed 5 years of Google Calendar and Chrome usage data to design an optimum user flow
- Implemented an extension that enables users to capture notes in context of digital workflows
- Integrated Google Sheets into the extension for task tracking and post-analysis of captured data

Autumn '21 **Oscillatory Neural Networks**

Guide *Prof. Udayan Ganguly* | *Neuromorphic Computing* | Slides

A neuromorphic computing based approach for solving NP hard problems

- Implemented the N-oscillator energy function based solution for the Travelling Salesman Problem
- Studied the scaling law in time by observing the system's response to increasing network size
- Observed the effect of varying noise on the network's settling time and the quality of obtained solution

Spring '22 **TCAD Modelling of 3T RRAM**

Guide *Prof. Udayan Ganguly* | *Nanoelectronics* | Slides

- Studied the working principle of a 3-terminal RRAM and its applications in In-Memory Computing
- Implemented a model of the 3T RRAM in Sentaurus TCAD to analyse device physics and properties
- Observed the current-voltage response of the device in different configurations and varying temperatures

Spring '22 **Electrical Detection Beyond Debye Length**

Guide *Prof. Pradeep Nair* | *Bio Sensors & BioMEMS* | Slides

A scheme to detect bio-molecules in an electrolyte using a single-walled carbon nanotube transistor

- Modelled the change in current flowing through a transistor due to the presence of a target molecule
- Simulated the effect of a varying electric field on ions in the electrolyte and transistor current
- Estimated the current's transient response in transport-limited conditions using Monte Carlo simulations

Aug '20 **No Code Machine Learning** | Platform | Blog

A platform enabling non-coders to leverage machine learning without writing a single line of code

- Implemented an algorithm to clean input data, train a Random Forest & make predictions on test data
- Developed a model optimization algorithm, automating hyperparameter tuning and feature engineering
- Deployed it as a web service with an input interface that emails the predictions after processing

Spring '21 **Matching Pairs Game on Pt-51**

Guide *Prof. Rajbabu Velmurugan* | *Microprocessors Lab*

- Built an interactive game using Embedded C and displayed it on 16x2 LCD connected to Pt-51 board
- Enabled UART module for Serial I/O using PL2303 adapter to allow regular inputs from the user
- Encoded a linear feedback shift register for multiple iterations of the game and to display high scores

Technical Skills

Programming	Python, MATLAB, Julia, Javascript, HTML, CSS, C++, ASM, VHDL, Embedded C
Softwares	Sentaurus TCAD, AutoCAD, Arduino IDE, Unity, Quartus, Chrome Extension Development, Git
Frameworks	Django, Tornado, Pytorch, fastai, Matplotlib, scikit-learn, Pandas, Numpy

Leadership Experience

Autumn '22 **Teaching Assistant** | **EE 746 - Neuromorphic Engineering**

Department of Electrical Engineering, IIT Bombay

- Facilitated smooth course organization, responsible for grading assignments and quizzes
- Mentored student groups, solving queries and guided them through course/research projects

July-Aug'20 **Programming Instructor** | **Camp K12**

- Mentored students ranging from grades 5 to 11 and taught them the basics of programming
- Simplified complex deep learning concepts like training, validation, loss and overfitting, making them understandable to students having no prior math or programming background
- Sparked an interest in coding in students having no prior programming experience by helping them develop chatbots and web-scrapping tools

2020-21 **Assistant Team Manager**| **IIT Bombay Racing**

A team of 100+ students working on designing and manufacturing an electric race car

- Negotiated with 10+ corporates in a team of 7 to work out annual sponsorships worth INR 5.5 million
- Senior Editor of Milestone, the official team magazine; Led a team of 25 with readership across 5 countries responsible for coordination between content creators and designers

Spring'22 **Organizer** | **Climbathon**

Freedom - The Climbing Wall, IIT Bombay

- Organized training sessions and competitions to increase awareness about climbing in the campus
- Introduced 100+ participants to climbing, teaching them the basic techniques and safety protocols

Coursework

Electrical Engineering	Power Engineering, Analog Circuits, Digital Systems, Signal Processing, Electronic Devices and Circuits, Control Systems, Microprocessors, Communications Systems, Nanoelectronics
Mathematics	Calculus, Linear Algebra, Probability and Random Processes, Complex Analysis
Miscellaneous	Neuromorphic Engineering, Biosensors & BioMEMS, Economics, Accounting and Finance, Advance Network Security, Speech Processing, Operation Analysis

Extracurricular Activities

- Certified Open Water Scuba Diver, permitted to achieve a depth of 18 metres without supervision
- Writer for Towards Data Science, a publication on Medium, having a view count of 50k+
- Completed 80+ hours of training in Badminton as a part of National Sports Organisation (NSO)
- Bagged a gold medal and the hostel trophy in the inter-hostel Squash Championship
- Represented India in the MaRRS International Spelling Bee held in Putrajaya, Malaysia