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

Scholastic Achievements

- Achieved **99.81 Percentile** in **JEE-Main** out of over 1 million candidates *(2021)*
- Secured **All India Rank 1207** in **JEE-Advanced** out of over 0.14 million candidates *(2021)*
- Secured **AP grade** for excellent performance in **PH 108-Basics of Electricity & Magnetism** *(2022)*
- Secured a **Branch Change** to **Computer Science** department on the basis of academic performance *(2022)*
- Secured **AIR 275** in the prestigious **KVPY SX** and awarded fellowship by **IISC Bangalore** *(2021)*

Work Experience

Applied AI Researcher at Brance Technologies *(Summer 2023)*

- Developed and implemented performant chatbot systems using **vector embeddings** for data retrieval and **Large Language Models** for question-answering, resulting in significantly improved user experience and engagement
- Utilized **Haystack** framework and **FAISS** to efficiently index and store proprietary data, leveraging **vectorDBs** to store the embeddings. Utilized **Hugging Face models** to form the entire **indexing and retrieval pipeline**
- Included **document reranking** resulting in improved relevance and accuracy of the retrieved information for chatbot
- Implemented **Locality-Sensitive Hashing (LSH)** to create a highly **performant caching system** to cache user queries that utilizes **semantic search**, optimizing the speed, accuracy, and efficiency of data retrieval for chatbot
- Leveraged **Nginx** and **FastAPI** on an **AWS EC2** instance to ensure seamless communication, and reduced latency for the chatbot system. Utilized **async calls** and FastAPI's scalability for smooth data retrieval and processing

Key Projects

Stable Diffusion from Scratch *(Summer 2023)*

Self Project

- Used **PyTorch** to independently develop and implement **each component** of a Stable Diffusion model on smaller datasets before using the Hugging Face's **diffuser library** to implement the final diffusion model on a larger dataset
- Implemented a **Variational Autoencoder (VAE)** and trained it on the Fashion MNIST dataset using **reconstruction loss** and **KL-Divergence loss**, enabling accurate reconstruction of inputs and latent space interpolation
- Implemented a **Diffusion U-Net** with **timestep embeddings** and **self-attention** and used it to implement both unconditional and conditional **DDPM** (Denoising Diffusion Probabilistic Models) on MNIST and CIFAR-10 datasets
- Used various scheduling techniques like **DDIM**, **LMSDiscrete** and **PNDM** etc. to improve speed of the generations
- Implemented **latent diffusion** by utilizing the diffuser's VAE to **encode images** to latent representations, and subsequently trained a **DDPM** on these latents using the LSUN churches datasets to generate high-quality images
- Used various metrics like **FID** (Fréchet Inception Distance) scores to evaluate the quality of the generated images

Discrete Event Simulator for Bitcoin Network *(Spring 2023)*

Guide: Prof. Vinay J. Ribeiro | Course Project : Introduction to Blockchains and Smart Contracts *IIT Bombay*

- Implemented a discrete event simulator for the Bitcoin Network and **analyzed the forking** and length of the main chain. Additionally, simulated **selfish mining** and **stubborn mining** attacks on the network by an adversary node
- Analyzed the **adversary's relative profitability** under various factors like hashing power and network latency etc.
- Utilized the **Networkx library** to create a connected **P2P network** and generated visual representations of the blockchain. Used the **SimPy library** to maintain a **global clock** and simulate the **mining and transaction events**

FastChat *Autumn 2022*

Guide: Prof. Kavi Arya | Ongoing Course Project : Software Systems Lab *IIT Bombay*

- Developing a messaging software with **end-to-end encryption** by using **RSA+AES** to encode the messages and both **group chat** and **individual chat** support using **python socket library** and **PostgreSQL** database
- Implementing a **load balancer** with **least connect strategy** using **bash** to distribute load among multiple servers. Focusing on obtaining **high throughput** while using only **limited resources** dedicated for the servers
- Used **bash** scripts to simulate common messaging patterns and calculate **throughput** and **latency** of the system

Rail Planner *Autumn 2022*

Guide: Prof. Supratik Chakraborty | Course Project : Data Structures and Algorithms Lab *IIT Bombay*

- Developing a railway planner using algorithms such as **Merge Sort, KMP, Quicksort**, etc.
- Utilising Data Structures such as **linked lists, Binary Search Trees, AVL Trees, Hash tables, Tries**, etc.

Technical Skills

Programming	C/C++, Python, Bash, Solidity, Java, JavaScript, VHDL, Sed, Awk
Data Science	Tensorflow, Pytorch, Keras, Trax, Scikit-learn, OpenCV, NumPy, Pandas, Matplotlib
Software & Tools	MATLAB, Git, LaTeX, Docker, Wireshark, Z3, Doxygen, Sphinx, Ngingx, FastAPI
Web Development	HTML5, CSS, JavaScript, BootStrap, jQuery NodeJS, ExpressJS, SQL, MongoDB

Extracurricular

- Mentored two groups of students during the **SoC (Summer of Code)** program conducted by **WNCC, IITB** *(2023)*
- Successfully completed one year under **National Sports Organization(NSO)** in **Chess** at IIT Bombay *(2022)*
- Pitched a **Business Model Canvas** for a startup in the health sector which entailed making online ambulance bookings, for the EnB Buzz contest conducted by the **Entrepreneurship cell of IIT Bombay** *(2021)*
- Participated in a team of 3 and wrote a working script and successful submission in **Google Hashcode** *(2021)*
- Worked as team of 4 to make a remote controlled bot using ESP32 for XLR8 - an event of **ERC, IITB** *(2022)*