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(Advanced Performer) grade** for excellent performance in **PH 108-Basics of Electricity & Magnetism**, awarded to 27 out of over 1300 students taking the course *(2022)*
- One of the **17 out of 1400+** students to secure a **Change of Branch** to the department of **Computer Science and Engineering** owing to excellent academic performance in first year at IIT Bombay *(2022)*
- Secured **All India Rank 275** in the prestigious **KVPY (Kishore Vaigyanik Protsahan Yojna)** SX and awarded fellowship by the Department of Sciences, **Indian Institute of Science(IISC) Bangalore** *(2021)*

Key Projects

FastChat *(Autumn 2022)*

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

- Developing a messaging software by building a network of clients interacting via servers acting as mediators
- Focusing on obtaining **high throughput** while using only **limited resources** dedicated for the servers
- Ensuring **low latency** of individual message deliveries and **end-to-end encryption** between clients
- Using **python socket library** to develop the network, using **open source libraries** for authentication and communication, **PostgreSQL** database to store the data and **bash** for scripting and collecting results

Rail Planner *(Autumn 2022)*

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

- Designed a simplified vesrion of a railway planner using various data structures and analyzed the space & time complexity and the efficiency to demonstrate the **properties of different data structures in C++**
- Stored trains as a dictionary using **Hash Tables** and devised algorithms for fastest possible journies
- Used **BSTs and then AVL trees** for quick searching using the journey codes and used **Tries** to implement the autocompletion feature while searching for station names and added a feature to accept reviews for journies
- Used **Quicksort** to order trains by day and time, implemented the **KMP-string matching algorithm** for allowing review searches by using keywords and implemented **Heaps** to allow filtering the reviews by their rating

Lunar Lander using Deep Reinforcement Learning *(Autumn 2022)*

Self Project

- Used **Pygame** and **OpenAI's Gym** to train a lunar lander game **Deep Q-Learning with Experience Replay**. Used the **Sequential API** of the Keras library to define the **Q-network** and the **target Q-network**
- Used **Tensorflow Core** to define a **custom loss function** and a **custom training loop** using **GradientTape** to train the model. Used **epsilon greedy policy** to select the action with some amount of random decisions
- Utilized a **deque** for storing the experience buffer and used **experience replay** and **soft update** of the Q targets to stabilize the learning process and improve the model's convergence towards an optimal solution
- **Tuned and optimized model hyperparameters**, including learning rate, batch size, and number of episodes, epilon, gamma, number of timesteps to achieve the best results and solved the environment within 500 episodes

Machine Learning *(Autumn 2022)*

Self Project

- Experience in machine learning frameworks such as **scikit-learn, XGBoost, PyTorch, TensorFlow, and Keras**.
- Using Python packages such as **numpy, pandas, matplotlib and seaborn** for data manipulation and analysis. Learnt about **feature engineering** and feature selection techniques to improve the performance of the models

- Learnt about the various machine learning algorithms such as **regressions, clustering, k-nearest neighbors, support vector machines and decision trees** and implemented them from scratch using numpy and pandas
- Proficiency in using **cross-validation and hyperparameter tuning** to optimize machine learning models
- Used scikit-learn and XGBoost to implement various types of classifiers and regressors to predict and classify various types of data such as **predicting house prices and classifying flower species** respectively

Deep Learning and Neural Networks *(Autumn 2022)*

Self Project

- Gained strong understanding of deep learning concepts, including convolutional neural networks **(CNNs)**, recurrent neural networks **(RNNs)**, restricted boltzmann machines **(RBMs)** and **autoencoders**, acquired through self-study.
- Made a **convolutional neural network** to classify images of handwritten digits using **MNIST** dataset and also made a **GUI** to draw digits using **python Tkinter** and classify them using the model. Made three different models using **TensorFlow Core, Keras Functional API and PyTorch** and compared their performance
- Made many different types of **CNNs** to classify various types of data such as **Traffic signs recogninition, Crack detection, Smile detection, Hand sign recogninition** using **PyTorch** and **Keras API**
- Used **transfer learning** to train a **pretrained MobileNetV2** to classify images of **alpacas** and used **data augmentation** to improve the model's performance
- Implemented **ResNet50's architecture** from scratch using **Keras Functional API** and trained it on a hand sign dataset to classify images of 6 different classes. Compared its performance to a **pretrained ResNet50 model**

Generating Representative Images from a Sample *(Autumn 2022)*

Guide: Prof. Suyash Awate | Ongoing Course Project : Data Analysis and Interpretation *IIT Bombay*

- Used **MATLAB** to use a data set of images of various fruits and sampled random images to generate new representative fruit images using **Principal Component Analysis (PCA)**
- Used PCA to analyse images of handwritten digits from the **MNIST Database** and optimally reduce the dimensionality and reconstruct the image
- Implemented hyperplane fitting of 2 random variables and sampled points in the Euclidean Plane according to a given multivariate distribution

Multiplayer Tic-Tac-Toe *(Autumn 2022)*

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

- Used **Java Socket Programming** for **inter process communication** using the **peer-to-peer model**
- Created the tic tac toe game using this model and handled various newtork and **IOStream exceptions**

Monte Carlo Analysis of Statistical Theorems *(Autumn 2022)*

Guide: Prof. Suyash Awate | Course Project : Data Analysis and Interpretation *IIT Bombay*

- Used **MATLAB** to implement a Monte Carlo simulation of a given Probability distribution
- Plotted the probability and cumulative distribution functions of various distributions and empirically verified various statistical theorems such as the law of large numbers, Poison thinning and the Gaussian nature of the Random Walk

Text File Editors *(Autumn 2022)*

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

- Developed an analog to the Linux Command Line utility **wc command** using the **awk programming language** that counts the number of characters, words and lines in a text file and also accepts flags similar to wc command
- Developed a program to check for valid email addresses using **sed** with pattern matching using **regular expressions**
- Implemented a **csv file editor** that formats columns based on customisable properties such as date, time and name
- Developed a program which changes the base of the number to a different given base using **bash scripting and awk**
- Developed a program to **encrypt** a piece of text when the words to encrypt and their corresponding cipher is given

Personal Website *(Autumn 2022)*

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

- Made a personal website to be hosted on the CSE department server using **HTML and CSS**
- Added various advanced **CSS** features animations, transitions, static scroll images, modals, checkboxes and slideshows
- Used **JavaScript** to make the website interactive, gauge user-choices and render web-pages accordingly and deployed the website on an SSH server; used **BootStrap** to impelement standard navigation bars, footers and other features

Bubble Trouble *(Spring 2021)*

Guide: Prof. Parag Chaudhuri | Course Project : Computer Programming and Utilization *IIT Bombay*

- Designed an interactive single player retro style game which impelements a bubble shooter to shoot random floating bubbles on the screen to demonstrate the **Object Oriented Paradigm in C++**
- Implemented event-handling using **XEvent** object extensively used the **C++ STL** and the Simplecpp library that was developed in-house by the institute to add the various features of the game
- Handled various events, assigning multiple responses by the game and designed the game for many levels of difficulty

Technical Skills

Programming Languages:	C++, C, Python, MATLAB, Java, Bash, Solidity, Sed, AWK
Software & Tools:	Tensorflow, Pytorch, Keras, Scikit-learn, OpenCV, Seaborn, Git, LaTeX, MySQL, NumPy, Pandas, Matplotlib, Doxygen, Sphinx
Web Development:	HTML, CSS, JavaScript, BootStrap

Courses Undertaken

Mathematics	Calculus, Linear Algebra, Differential Equations, Optimization Models
Computer Science	Data Structures and Algorithms#, Discrete Structures, Data Analysis and Interpretation, Software Systems Laboratory, Computer Networks*#,, Digital Logic Design*#, Design and Analysis of Algorithms*, Logic for Computer Science*, Introduction to Blockchains Cryptocurrencies and Smart Contracts*, Computer Vision*
Miscellaneous	Game Theory and Decision Analysis*, Introduction to Electric and Electronic Circuits, Quantum Physics and Application, Basics of Electricity and Magnetism, Engineering Graphics and Drawing, Organic and Inorganic Chemistry, Physical Chemistry, Biology

(to be completed by April 2023)*
(# Theory + Lab)

Extracurricular

- 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 competition 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** *(2021)*
- Worked in a team of 4 to make an ESP32 **WiFi-controlled** bot for XLR8 conducted by **ERC, IITB** *(2022)*