Scholastic Achievements

- Consistently qualified for the **Indian National Mathematics Olympiad** (INMO) among the **top 300 students** nationwide, leading to participation in the training camp, **INMOTC**, held at HBCSE, Mumbai. *('19 - '21)*
- Attained a place in the **merit list** of the students nationwide who successfully cleared the **INMO** *('21)*
- Recipient of **KVPY** fellowship granted to ∼**1800** students out of **97k**+ candidates by the govt. of India *('21)*
- Received **NTSE Scholarship** awarded to ∼**2000** students out of **0.9 million**+ applicants across India *('19)*
- Obtained National **Top 1%** in **National Standard Examination In Junior Science**(NSEJS) *('19)*

Internship And Research Experience

Machine Learning Analyst | ***Accenture Technology Labs*** | *Summer Intern* *(June'23 - Present)*

Application of Reinforcement Learning for Combinatorial Optimization in the domain of Supply Chain Management

- Applied **Deep Q-Learning**, **REINFORCE**, and **Actor-Critic** methods on environments from **OpenAI** Gymnasium
- Performed a comprehensive literature review on methods to solve **Combinatorial Optimization problems** such as **Travelling Salesman problem** & **Capacitated Vehicle Routing problem**, analyzing state-of-the-art papers
- Engineered an innovative **CVRP** solution by employing policy networks as **Graph transformer** with **Graph Convolution layer embeddings**, and trained via **policy-based methods** with a **shared baseline** distribution

Transformers for Unsupervised Medical Image Registration | *Research Project*

Medical Deep Learning and Artificial Intelligence Lab | Prof. Amit Sethi, EE, IIT Bombay *(May '23 - Present)*

- Implemented **VoxelMorph** and **TransMorph**, leveraging **ViT** and **Swin transformer** architecture for unsupervised **image registration** technique of MRI scans resulting in the accurate **generation of synthetic CT scans**
- Leveraged Facebook's **Segment Anything Model (SAM)** to generate high-quality masks from **input prompts** like points or boxes, successfully applied for auto-segmentation of the **LungCT** and **OASIS** datasets

Visual Grounding on Remote Sensing Data | *Research Project* *(June '23 - Present)*

Deep Learning in Remote Sensing & Computer Vision research group | Prof. Biplab Banerjee, CSRE, IIT Bombay

- Studied and implemented **OpenAI's CLIP** model to accurately predict the **most relevant text snippet** based on remote sensing images, showcasing **zero-shot capabilities** easily **transferable** to various Visual-Linguistic models
- Implemented **CoOp** and **CoCoOp Prompting techniques** to enhance CLIP-like Visual-Linguistic models
- Researched and implemented **RSVG Visual Grounding** model on satellite images, introducing a novel transformer-based **multigranularity visual language fusion (MGVLF)** module, for visual analysis in satellite imagery

Key Projects

Pan-sharpening of multi-spectral images | *Course Project : Satellite Image Processing*

Guide: Prof. Buddhiraju K Mohan, CSRE, IIT Bombay *(Spring '23)*

- Developed a **pan-sharpening algorithm** for **multi-spectral satellite images** using **Gram-Schmidt** and **Bovey's** transformations and compared the results with **Intensity-Hue Saturation (IHS)** and **mean-based** pan-sharpening
- Integrated the **ESRGAN** trained on **ImageNet** dataset with the pan-sharpening pipeline to achieve a high-resolution pan-sharpened image with **improved spatial and spectral fidelity** using **Pytorch** and **OpenCV**

Graph Kernel-based link prediction | *Course Project : Machine Learning Techniques*

Guide: Prof. P Balamurugan, IEOR, IIT Bombay *(Spring '23)*

- Implemented **Bhattacharyya graph kernel** to generate **Multidimensional Gaussian distribution similarity functions** and employed an **SVM-based Link predictor** for analyzing a dataset of a **signed social network**
- Utilized **Graph Convolutional Networks (GCN)** to learn node embeddings and propagate information across the network, capturing both local and global structural patterns, by using **NetworkX** and **PyG** libraries

Knee Bend Counter | *Self Learning Project, Github* *(Jan '23)*

- Utilized the **MediaPipe API**'s pose estimation capabilities for **real-time knee bend exercise tracking** by analyzing user movements, specifically knee joint extensions, to accurately count repetitions using **OpenCV**

Learning the Latent Structure in LLMs | *Seasons of Code (SoC)* *(May '23 - July'23)*
Web and Coding Club (WnCC), IIT Bombay

- Enhanced **GPT** and **BERT** models through transfer learning by replacing pre-trained word embedding
- Built and trained **BERT** and **miniGPT** models from scratch in **PyTorch**, demonstrating expertise in NLP tasks

Neural Style Transfer (NST) | *Self Learning Project, Github* *(July'23)*

- Employed pre-trained **VGG** and **ResNet** models to extract content and style features, resulting in mesmerizing artistic transformations, while adapting and fine-tuning the NST algorithm to achieve captivating stylized outputs
- Improved style transfer with novel **loss functions** and **regularization**, achieving sophisticated artistic results

Facial Expression Recognition | *Winter in Data Science (WiDS)* *(Dec '22 - Ongoing)*
Analytics Club, IIT Bombay

- Developed a cutting-edge solution for Facial Expression Recognition using **PyTorch** and **CNNs** by successfully implementing the state-of-the-art **DeXpression** model, a Deep Convolutional Neural Net for Expression Recognition

Using ML to Analyse News for Movement in Stock Prices | *Finsearch* *(June '22 - Aug '22)*
Finance Club, IIT Bombay

- Utilized NLP **sentiment analysis** techniques to analyze news by implementing **Recurrent Neural Networks**
- Built **LSTM** and **Random Forest** models for stock price forecasting, leveraging 20 years of **NIFTY50** data, achieving an intraday trading strategy with a mean daily **profit** of **0.3%**, **outperforming the index**

World Economy Analysis | *Self Learing Project, Github* *(Autumn '22)*

- Predicted future global and national economic movements by conducting a comprehensive analysis of historical data
- Utilized Deep Learning techniques such **GRUs** and **LSTMs** to construct highly accurate economic scenarios, comparing the economic conditions with and without COVID-19, and predicting the recovery period

Positions of Responsibility

Technical Mentorship | ***Graph Machine Learning*** *(May '23 - July '23)*
Seasons of Code (SoC), Web and Coding Club (WnCC), IIT Bombay

- Guided a group of nine students in exploring the principles of graph machine learning and geometric deep learning, enabling them to implement **GraphSAGE**, **GAT**, and **GCN** layers for **node**, **edge**, and **graph level** predictions

ACE Manager | *Electrical Engineering Alumni & Corporate Engagement Cell* *(April '23 - Present)*
Leading a 5-member team of student coordinators to enhance the engagement between alumni and the department

- Organized a day-long department lab tour and exhibition for **70+ IIT-B Alumni** and their family members
- Catalyzed the process of receiving **INR 30 Million** in donations to the department through our events

Convener | *Krittika - The Astronomy Club of IIT Bombay* *(June '22 - March '23)*
Part of a team of 8 responsible for managing the events conducted by the club throughout the year

- Conducted Python sessions on **NumPy** and **Pandas** for **400+** students in Computational Astronomy Bootcamp
- Acquried skills to operate **Dobsonian** and **Equitorial** mounted **telescoped** to carry out stargazing events
- Organized a trip to the **Giant Meter Radio Telescope** facility in Pune followed by a overnight stargazing session

Technical Skills

Software & Tools	Conda, Jupyter, CUDA, Git, Vim, Bash, Linux, LaTeX, Sublime, MATLAB
Analytics	PyTorch, PyTorch-Geometric (PyG), Tensorflow, Jax, OpenCV, Scikit-Learn, Matplotlib

Key Courses

Machine Learning	Machine Learning: Principles and Techniques, Advanced Methods in Satellite Image Processing, Reinforcement Learning†, Natural Language Processing†, Generative Adversarial Networks (GANs)†, Deep Learning: Advanced Computer Vision†
Mathematics & Computer Science	Probability and Random Processes, Calculus, Linear Algebra, Complex Analysis, Differential Equations, Computer Programming and Utilization, Game Theory†

Extracurricular Activities

** - To be completed in Autumn '23* *† - Online Courses*

- Completed **JPMorgan Software Trading** and **Cognizant Artificial Intelligence Virtual Experience Programs**
- Active member of an **ML reading group**, discussing and presenting recent papers from diverse domains in ML
- Attained **National Topper** status in the **KenKen International Championship** for two years, achieving the **highest speed and accuracy** in solving every puzzle during all 3 rounds at the National level *('17 - '18)*
- Achieved **top 5** finalist positions in multiple **Sudoku Championships** organized by **TOI** in Mumbai zone *('19)*
- Placed **2nd** in Remote-Controlled Plane competition by designing a custom model and flying it with expertise *('22)*
- Qualified **Founder's Pitch, SARC Tank : Pan IIT** round and represented IIT Bombay on Pan IIT level *('22)*
- Built a 555 timer IC sound generator, and skillfully extracted frequency in noisy environments with **SciPy** *('23)*
- Volunteered at **Prajog**, a **National Service Scheme**, delivering interactive science lessons through recorded experiments. Contributed to the **OLI-NSS, IITB** YouTube channel, which garnered **0.12 million+** viewers