



Parth Pundalik Pai  
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Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	8.88
Intermediate	DPUE	The Learning Centre PU College, Mangalore	2022	95.33%
Matriculation	KSEEB	Vidya Bharati School, Bhatkal	2020	98.72%

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

## SCHOLASTIC ACHIEVEMENTS

- Received an **AP** grade in the MS101 course, achieved by only **7 individuals** out of **600+** students (2023)
- Granted a **Change of Branch** awarded to **31/1300+** students for excellent academic performance (2023)
- Ranked in the **Top 0.35 percentile** out of **0.94Mn+** candidates in **JEE Mains** examination (2022)
- Among the **Top 2.13 percentile** out of **0.16Mn+** candidates in **JEE Advanced** Examination (2022)
- Secured a place in the **Top 5 percentile** out of **50k+** candidates in **KVPY SX** examination (2022)
- Obtained Karnataka **State Rank 46** among **216k+** candidates appeared for **KCET** examination (2022)

## KEY TECHNICAL PROJECTS

**Guidance Navigation and Controls System** | *Student Satellite Program* (May'23 - Nov'23)  
*Part of a 40+ member team with the vision of making IIT Bombay a centre of excellence in space technology*  
**Attitude Determination and Controls Subsystem**

- Designed and executed the **Model Predictive Control (MPC)** algorithm in MATLAB by using the **Prediction horizon**, **Control horizon** and Tuned the MPC parameters to minimize the cost function
- Implemented the algorithm using **Receding horizon** technique yielding the new Predicted state
- Developed **LU decomposition** algorithm with Partial Pivoting, **QR decomposition** using Householder reflections, the **Gram-Schmidt Process**, and **Cholesky decomposition** for matrices in MATLAB
- Applied **Singular Value Decomposition** and **Rank Approximation** Algorithm for large matrices

**ML Based Movie-Recommendation System** | *Course Project* (Oct'23 - Nov'23)  
*Course: Statistical Machine Learning and Data Mining | Guide: Prof. Asim Tewari* IIT Bombay

- Preprocessed a dataset of **44k+** movies and created embeddings using transformer's **AutoTokenizer**
- Used **bert-based-uncased** model from Huggingface to convert the descriptions into text embeddings
- Implemented **Cosine Similarity** measure to compare the prompt embeddings with existing embeddings
- Created an interactive app environment using **gradio** to output the **top 5** best recommended movies

**ML based Analysis of external flow around Air-Foil** | *Course Project* (Feb'24 - May'24)  
*Course: Applied Data Science and Machine Learning | Guide: Prof. Alankar Alankar* IIT Bombay

- Implemented the **Computer Vision** approach to generate **Streamline plot** using **1Mn+** datapoints
- Established the **Streamline Density** to predict the Pressure Coefficient using Neural Networks method
- Implemented **Random Forest** model to optimise Camber value & angle of attack with  **$R^2$**  value of **0.95**

**Breakout Genius - AI game master using RL** | *Season of Code 2023* (May'23 - July'23)  
*Built a Reinforcement Learning game master to play Atari games* WnCC, IIT Bombay

- Created **Atari Breakout Game** environment using **OpenAI's gym** for agent-environment interaction
- Incorporated **epsilon-greedy strategy** in the model for effective exploration-exploitation tradeoff
- Implemented **Frame Stacking** to handle temporal dependencies and simplify the state-space complexity
- Tested a pre-trained PyTorch model of **9Mn** steps obtaining a reward of **9.0** in the generated video file

**Language Translation model using NLP** | *Learner's Space 2023* (June'23 - July'23)  
*English to Italian Translation model using Natural Language Processing* UGAC, IIT Bombay

- Split the dataset using **sklearn's** `train_test_split` and created embeddings using **AutoTokenizer** function
- Implemented the **Helinski-NLP** model for translation, used **sacrebleu** score for evaluating the model
- Fine-tuned the model by training it for **19k** steps and brought down the training loss from **1.29** to **1.04**
- Created an interactive app environment using **gradio** to test the new **fine-tuned** model for translation

## OTHER PROJECTS

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**RL based stock trading strategy optimization** | *Finsearch 2024* (June'24 - Present)  
*Reinforcement Learning based stock price prediction* Finance Club, IIT Bombay

- Conducted a detailed study of RL algorithms such as **Q Learning** and **Policy Gradient Methods**
- Successfully applied the **DQN** algorithm in the Inverted Pendulum setting and achieved the set goal
- Orchestrated a custom environment and a **reward function** designed specially for stock market scenario
- Using the **DDPG** algorithm to implement an RL agent for making **trading decisions and strategies**

**Music Generation using RNNs and LSTMs** | *Season of Code 2024* (May'24 - Present)  
*Melody generation using LSTM networks given a seed* WnCC, IIT Bombay

- Preprocessed the **Deutsch folk songs** from **ESAC** dataset and encoded into **time-series** representation
- Trained an **LSTM** Neural network using **tensorflow** and decoded the generated melodies into MIDI notes
- Implemented the model architecture on **larger dataset** and **larger mapping** file for more variation

**Custom GPT using Shakespeare text** | *Self Project* (May'24)

- Implemented and fine-tuned a custom **Generative pre-trained transformer** model for text generation
- Integrated **Self-attention** mechanism along with **residual connections** for efficiency and faster training
- Designed training routines with **dropout** regularization optimizing the hyperparameters for **3000** iterations
- Successfully trained a model with **10.78 Mn+** parameters and reduced validation loss from **4.23** to **1.48**

**Transfer Learning & Object Detection using ResNet50** | *Self Project* (Jul'24)

- Performed object detection on the **CIFAR-10 dataset** which consists of **60,000** color images in **10** different classes, with 6,000 images per class using **Tensorflow** and **Keras** libraries in Python
- Achieved a test accuracy of **91.06%** and an F1 Score of **0.9109** by implementing the **ResNet50** architecture using TensorFlow on the dataset, with the model accurately predicting from a total of **10 classes**

## TECHNICAL SKILLS

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<b>Programming</b>	Python   C++   Arduino   MATLAB
<b>Softwares</b>	GitHub   Fusion 360   Linux   L <sup>A</sup> T <sub>E</sub> X
<b>Packages</b>	PyTorch   Transformers   Scikit-learn   Numpy   Pandas   Matplotlib   Keras

## KEY COURSES UNDERTAKEN

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<b>Math Courses</b>	Linear Algebra   Differential Equations   Differential Calculus   Integral Calculus
<b>CS Courses</b>	Computer Programming and Utilization   Randomized Algorithms*   L <sup>A</sup> T <sub>E</sub> X†
<b>ML Courses</b>	Programming in Data Science   Statistical Machine Learning and Data Mining
	Introduction to Machine Learning   Applied Data Science and Machine Learning
<b>Other Courses</b>	Estimation on Lie Groups   Economics   Introduction to Makerspace

*\*currently in Summer of Science 2024, † completed in Learner's Space 2024*

## PORs AND MENTORSHIP

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**Class Representative** | *First year B.S. Mathematics* (Nov'22 - June'23)

- Addressed the issues of batchmates, catering to their academic needs and creating a positive and **conductive atmosphere** resulting in notable **academic growth** and success within the student community
- Served as a member of the **Mathematics Association Council**, IIT Bombay by actively involving in organizing and planning the traditional day, department trip with utmost dedication and sincerity

**Mentor** | *Season of Code 2024, Web and Coding Club* (May' 23 - Present)

- Mentored a group of **10+** students in the topic of **Future forecasting using Time series analysis**
- Guided the mentees in clearing their conceptual doubts and compiling good resources for their learning

## EXTRACURRICULAR ACTIVITIES

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- Won **Gold Medal** in Stageplay at 6th **Inter-IIT Culturals Meet** held at **IIT Kharagpur** ('23-24)
- Among the **top 20%** teams in Internation Quant Challenge hosted by **WorldQuant BRAIN** ('24)
- Mentored a group of **5** students in **Summer of Science 2024** conducted by MnP club, IIT Bombay('24)
- Completed the **Junior Degree** in Hindustani Classical **Vocals** issued by **KSEEB**, Karnataka ('13-15)
- Professionally trained in Indian Classical **Flute** after a year-long training under NSO-Culturals ('22-23)
- Participated in the **Versova Beach Cleaning** programme hosted by **Abhyuday, IIT Bombay** ('24)
- Bagged the **Best Outgoing Student** award in Class 10th owing to overall allround excellence ('19-20)