Parth Pundalik Pai
B.Tech Mechanical Engineering
Indian Institute of Technology Bombay

parth-pai.github.io
parthpai@iitb.ac.in
+91-7975829293
Mumbai, India

Examination	University	Institute	Year	CGPA / %
Graduation	IIT Bombay	IIT Bombay	2026	8.84
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 & Artificial Intelligence** from C-MInDS, IIT Bombay

Scholastic Achievements

- Selected as the **sole** nominee from IIT-Bombay for **KTH Stockholm** Semester Exchange Program *(2024)*
- Granted a **Change of Branch** awarded to **31/1400+** students for excellent academic performance *(2023)*
- Received an **AP** grade in the MS101 course, achieved by only **7 individuals** out of **600+** students *(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)*
- Obtained Karnataka **State Rank 46** among **216k+** candidates appeared for **KCET** examination *(2022)*

Professional Experience

Machine Learning Intern | *Jaguar Land Rover TBSI, Bangalore, India* *(May'25 - Jul'25)*
*Awarded a **Letter of Recommendation** for exemplary performance in Engineering Body Chassis team*

Digital Twin: Neural Network based Surrogate Modelling in Vehicle Dynamics

- Developed a parallelized and distributed Python pipeline using **CarMaker API** to automate simulations across **multiple devices and CPU cores**, reducing total simulation time from **583 hours to 18.5 hours**
- Designed, feature-engineered and fine-tuned **ANN** models to predict Roll, LLTD, Understeer & Jacking
- Implemented a black-box **Optuna** optimizer to infer the vehicle input parameters for target vehicle dynamics, enabling efficient **inverse mapping** via parallel studies across multiple processes with **PostgreSQL**
- Secured stakeholder approval to move project to production, a key step in JLR's **Digital Twin** strategy

International Exposure & Research

Associative Memory tasks for Adaptive LIF Neurons | *Research Assistant* *(Feb'25 - May'25)*
Guide: Prof. Pawel Herman & Prof. Anders Lansner, KTH *Stockholm, Sweden*

- Demonstrated robust **associative memory** in a biologically plausible **LIF neuron** with distorted inputs
- Compared **LIF and graded neuron** models to highlight the **computational scalability** of the models
- Optimized various parameters in the network to obtain the **best cutoff** value for different network sizes
- Identified **sparse and stable spiking** as the key driver for LIF neurons effectiveness in smaller networks

Semester Exchange | *KTH Royal Institute of Technology, Stockholm, Sweden* *(Jan'25-May'25)*

- Presented a detailed Literature review report on **Selective Laser Melting** of Superalloys with applications
- Authored a detailed report analyzing **Apple's** Social and Environmental Sustainability in its **supply chain**

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 a **Receding horizon** technique, optimally predicting the new 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 | *ME781 Course Project* *(Oct'23 - Nov'23)*
Course: Staistical Machine Learning and Data Mining | Guide: Prof. Asim Tewari *IIT Bombay*
- Leveraged **AutoTokenizer** model to preprocess a dataset of **44k+** movies and generate embeddings
- 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

ML based Analysis of external flow around Air-Foil | *ME228 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 $\boldsymbol{R^2}$ 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 more effective exploration-exploitation tradeoff
- Implemented **Frame Stacking** to handle temporal dependencies and simplify the state-space complexity

Music Generation using RNNs and LSTMs | *Season of Code 2024* *(May'24 - Jul'24)*
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 **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

Dashboard development for Battery Health monitoring | *JLR Global Hackathon* *(Jun'25)*
Developed an ML based Battery Health Monitoring system using NASA's Battery SOC data *JLR TBSI*
- Trained **LSTM & random forest** models estimating battery health from a Battery SOC time series data
- Developed a **dashboard** for battery health monitoring & created an interactive user interface using **gradio**

Technical Skills

Programming	Python | R | C++ | Java | YAML | SQL | Arduino | MATLAB
Softwares	GitHub | Linux | IPG CarMaker | LaTeX | Fusion 360
Libraries	PyTorch | Transformers | Scikit-learn | Numpy | Pandas | Matplotlib | Keras

Key Courses Undertaken

Math Courses	Linear Algebra | Differential Equations | Differential Calculus | Integral Calculus
CS Courses	Computer Programming and Utilization | Introduction to Cryptography
ML Courses	Programming in Data Science | Speech and Natural Language Processing & the Web Statistical Machine Learning & Data Mining | Probability & Stochastic Processes I* Introduction to Machine Learning | Foundations of Intelligent & Learning Agents*
Other Courses	Estimation on Lie Groups | Intro to Makerspace | Geospatial Predictive Modelling*

**to be completed by Nov'25*

PORs & Mentorship

Teaching Assistant | *Statistical Machine Learning and Data Mining (ME781)* *(Aug' 24 - Nov'24)*
- Selected as a **teaching assistant** for the course based on academic excellence and inter-personal skills
- Facilitated the conduct & evaluation of weekly quizzes, assignments, examinations for **300+** students

Mentor | *Season of Code 2024, Web and Coding Club* *(May'24 - Jul'24)*
- Mentored a group of **10+** students in the topic of **Future forecasting using Time series analysis**

Extracurricular Activities

- Won **Gold Medal** in Stageplay at 6th **Inter-IIT Culturals Meet** held at **IIT Kharagpur** *('23)*
- Among the **top 20%** teams in International Quant Challenge hosted by **WorldQuant BRAIN** *('24)*
- Awarded **Special Mention** for exceptional Flute performance in the Battle of the Bands, Symphony *('24)*
- Participated in the **Versova Beach Clean-up** programme hosted by **Abhyuday, IIT Bombay** *('24)*
- Professionally trained in Indian Classical **Flute** after a year-long training under NSO-Culturals *('22-23)*
- Completed the **Junior Degree** in Hindustani Classical **Vocals** issued by **KSEEB**, Karnataka *('13-15)*