P Balasubramanian
Computer Science & Engineering
Indian Institute of Technology Bombay

200050103
B.Tech.
Gender: Male
DOB: 22-02-2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	8.42
Intermediate	CBSE	P.S.B.B.S.S School KK Nagar	2020	98.20%
Matriculation	CBSE	P.S.B.B.S.S School KK Nagar	2018	98.80%

Pursuing a **minor** degree in **Data Science and Artificial Intelligence** from CMInDS

Scholastic Achievements

- Secured **All India Rank 308** in Joint Entrance Examination Advanced among **1.5 Lakh** candidates *['20]*
- Present in the **top 0.5%** in Joint Entrance Examination Mains among **0.85 million** candidates *['20]*
- Recipient of the Kishore Vaigyanik Protsahan Yojana **KVPY Fellowship** (SA & SX Stream) *['20]*
- Scored **412/450** Marks in **BITSAT** (Birla Institute of Technology and Science Admission Test) *['20]*
- Cleared Stage-1 of **National Standard Examination of Chemistry(NSEC)** being among the **top 1%** and was selected for the **Indian National Chemistry Olympiad(INChO)** *['20]*
- Awarded National Talent Search Examination **NTSE** Scholarship by NCERT, Govt. of India *['18]*

Key projects

Deep Reinforcement Learning for Stock Trading *[April'21 - July'21]*

Seasons of Code-'21 | Web and Coding Club (WnCC)

- Investigated the concepts involved in **Tabular Soln. Methods** like Markov Decision Processes, Monte Carlo Methods, Dynamic Programming, Temporal-Difference learning for solving **RL problems**
- Scrutinized research papers and implemented **PPO** (Proximal Policy Gradient), an Actor-Critic algorithm
- Worked with the **OpenAI-Gym** toolkit for developing RL- algorithm, explored the classic control problems given and solved the **Cartpole & Acrobat-v1** challenges from the given environments
- Examined **Quant trading** strategies like momentum, reversion, pair-trading and backtested on **Quantconnect**
- Learnt **Fundamental & Technical** analysis and the basic stock market jargon from Zerodha's Varsity

International Aerial Robotics Competition (IARC) *[October'21- Present]*

UMIC, IIT Bombay | Association for Unmanned Vehicle Systems International Foundation (AUVSI)

- IARC is the **longest running** collegiate aerial robotics challenge in the world, with the objective of moving the state-of-the-art in aerial robotics forward by means of meticulously crafted missions perceived "impossible".
- Working as **Jr. Machine Learning Engineer** in team AeRoVe, an **interdisciplinary** team of **20+** students
- Surveying literature on **object detection**, particularly the **R-CNN**, fast and faster R-CNN, **YOLO**, **Gaussian YOLOv3**, **EfficientDet** architectures to facilitate smooth autonomous flight of the drone
- Assessing papers of different object tracking architectures such as **SORT** and **DeepSORT**
- Working on **OpenCV** for implementing color **thresholding** techniques for navigation light detection

Robotic Dishwasher *[April'21 - July'21]*

Institute Summer Technical Project (ITSP-'21) | IIT Bombay

- Modelled an **URDF** pair of **robotic arms** with grippers and brushes using **Robot Operating System**
- Simulated working of the arm in **RVIZ** following a set of sequential steps specific to an utensil
- Trained a **7-layer CNN** with TensorFlow on a homemade dataset where **data augmentation** was used to increase the model's accuracy to identify the utensil on the live video input captured with **OpenCV**
- Designed Python scripts to communicate between nodes and pass data with topics in ROS

Student Design Challenge (SDC) *[January '21 - April'21]*

UMIC, IIT Bombay | American Society of Mechanical Engineers (ASME)

- An International Mechatronics competition held in **5 continents** by the American Society of Mechanical Engineers
- Secured **4th Rank in the world finals** of SDC 2021 which was themed on **"Harvesting Sun and Wind"**
- Worked in the **Mechanical** subsystem to build a bot to carry a **5 kg** payload powered by a single AAA battery
- Designed the robot and made a 3D CAD model in **Fusion360** and analyzed the mechanics of the design
- Crafted the electrical circuit that is capable to charge a battery and a supercapacitor using a solar panel and a wind turbine and optimized the circuit to minimize the power consumption of the bot.

Arcface: Deep Face Recognition Model *[August'21 - Present]*

Machine Learning Subsystem | Unmesh Mashruwala Innovation Cell (UMIC)

- Surveyed literature on **face recognition** including **DeepFace, FaceNet, SphereFace ,CosFace** and the State-of-the-Art **Arcface** model to learn discriminative feature vectors and implement **few-shot** face recognition
- Implemented **Arcface Layer** from scratch and used **transfer learning** with **ResNet50** architecture as backbone feature extractor in **TensorFlow** to get highly discriminative feature vectors
- Trained the Arcface model on the **LFW** (Labeled Faces in the Wild) dataset of **350+** people with **1.4K+** images

Coursera Guided Projects | Coursera *[June'21]*

Coursera Project Network

- **Audio Classification**: Pre-processed raw audio data and created **spectrograms** using matplotlib. Implemented and trained a CNN to classify the audio using the **TensorFlow-keras** framework
- **Visualizing Filters of a CNN**: Used TensorFlow to implement a **DCNN (Deep CNN)** and visualize image features that maximally activate filters of a particular layer using **Gradient-Descent** algorithm

Car Price Prediction Model *[June'21]*

Self Project

- Trained a **Random Forest Regressor** to predict resale value of cars based on its attributes using **sk-learn** library
- Obtained dataset from Kaggle and used **pandas** & **seaborn** for preprocessing and visualization respectively.
- Deployed model using **Flask & Jsonify** libraries and created front-end interface using **HTML** to get input data

Other projects

WashPort *[February'19]*

National Science Fair | CBSE (Central Board of Secondary Education)

- Built a **smart**, portable Washing machine for Reusable Menstrual Pads using solenoids, water pumps, relays and coded on a **Raspberry pi 3** module with python (**TKinter**) to create the touchscreen control interface.
- Won the Regional Science fair held by CBSE and qualified to take part in the Nationals held in New Delhi.
- Wash Port can be used as a machine to wash these cotton cloths isolated from other cloths in the house thus promoting the use of **reusable menstrual pads** and reducing toxic plastic waste

Google Code-in 2017 *[Nov'17 - Jan'18]*

Alphabet Inc.

- GCI was a contest that introduced pre-university students to **open source** software development
- Contributed to open source software completing **5 tasks** in GCI-2017

IGBC Green Your School Contest *[May'16 - October'16]*

Indian Green Building Council (IGBC)

- Placed 1st in the **Innovation** category and received a prize of **₹3.5 Lakhs** among **200+** teams
- Implemented Autonomous Lighting System to save electricity, Leg operated taps with solenoids to save water and a Chlorella Vulgaris (algae) based **sewage water treatment plant** in my school

Position Of Responsibility

Coordinator | UMIC IIT Bombay *[August'21 - Present]*

*UMIC aims to facilitate technical start-ups and foster an atmosphere of **innovation** & **entrepreneurship***

- **Junior Engineer** in **ML/CV** (Machine Learning & Computer Vision) subsystem of **Team AeRoVe**
- Member of the team in charge of planning, organizing and publicizing events under the Innovation Cell
- Interviewed and recruited **15** members from a pool of 300+ UG and PG applicants for Innovation Cell

Technical Skills

Programming Languages	Python, C, C++, Java, Bash, Prolog, Awk, Sed, URDF, Xacro
Web Development	HTML, CSS, Bootstrap, Javascript, Django, Flask
Software/Tools	Git, LaTeX, Arduino, ROS (Robot Operarting System), Gazebo, Fusion360
ML & Data Science	TensorFlow, Keras, PyTorch, OpenCV, Numpy, Pandas, Scipy, Matplotlib, scikit-learn

Key courses undertaken

Computer Science	Abstractions and Paradigms in Programming and Lab, Software Systems Lab*, Data Structures and Algorithms and Lab*, Data Analysis and Interpretation*, Discrete Structures*, Computer Programming and Utilization, Computer Networks and Lab**, Logic for Computer Science**, Design and Analysis of Algorithms**, Digital Logic Design and Lab**
ML & DL	Machine learning for Remote Sensing II *, Convolutional Neural Networks$^{\$}$, Sequence Models$^{\$}$, Neural Networks and Deep learning$^{\$}$, Structuring ML Projects$^{\$}$, Improving Deep Neural Nets (Hyperparameter tuning, Regularization & Optimization)$^{\$}$, Fundamentals of RL$^{\$}$

** To be completed by Dec '21* *** To be completed by Apr '22* *$^{\$}$ Online Courses*

Extra-Curricular Activities

- **Mentored** two teams of young scientific minds in the **TrailBlazHER Innovation Challenge** 2021
- Received **9** years training in Alan-Thilak Shito Ryu Karate and a **Black-belt** holder
- Completed a **Trading** and **Product Management** Workshop conducted by **SARC**, IITB
- Organized the water-bottle rocket and egg-drop challenge at the **Science Fest** hosted by my school
- Placed **2nd** in galaxy **Science Quiz** twice and won the Mind Storm Quiz at IIT Mardras' **Forays** Mathfest
- Completed a 10 level **Robotics** course and graduated with distinction in Programming from **Kidobotikz**