	Darshan Makwana	21D100003
	Mechanical Engineering	**B.Tech.**
	Indian Institute of Technology Bombay	**Gender: Male**
		DOB: 04/12/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	9.05
Intermediate	HSC	S K Somaiya	2021	9.68
Matriculation	SSC	M D Bhatia	2019	9.04

Pursuing Dual Minors in **Computer Science** and **Machine Intelligence & Data Science**

SCHOLASTIC ACHIEVEMENTS

- Awarded **Branch Change** to Mechanical Engineering based on outstanding academic performance *(2022)*
- Amongst **top 1 percentile** of students in JEE out of **1+ million** candidates across India and abroad *(2021)*
- Awarded the prestigious **NMMS** Scholarship among **0.1+ million** talented candidates across the nation *(2018)*
- Amongst the **top 1%** at National level **Homi Bhabha Balvaidynanik** out of **1+ million** candidates *(2017)*

PROFESSIONAL EXPERIENCE

Technical University of Munich | Research Intern | Prof. Marco Caccamo *(Jun' 23 - July' 23)*
System Identification and Model Based Deep Reinforcement Learning for robust Quadruped Robot Control
- Conducted **literature review** on system identification techniques and their application to **quadruped robots**
- Developed and refined a **system model**, leveraging **system identification techniques** developed in the control domain to accurately represent the **dynamics** and **uncertainties** of a quadruped robot in the simulation
- Implemented various approaches to obtain system models for **MPC**, and compared them against **model free DRL**

Machine Learning Intern | Hexo AI *(Feb' 23 - Apr' 23)*
Part of the Research Team responsible for development and evaluation of models for Product Photography Generation
- Literature reviewed various latent diffusion models comparing their architecture with their degree of **photorealism**
- Devised a text conditional **latent diffusion model** from scratch for generation of flowers from text captions
- Worked in a team of **3** to deliver robust and high fidelity image inpainting models with **text conditioning**

Natural Language & Processing Intern | 64Squares *(Dec' 22 - Jan' 23)*
Created and Stress tested contextual AI chatbots for b2b markets
- Developed methods to analyze **unstructured** data on dialogues to improve natural language unit predictions
- Trained **Bert** and **Spacy** language models with **DIET classifier** for accurate intent and entity predictions
- Performed stress testing on various proprietary models to determine their **stability** and improve their **resilience**

KEY PROJECTS

Text to SVG Generation | AI Genesis Hackathon | HackerEarth *(Apr' 23 - Jun' 23)*
- Fused a differentiable vector rasterizer with a **latent diffusion model** for SVG generation using text captions
- Built a pipeline to vectorize text2img diffusion samples and **fine-tuning** it with a Score Distillation Loss
- Created a sleek UI using **Gradio** where users can **sample and edit** the generated SVG from the pipeline

Image2Image Translation with CycleGAN | Using GANs to create art | Kaggle Hackathon *(Dec' 22)*
- Implemented a Conditional **Generative Adversarial Network** to achieve translation of images to monet paintings
- Built the **CycleGAN** model in **pytorch** and trained it on monet paintings dataset to achieve image style transfer
- Built a pipeline for evaluating the Modified FID (MiFID) from the generated samples achieving an **MiFID of 52.23**

Control Theory Bootcamp | Learner's Space | ERC Club *(Jun' 23 - Present)*
- Utilized mathematical modeling techniques to analyze and predict system model of a bot and the actuator system
- Implemented a **Proportional Integral Derivative** (PID) controller in python to balance a seesaw with a ball
- Expanding knowledge base through exposure to various control theory topics, including optimal/adaptive control

Star Galaxy Separation | Course Project | Prof. Amit Sethi | CMinDS Department *(Oct' 22 - Nov' 22)*
- Collected Data containing a catalogue of more than 222,000 objects from **HST(Hubble Space Telescope)** archive
- Implemented **SMOTE** technique for correcting the effects of an imbalanced dataset in the training data
- Effectively employed l_1 **Regularized SVM**, **Naïve Bayes** and **Logistic Regression** method for classification

Deep Neural Networks | Summer of Science | Maths and Physics Club *(May' 22 - Jul' 22)*
- Implemented a fully functional **Neural Network** using a novel approach for calculating the **Entropy Loss** and the **Backward Pass** from scratch using only **Numpy** library for understanding the core aspects of a NN
- Achieved an accuracy of **97%** on a **butterfly classification system** trained on Leeds wildlife butterfly dataset
- Developed an **OCR Neural Network** for solving **PDEs** using **Physics Informed Neural Networks (PINNs)**

Maze Generation Library | Open Source | Self Project, IIT Bombay *(Mar' 22 - May' 22)*
- Created an open source python library for generation of mazes and **finding optimal paths** given the start locations
- Implemented object oriented class for **Kruskal, Prims, Hunt and Kill** algorithms for sparse maze generation
- Used **Cython** for leveraging efficient and fast indexing of C which resulted in **800%** increase in performance

End to End Terminal Chat application | Open Source | Self Project, IIT Bombay *(Dec' 22 - Jan' 23)*
- Created an open source end-to-end **encrypted** pythonic terminal **chat application** using **curses** for UI/UX
- Implemented Server-side backend in python using **web sockets** for efficient communication and minimum lag
- Created methods for account creation and authentication thus supporting custom **lobbies** and **user invites**

Android Application | Phonathon | SARC, IIT Bombay *(Jun' 22 - Jul' 22)*
- Created an **Android Application** using **React Native** as a framework for the event of phonathon under SARC
- Implemented a **Normalized** database structure for authenticating, registering and logging users and alloting a group of alumni to a particular user model which resulted in **300%** y-o-y increase in participation for the event
- Ideated a **novel** approach for detecting **fraudulent phone calls** from a user and disqualifying them from the event

Understanding the performance and volatility of crypto assets | Finance Club *(Jun' 22 - Aug' 22)*
- Studied the performance of **Crypto Assets** that use **DLT** such as **Blockchain** to create/verify secure transactions
- Investigated the reasons for **Volatility** of **Crypto Currencies** and patterns for volatility in **Crypto Trading**
- Analysed the Future for **Crypto Assets** based on these factors and government scrutiny they are likely to attract

Bubble Shooter Game | Course Project | Prof. Parag Chaudhuri | CSE Department *(Dec' 21 - Feb' 22)*
- Used **Object Oriented Programming** in conjunction with **STL Libraries** and **Graphics** to create a game
- Added different features like **Timer in each level**, **Randomized Bubble Radius**/**Speed** and **Scoreboard**
- Visually enhanced the game by adding aesthetic assets and updating scores using concepts of **Data File Handling**

POSITIONS OF RESPONSIBILITY

Machine Learning Mentor | Summer of Science | MnP club *(May'23 - Present)*
Created teaching materials for helping to understand and visualize various machine learning algorithms
- Mentored **7** students to make them acquainted with **SOTA** Machine Learning algorithms and their use cases
- Collaborated to take part in various Machine Learning hackathons with the mentees, securing top **1%** in 2 of them

Teaching Assistant | Quantum Physics | Differential Equations *(Apr' 23 - Jun' 23)*
Academic Post to guide fresher students through academic difficulties in PH112 and MA108
- Conducted weekly tutorial sessions for a batch of **40** students to discuss solutions to preassigned tutorial problems
- Solved queries throughout the semester and conducted **extra doubt solving** sessions for students facing difficulties

Web Coordinator | Student Alumni Relations Cell, IIT Bombay *(May' 22 - Jun' 23)*
*Part of a **60 member** team responsible for fostering relations among **60K+** alumni and students*
- Worked in a team of **5** to handle the social activity and web presence of Student Alumni Relations Cell
- Responsibe for developing various websites and game leading to **5000+** registrations with **150 % y-o-y** increase
- Databased and interacted with **100+** Alumnis during the **35th Phonathon**, telephonic marathon of IIT Bombay

Core Team Member | Data Analytics and Visualization Team, UGAC *(Jul' 22 - Apr' 23)*
*Part of a **12 member** team working to provide **data-centric solutions** to the Institute and external organizations*
- Collaborated with **Prof. Sunita Sarawagi** from **CSE, IITB** for projects leveraging public **Indian datasets**
- Dissected and Interpreted **national data** on power and coal usage for gaining useful insights from the data
- Conducted a session for explaining a research paper on **Efficient Graph based Image Segmentation**
- Compiled Case studies and Analysis reports from trends in data on **course grading** and **semester exchange**

TECHNICAL SKILLS

Programming   C/C++, Python, Javascript, Solidity, MATLAB, bash, Git

Data Science   PyTorch, TensorFlow, OpenCV, NLTK, Numpy, Pandas, Matplotlib, Scikit-Learn, Scipy

Development   HTML, CSS, Bootstrap, Tailwind CSS, Django, Node, React

KEY COURSES UNDERTAKEN

- **Computer Science:** Data Structures and Algorithms, Computer Programming and Utilization, Games and Information (Game Theory), Introduction to Electrical and Electronics circuits, Smart Contracts†, Numerical Analysis
- **Data Science:** Optimization Theory, Fundamentals of Reinforcement Learning†, Programming in Data Science
- **Miscellaneous:** Calculus, Linear Algebra, Differential Equations, Electricity & Magnetism, Quantum Physics

*Ongoing   †Coursera Courses

EXTRACURRICULAR ACTIVITIES

- Conducted session on **Mathematics of Paper Folding** for teaching maths to 10th Graders with origami *(Aug '22)*
- Developed a **Tower Defence** AI Algorithm for competing in Correlation One's Programming Challenge *(Jun' 23)*
- Acquired **Rank 45** among 230+ teams in Inter **IIT Hackathon - Convolve** hosted by **IIT-Guwahati** *(Dec '22)*
- Secured **Global Rank 171** among **11K** participants in **Codechef November Starters Challenge** *(Nov '22)*