Manav Doshi | **200100094**
Mechanical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 26/12/2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	9.04
Intermediate	HSC	Pace Junior Science College	2020	90.10%
Matriculation	IGCSE	Witty International School	2018	92.30%

Scholastic Achievements

- Secured a rank of **896** in **JEE Advanced** examination | Achieved a percentile of **99.84** in **JEE Main** examination ['20]
- Pursuing a minor degree in **Artificial Intelligence and Data Science** from C-MInDS, IIT Bombay | Minor SPI **9.50** ['23]

Publications

Siddartha Ganguly, **Manav Ketan Doshi** et al. *"An illustration of a quasi-interpolation driven technique for feedback synthesis*"; **Accepted** and **invited for presentation** at International Federation of Automatic Control (IFAC) World Congress 2023, Japan

Professional Experience

Research Intern | Adobe Research Lab | Scalability of Approximate Visualizations [May'23 - Aug'23]
*Transforming data into insightful dashboards, performing inference under a budget for datasets of the order of **100Mn**+ records*

Innovation	• Proposed a **novel metric** to quantify and assess deviations between original and approximate visualizations • Developed an end-to-end visualization recommendation pipeline to work on industrial **large-scale** datasets
Research	• Profiled how visualization recommendation models are affected by noise addition in **statistical features** • Engineered strategies to traverse **large discrete action spaces** for Reinforcement Learning Policies
Impact	• Achieved a **90%** reduction, saving over **45** hours by implementing an **RL Agent** to reduce inference time • Reduced overestimation of Q values and improved **training stability** by programming a target Q-network • Amplified training speeds by **30%** by PPO algorithm **|** Observed MSE Losses of $\mathbf{10^{-4}}$ after **1000** episodes

Research Experience

Content-Based Image Retrieval | Bachelor's Thesis | Prof. Biplab Banerjee [Aug'23 - Present]
Content-Based Image Retrieval is the extraction of images from a database by leveraging their intrinsic content attributes

- Introducing novel methods in image retrieval, leveraging the zero-shot and few-shot capabilities of **OpenAI's CLIP models**
- Devising **NLP** methods to harmonize visual elements with textual prompts, seamlessly incorporating vision and language
- Engineering methods to strategically navigate around the **resource-intensive** task of manually labeling dataset triplets
- Training custom **AutoEncoders** and **Neural Networks** to transform an image to a concept token in the textual latent space

Quasi-interpolation for Feedback Synthesis | Prof. Debasish Chatterjee [Mar'22 - Feb'23]
Quasi-interpolation is a pivotal technique to construct a smooth function by approximating data points through localized segments

- Implemented quasi-interpolation schemes to furnish **one-shot** approximate LQR feedback maps for unconstrained systems
- Achieved errors $\mathbf{< 10^{-4}}$ **rad** over multiple experiments by analyzing inverted pendulum system with synthetic feedback
- Obtained multidimensional feedback maps with **uniform error bounds** by employing quasi-interpolation techniques

International Aerial Robotics Competition | Unmesh Mashruwala Innovation Cell, IIT Bombay [Oct'21 - Sep'22]
*Received a **special mention** at IARC, highlighting exceptional innovation and expertise in solving the problem statement*

- Led an interdisciplinary team of **40**+ mutltifaceted students as a **Senior Machine Learning and CV** Engineer in the AeRoVe division of UMIC with the long-term objective of developing cutting-edge fully autonomous quadcopters
- Achieved mAP of over **95%** @IoU 0.5 by training deep learning models like **YOLOv4** for object detection and tracking
- Decreased inference time of model by **300%** | Built **TensorRT engines** and deployed them on **Nvidia Jetson Xavier NX**

Key Projects

DRDO's UAV-Guided UGV Navigation Challenge | Inter IIT Tech Meet 10.0, IIT Kharagpur [Feb'22 - Mar'22]
*Secured **third place** in DRDO's navigation challenge among **12 other IITs** as a part of the 10th Inter IIT Tech Meet*

- Designed robust algorithms to assist in UGV navigation through snow covered terrains using **drone camera feedback**
- Developed python scripts using **Ardupilot firmware** to perform **road segmentation** using RGB and depth feed
- Implemented a **Stanley controller** from scratch to enable the vehicle to navigate across various tight turns and altitudes
- Used **OpenCV segmentation methods** and deep learning models like **YOLOv4-tiny** to calculate vehicle pose and velocity

UAV Competition | International Conference on Unmanned Aircraft Systems 2022 [Apr'22 - May'22]
Developed a codebase for autonomous fire-fighting drones capable of 3-D obstacle avoidance and extinguisher deployment

- Implemented **3D obstacle avoidance algorithms** such as **Vector Field Histogram** to guide UAV through complex arenas
- Successfully employed custom dictionary **Aruco marker detection** to localize drop locations by processing UAV imagery
- Precisely delivered payload at drop location by performing performing highly specific "**swing & drop**" drone maneuver

Intelligent Learning Agents [Aug'22 - Nov'22]
Course Project *Course Instructor: Prof. Shivaram Kalyanakrishnan*

- Demonstrated algorithmic expertise by implementing the **ϵ-greedy, UCB, KL-UCB**, and **Thompson Sampling** algorithms
- Implemented optimization algorithms like **Value Iteration**, **Linear Programming**, and **Policy Iteration** to custom MDPs
- Orchestrated vehicular navigation through a complex parking lot by implementing the **SARSA** algorithm with **Tile Coding**
- Devised and programmed a **MDP framework** to optimize decision-making strategies for a batter during a chasing scenario

Zepto - Hyperlocal Delivery Optimization [Jan'23 - Apr'23]
Course Project *Course Instructor: Prof. Avinash Bhardwaj*

- Expanded delivery location radius by **9%** by improvising **facility localization** algorithms to set-up **10** dark-stores in Powai
- Reduced delivery distances by **3.1%** & time by **6.3%** by optimizing **route planning** on Powai roads & **order batching**
- Designed an optimization solution, leveraging **LP** techniques from **PuLP** for efficient vehicle routing and resource allocation
- Collaborated in a team of **4** members to integrate **real-time data** feeds into the Hyperlocal Delivery Optimization system

Airline Delay Prediction Using Machine Learning [Nov'22]
Course Project *Course Instructor: Prof. Asim Tewari*
*One of only **5** teams to receive a **perfect score** on the course project based on **rigorous pitches** and **entrepreneurship ideas***

- Reduced losses in revenue caused by using various datasets to predict flight delay in minutes and prepared a **mock pitch**
- Obtained **91.6%** accuracy over **1.8 million** flights by implementing classification techniques incorporating **20+ features**
- Created data pre-processing and multiple linear regression pipelines using **scikit-learn** to obtain RMSE error of **10.48**
- Collaborated with **5** members on a delay prediction system, applying **Decision Trees** and **Support Vector Machines**

Positions of Responsibility

Department Research Co-ordinator | *Undergraduate Academic Council, IIT Bombay* [Jul'22 - Mar'23]
*Securing research opportunities to bolster the participation of **800+** students and **facilitate UG research** in the institute*

- Collaboratively ideated and structured an the Summer Undergraduate Research Programme **(SURP)** in a team of **8**
- Adminstered **40+** research projects from **20+** professors and their allocations amongst **900+** applicants based on interviews
- Proactively brokered **collaborations** to bridge the divide between research-driven undergraduate students and professors

Team Manager | *Unmesh Mashruwala Innovation Cell, IIT Bombay* [Jul'22 - Mar'23]

- Managed a **20+** membered-team, responsible for maintaining the team's website and augmenting social media outreach
- Raised **1.5 million INR** from the institute and **relevant sponsors** to meet equipment requirements of the technical team
- Established relations with academic and industry experts, as well as sponsors to ensure state-of-the-art **R&D facilities**
- Orchestrated the two-month long recruitment drive of **150+ applicants**, comprising of interviews, training and projects

DAMP & ISMP Mentor | *Student Mentorship Program, IIT Bombay* [May'22 - Present]

- One of the **143** mentors selected from **380+** applications | Responsible for mentoring **12** freshmen and providing counsel
- **Web Subgroup Head** - Leading a team of **6** mentors overseeing maintenance of blogs containing **230+** course reviews
- Assisting scholastically struggling students in the **Academic Rehabilition Program (ARP)** with their curricular endeavours

Teaching Assistant | *CE102 - Engineering Mechanics* | *Prof. Najeeb Shariff* [Mar'22- Jul'22]

- Facilitated regular **tutorial** sessions for a cohort of **80+ incoming freshmen**, providing guidance through direct interaction
- Collaborated with instructors to manage **course logistics**, contributing by proctoring exams and assessing answer scripts

Technical Skills and Key Courses Taken

AI Courses	Programming for Data Science, Data Structures & Algorithms, **Foundations of Intelligent and Learning Agents**, Advanced Methods in Satellite Image Processing, **Statistical ML & Data Mining**, Optimization Models, **Advanced topics in Deep Learning for Image analysis**, Advanced Topics in Machine Learning
Programming	C/C++, Bash, Python, OpenCV, MATLAB, Tensorflow, Keras, PyTorch, Scikit-learn, OpenAI Gym
Software	Arduino IDE, MSC Adams, Git, Excel, Django, Jekyll, ReactJS, BeautifulSoup, Selenium, LaTeX

Extra-curricular Activities

Football	• Led a team of **6** for conduction of Aavhan Football, featuring **24 colleges** with cash prizes of **INR 50K** • One of the **24** players selected for Inter-IIT Football Camp out of **14k+** students in the institute • Represented IIT Bombay's football team in the Mumbai District Football Association for **2** years running • Placed **second** in IFL - IIT Bombay's annual sports competition seeing over **300+** participants
Mentorship	• Guided a team of **4** freshmen participants in CodeWars, India's inaugural robot programming contest. • Directed a team of **10** students in Summer of Code program, facilitating efforts in constructing a GAN • Mentored **4** students during a training program, aiding them in mastering ROS, Gazebo, and OpenCV
Miscellanous	• Completed **80+** hours of volunteering work under the **National Service Scheme** (NSS), IIT Bombay • Designed t-shirts for **D' Fest 2022** organised by Industrial Design Center, IIT Bombay