Dikshant | **180040033**
Civil Engineering | **B.Tech.**
Indian Institute of Technology, Bombay | **Gender: Male**
DOB: 12-12-2000

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2022	8.91
Intermediate	CBSE	Delhi Public School, Hisar	2018	91.20%
Matriculation	CBSE`	K.L. Arya D.A.V. Public School, Hisar	2016	10

Pursuing a Minor degree in the Department of **Electrical Engineering**, IIT Bombay

Scholastic and Technical Achievements

- Currently ranked **7th** based on merit in a class of **112 students** in department of Civil Engineering *('21)*
- Recipient of **Kishore Vaigyanik Protsahan Yojana(KVPY)** Fellowship awarded by Govt. of India *('18)*
- Secured **97.8 percentile** in JEE Advanced entrance examination among 0.15 million+ candidates *('18)*
- Received **Special Mention** for exemplary contribution to institute technical culture by hostel council *('20)*
- **Second runner-up** in How Things Work contest for demonstrating the working of a wireless mouse *('20)*

Publications and Preprints

- **Interconnecting Vehicle using IoT Framework for Multi-Agent Patrolling** *('21)*
  Deepak Mallya, **Dikshant**, Vishwajeet Bhagyawant, Leena Vacchani, Arpita Sinha
  Submitted at ACM Journals: Transactions on Internet of Things (TIOT) [Under Review]

Research Experience and Internships

Multi-Agent Patrolling *(Apr '20 - Apr '21)*
Guides: Prof. Leena Vacchani and Prof. Arpita Sinha, Department of Systems & Control *IIT Bombay*
- Delineated a multi-agent patrolling algorithm using **Deep Q Network** Reinforcement Learning technique
- Developed the patrolling algorithms using **IoT** by simulating **packet loss** in junction and car communication
- Applied **Conscientious Reactive** architecture for reducing idleness value using **TraCi** library with **SUMO**
- Forged an interface between **ROS** and **Webots** simulator for designing a controller for a car on CAIR map

Scalable Multi-Agent RL Training School for Autonomous Driving *(May '21 - Aug '21)*
Guide: Prof. Matthew Taylor, Intelligent Robot Learning Lab *University of Alberta, Canada*
- Constructed a pipeline to add **HAMMER** algorithm to facilitate the coordination between multiple ego agents
- Evaluated **PPO**, **DQN** & **SAC** baselines on single & multiple ego agents cases for with(out) traffic scenarios
- Appended hand-coded messages, like position and distance from other ego agents, to the baseline architectures
- Adjoined **SMARTS** and **ULTRA** with graham cluster of **Compute Canada** using the singularity image

Room Service Automation Bot *(Jun '20 - Jul '20)*
Golden Oak Projects Private Limited *Startup based in Delhi*
- Built a robot which can carry out room services like supplying food items and clothing autonomously
- Mapped a room environment, build using **Gazebo** simulator, and navigated the bot using **DWA** algorithm
- Interfaced **R-Pi**, arduino, **IMUs** and **lidars** for accurate SLAM, localization and navigation of the bot

Technical Projects

SeDriCa | Unmesh Mashruwala Innovation Cell *(Aug '20 - Ongoing)*
*Working in a **20+** member team aiming to develop a **self-driving car** capable of traversing on Indian roads*
- **Leading controls subsystem** to apply Model Predictive Control for trajectory tracking & satisfying constraints
- Implemented **kinematic 2D bicycle model** to capture vehicle motion in normal driving conditions
- Devising dynamic model & designing **Hybrid MPC controller** to attain higher speeds & tackle slippery roads
- Assimilated the waypoints & velocity constraints from path planner to feed **do-mpc** control toolbox

Intelligent Picking Robot | Flipkart Grid 2.0-Robotics Challenge *(Jun '20 - Aug '20)*
Led a team of 5 developing an autonomous robotic arm capable of picking and transporting items in warehouse
- Among the top **121 teams** qualified for Stage 3 out of **6000+** registered teams from all over India
- Implemented **YOLOv3** algorithm for object detection & **OpenCV** tactics to gauge possible grasping points
- Mapped the area between pick and drop stations using **SLAM**, and employed **A*** algorithm for path planning

Terrace Farming Bot | Inter IIT Technical Meet 8.0 *(Oct '19 - Dec '19)*
Worked in a team of 8 to develop an autonomous step climbing robot to perform terrace farming operations
- Prototyped the bot to **climb**, **seed**, **plow** & **harvest** with its own autonomous navigation software system
- Fused monocular **visual odometry** and data from MPUs & stepper motor encoders for state estimation
- Implemented a **PID** based position and orientation controller & employed ultrasonic sensors to provide feedback

Person Detection in low-light Near-Infrared Images | **Intro to ML** *(Feb '21 - May '21)*
Guide: Prof. Amit Sethi *Electrical Engineering Department, IIT Bombay*
- Performed literature review regarding available benchmarks for object detection networks in low-light condition
- Effectuated **R101-FPN** and **X101-FPN** object detection models from the Model ZOO of **Detectron 2**
- Attained an accuracy of **98.54%** on test dataset from **X101-FPN** using F1 score evaluation metrics with **IoU**

Autonomous Quadruped Robot | **RoboCup Rescue League Challenge** *(Sep '19 - May '20)*
*Part of **17** member team working on autonomous quadruped for its easy maneuvering on any terrain*
- Modeled & stabilised an inverted pendulum on a cart system using **Kalman filter** with the help of simulink
- Performed **Inverse Kinematic Analysis** for quadruped control to ensure optimum balance on a flat ground
- Studied rhythmic movement of each leg of the quadruped for optimal **gait** selection based on speed & terrain

Swiftening A* and D* lite algorithms | **Scientific Computing** *(Feb '21 - May '21)*
Guide: Prof. S. Gopalakrishnan *Mechanical Engineering Department, IIT Bombay*
- Juxtaposed the **Serial**, **OpenMP** and **CUDA** (for GPUs) implementation of A* and D* lite algorithms
- Envisioned the implementation of A* algorithm using **pygame** library for with(out) **parallel programming**
- Compared shared memory(OpenMP) and message passing interface(MPI) systems by parallelizing GEM

Applications of ML in Quantum Mechanics | **Summer Research Project** *(Apr '19 - Jul '19)*
Guide: Prof. Alok Shukla *Engineering Physics Department, IIT Bombay*
- Brushed up the basics of quantum mechanics including energy quantisation and Schrödinger equation
- Evaluated a neural network to find out the **minimum energy** of the Hydrogen and Helium molecules

Other Technical Activities
- Prototyped **Thor's Hammer** using electromagnets & RFID for Institute Technical Council Orientation *('19)*
- Built an Arduino based autonomous **Line-Follower** robot capable of following a desired path *('19)*
- Demonstrated the **Chrome Dino game** using **Arduino** and 16*2 LCD in EnPOWER UG orientation *('19)*
- Delivered a **talk** on **Control Theory** and **PID** to **70+ students** with MATLAB and Simulink demos *('20)*
- Introduced Python to **1000+ students** in the course **PyCK** hosted under WnCC, IIT Bombay *('21)*
- **Guided 150+** freshmen teams in XLR8 2019 to build and debug wireless Bluetooth controlled robot *('19)*
- Mentored a team for the **meshmerize** competition involving path planning for Techfest, IIT Bombay *('19)*

Position of Responsibility
Convener | Electronic and Robotics Club, Institute Technical Council *(May '19 - Apr '20)*
Part of a 15+ member team that conceptualises and organises events for tech enthusiasts in the Institute
- Ushered **ROS workshop** for beginners during covid quarantine period, attended by **300+ tech enthusiasts**
- Attained a footfall of **600+ participants (30% increase)** in the flagship event: XLR8-2019 with successful execution of the event and achieved the **highest success ratio (92%)** in the last 4 years
- Delivered sessions on **Arduino, Raspberry Pi, Image Processing** and **Serial Communication Protocols**
- Ideated and conducted **'Jhatka GC'**, an electronics and robotics based institute-level inter-hostel championship

Technical Proficiency
Languages	Python, C++, Matlab, Git, Octave, CSS, HTML, Markdown, LaTeX
Softwares	Webots, Gazebo, CARLA, SUMO, Netedit, TraCi, Simulink, Auto-CAD
Frameworks/Libraries	ROS, Gym, PyTorch, Tensorflow, Keras, OpenCV, Numpy, Pandas, Pygame
Electronics	Raspberry Pi, Arduino, Node MCU, ESP32

Key Courses Undertaken
Computer Science	Foundation of Intelligent & Learning agents, Artificial Intelligence and Machine Learning*, Introduction to ML, and Computer Programming and Utilisation
Controls	Linear and Non-linear systems, Intelligent Feedback & control systems, Adaptive Control theory, Signals and Systems, Linear Algebra, Differential Equations
Robotics	Introduction to Robotics, ROS: Localization, Navigation and SLAM, HPSC
Interdisciplinary	Probability and Random Processes, Calculus, Power Electronics*, Electrical and Electronic circuits, Quantum Physics, Urban Science & Engineering*

**to be completed in Fall 2021*

Extracurriculars
- Bagged **1st position** from the hostel in **logic GC**, organized by Maths and Physics Club, IIT Bombay
- Represented Hostel 3 & secured **1st place** in intra-hostel football amd intra-hostel cricket tournaments
- Served as an **NCC cadet** in the 2 Maharashtra Engineering Regiment of IITB 2018-19 while being among the selected cadets for the Republic Day Parade '19; awarded with the NCC ATC certificate
- Represented IIT Bombay in Football, Volleyball, Tug of War and Athletics in **Annual Training Camp**
- Counseled school students of BMC under **Career Counseling Campaign** organized by Abhyuday, IIT Bombay
- Planned and executed **280+ events** in 24th edition of Techfest, IIT Bombay as Robowars Coordinator