

# MIHEER DIWAN

+1 774-519-8377    [msdiwan@wpi.edu](mailto:msdiwan@wpi.edu)    [miheer-diwan](https://www.linkedin.com/in/miheer-diwan)    [miheer-diwan](https://github.com/miheer-diwan)    [miheer-diwan.github.io](https://miheer-diwan.github.io)

## Education

### Worcester Polytechnic Institute

Expected: May 2024

Master of Science in Robotics Engineering

Worcester, MA

Courses: Computer Vision, Machine Learning, Robot Controls, Advanced Robot Navigation, Autonomous Aerial Robotics

### Mukesh Patel School of Technology Management & Engineering, NMIMS University

May 2022

Bachelor of Technology in Mechatronics Engineering (Minor: Robotics & IoT)

Mumbai, India

## Technical Skills

Languages & Tools : Python, C++, MATLAB, PyTorch, OpenCV, Numpy, ROS, Docker, Git, SolidWorks, Blender  
Machine Learning Tools : CNN, ResNet18, DenseNet, LSTM, HomographNet, Regression, Clustering, NLP

## Work Experience

### Autonomous Quadrotor Navigation in Uncharted Terrains

Aug 2023 – Dec 2023

Graduate Researcher, Perception and Autonomous Robotics Group [PeAR], WPI

Advisor: Prof. Nitin Sanket

- Developed a Generative, Procedural environment for quadrotor simulation and learning using Blender software.
- Employed RRT\* algorithm and **Minimum Snap Trajectory** generation to navigate a dense, simulated forest.
- Designed a **Model Predictive Control** for precise trajectory tracking and traversal of optimal trajectories.

### Vision Based Autonomous Driving

May 2023 – July 2023

Graduate Researcher, Embedded Computing Lab, WPI

Advisor: Prof. Xinming Huang

- Developed a full-perception stack for autonomous driving using camera images, **LiDAR** point clouds and **Voxel Grids**.
- Estimated absolute and relative depth using both **Stereo Photogrammetry** and **Intel's MiDaS depth model**.
- Used **YOLOv8** for **Object Detection** and **Instance Segmentation** for road vehicles, traffic signs, and pedestrians.
- Detected lanes on custom dataset with a 97.8 % accuracy using Cross Layer Refinement Network (**CLRNet**).

### Control Systems Intern, NMIMS University, Mumbai

June 2021 – Nov 2021

Project: Back-EMF based sensorless BLDC Motor Control | MATLAB, Simulink

Advisor: Prof. Dattatray Sawant

- Conducted comprehensive research, exploring and analyzing multiple non-linear methods for BLDC motor speed control.
- Constructed a closed-loop model for sensorless control of BLDC motors based on Back-EMF and zero-crossing detection.

## Projects

### Sim2Real Mini Drone Racing | JETSON Orin Nano, PyTorch

- Deployed algorithm on **DJI TelloEDU** drone for autonomously detecting and navigating windows and arbitrary gaps.
- Trained a custom deep-learning network using only simulated data and **domain randomization** to segment windows in the real world with an accuracy of **92 %** and determined the 3D pose with Perspective-n-Point (PnP).
- Leveraged Optical Flow and Spatial Pyramid Network (SPyNet) to detect and navigate arbitrarily shaped gaps in walls.

### Classical and Deep Visual Inertial Odometry (VIO) | Sensor Fusion, State Estimation, Kalman Filter

- Implemented "Robust Stereo VIO for Fast Autonomous Flight" paper for a state-of-the-art sensor fusion using **MSCKF**.
- Fused camera images and IMU data using **LSTM** based network to perform state estimation in real time.

### Structure from Motion (SfM) | Multi-View Geometry, Triangulation

- Extracted and matched monocular camera image features using SIFT descriptors and **RANSAC** algorithm.
- Calculated the Fundamental matrix and the Essential matrix based on **Epipolar geometry** constraints and leveraged camera triangulation to determine camera poses ensuring adherence to Cheirality Condition.
- Performed **3D scene reconstruction** by refining camera poses using Bundle Adjustment and the Visibility matrix.

### Neural Radiance Fields (NeRF) and Gaussian Splatting | Volume Rendering, CUDA Optimization

- Implemented the original NeRF method to synthesize novel views by optimizing a continuous volumetric scene function.
- Evaluated the performance against SOTA Gaussian Splatting for **real-time** radiance field rendering on a custom dataset.

### Camera Calibration | Corner Detection, Feature Extraction

- Devised a robust camera calibration algorithm using Zhang's method to estimate camera intrinsics and extrinsics.
- Predicted distortion coefficients and minimized distortion errors of the camera, employing **Non-linear optimization**.

## Leadership Experience

### Co-Head: Design & Simulation Department, Team Technotix, MPSTME

2019 – 2021

- Headed a team of 15 people to develop two mobile robots: Arrow-Shooting robot and Ball-Throwing robot.
- Fabricated a custom swerve drive mechanism for the robots which provided **30 %** increase in the speed of the robots.
- Secured **India National Finalist** positions in ABU Robocon 2020 and 2021, with a flawless score in the Design Phase.