

# SHASHWAT MUDUGUR ASHOK KUMAR

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## EDUCATION

### Purdue University

Master of Science in Autonomy and Robotics

Relevant Coursework: Robotics, Autonomous Systems, Artificial Intelligence

Cumulative GPA: 3.77/4.0

West Lafayette, IN, USA

Aug. 2024 – (Dec. 2025)

### Manipal Academy of Higher Education

Bachelor of Technology in Mechatronics, Minor in Electric Vehicle Technology

Cumulative GPA: 8.54/10.0

Manipal, Karnataka, India

Oct. 2020 – May 2024

## SKILLS & INTERESTS

**Technical Skills:** ROS2, NAV2, MicroROS, OpenCV, PyTorch, Keras, Git, CAD, 3D Printing, PLC Programming.

**Programming Languages:** C, C++, Python, Embedded C and RTOS, CMSIS, MATLAB and Simulink.

## WORK EXPERIENCE

### Robotics Firmware Engineering Intern

Algobotix

May 2024 – July 2024

Bangalore, Karnataka, India

- Redesigned the payload system for autonomous drone navigation using CAD and 3D printing, integrating Raspberry Pi, IMU and battery.
- Implemented MAVLink protocol with C++ and STM32 for communication and control of drone and payload.
- Developed a C++ ROS2 node that integrated PX4 flight controller using XRCE-DDS protocol to visualize the drone's position and orientation in real-time. [🔗 GitHub](#)

### Research Intern - Bachelor's Thesis

Robert Bosch Center for Cyber-Physical Systems, Indian Institute of Science(IISc)

Jan 2024 – May 2024

Bangalore, Karnataka, India

- Designed a drone flight controller using ESP32 controller integrated with Micro ROS to interface with a Motion Capture System. Implemented fail-safe mechanisms utilizing MPU-6050 and Lidar for autonomous safe landing in case of communication loss. [🔗 GitHub](#)
- Devised a Prescribed Performance Control Algorithm for speed control of DC Motor, utilizing Teensy microcontroller. [🔗 GitHub](#)
- Implemented a Ball Catching Robot with an RX-200 Serial Manipulator, leveraging OpenCV and Python. [🔗 GitHub](#)

### Systems Engineering Intern

Ola Electric

June 2023 – Aug 2023

Bangalore, Karnataka, India

- Introduced supercapacitors into vehicle models to enhance regenerative braking performance and simulated the system using Gamma Technology Software, resulting in a 23 percent increase in vehicle range.
- Designed a flight controller that utilizes PID control algorithms and integrates an MPU-6050 IMU sensor via I2C communication for precise drone stabilization and control.

### Electronics and Powertrain Engineer

Moto Manipal – E-Superbike Team

Nov 2020 – May 2023

Manipal, Karnataka, India

- Designed the wiring harness of an electric superbike powered by 10kw PMSM Motor. Worked on calculation, design, and manufacturing the Li-ion battery pack also worked on MATLAB and Simulink for powertrain modeling and range calculations.
- Developed an interactive dashboard using Python and RaspberryPi3 and collected data from the motor controller using CAN (Controller Area Network) communication along with data logging system for monitoring and analysis through ESP32 controller. [🔗 GitHub](#)

## RESEARCH EXPERIENCE AND PROJECTS

### Smart Temperature Control for Hydroponics

Embedded C, C++, RTOS

- Integrated an STM32 microcontroller, DS18B20 temperature sensor via 1-Wire protocol, and relay-controlled fan to implement a closed-loop system for maintaining the temperature of a hydroponics system.

### Traffic Sign Classification using Cross Stage Partial Network

PyTorch, Python, Open CV, Matplotlib

- Developed a Traffic Sign Classification model utilizing the Cross Stage Partial Network (CSPNet) to identify traffic signs using the German Traffic Sign dataset with an accuracy of 87 percent. [🔗 GitHub](#)

### Ball-Following Robot using Kalman Filter

ROS2, Python, Open CV, Rviz, Gazebo

- Implemented a ball-following robot simulation utilising camera data, OpenCV for vision and Kalman filter for motion tracking. [🔗 GitHub](#)

### RRT\* Path Planning and Following for Obstacle Avoidance on TurtleBot3

Python, ROS2, Rviz, Gazebo, Matplotlib

- Implemented RRT\* algorithm for path planning and graph construction using KD-Tree; implemented path generation and tracking using a PID controller with simulations in RViz and Gazebo environments. [🔗 GitHub](#)

### A\* Path Planning with PID Control on TurtleBot4 and Simulation on TurtleBot3

Python, ROS2, Rviz, Gazebo, Matplotlib

- Developed and tested an A\* path planning algorithm with PID control on TurtleBot4, achieving optimized navigation and trajectory following with obstacle avoidance. [🔗 GitHub](#)

## LEADERSHIP & ACTIVITIES

**Team Leader at MotoManipal:** Emerged victorious in Electric Bike Design Challenge organized by Mechatron Motors. Secured third place in National Online E-Bike Design Challenge hosted by the Fraternity of Mechanical and Automotive Engineers.

**Captain and Team Member of Karnataka State Basketball Team:** Participated in the U-16 and U-19 National tournaments.