SHASHWAT MUDUGUR ASHOK KUMAR

West Lafayette, Indiana

✉ ma.shashwat@gmail.com | ☎ +1 (765)-(694)-5374 | 🌐 Portfolio Website | in LinkedIn | ⌂ GitHub

EDUCATION

Purdue University West Lafayette, IN, USA
Master of Science in Autonomy and Robotics *Aug. 2024 – (Dec. 2025)*
Relevant Coursework: Embedded Systems, Autonomous Systems, Artificial Intelligence
Cumulative GPA: 3.77/4.0

Manipal Academy of Higher Education Manipal, Karnataka, India
Bachelor of Technology in Mechatronics, Minor in Electric Vehicle Technology *Oct. 2020 – May 2024*
Cumulative GPA: 8.54/10.0

SKILLS & INTERESTS

Programming: C, C++, Python
Firmware Development: Bare-metal programming, RTOS (FreeRTOS), Embedded C, Assembly
Microcontrollers: STM32 (HAL, CMSIS), ESP32 (ESP-IDF), Teensy, Arduino
Communication Protocols: I2C, SPI, UART, CAN
Robotic Frameworks: ROS2, Micro-ROS, NAV2, Rviz, Gazebo

WORK EXPERIENCE

Robotics Firmware Engineering Intern May 2024 – July 2024
Algobotix *Bangalore, Karnataka, India*
- Integrated MAVLink protocol with **C++** and **STM32** to enable communication between the drone and ground station
- Designed a ROS2 **C++** node to interface with the PX4 flight controller via XRCE-DDS to visualize drone telemetry in real-time ⌂ GitHub
- Redesigned the payload system for autonomous drone navigation using CAD and 3D printing, integrating Raspberry Pi, IMU and battery

Embedded Research Intern - Bachelor's Thesis Jan 2024 – May 2024
Robert Bosch Center for Cyber-Physical Systems, Indian Institute of Science(IISc) *Bangalore, Karnataka, India*
- Designed and developed a drone flight controller using **ESP32** integrated with Micro-ROS for interfacing with a Motion Capture System, programmed in **C and C++** using ESP-IDF ⌂ GitHub
- Implemented **FreeRTOS** scheduler to acquire Motion Capture System data and activate fail-safe mechanisms during communication loss
- Integrated MPU-6050 (via **I2C**) and Lidar (via **UART**) to enable autonomous safe landing under fail-safe conditions
- Devised a Prescribed Performance Control (PPC) algorithm for DC motor speed control using a **Teensy** microcontroller and **C**, achieving 30% better stability compared to PID control ⌂ GitHub

Systems Engineering Intern June 2023 – Aug 2023
Ola Electric *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% increase in vehicle range
- Designed a flight controller using **Arduino** and **C**, implementing **PID** control for precise drone stabilization and integrating an MPU-6050 via **I2C** for real-time motion sensing.

Electronics and Powertrain Engineer / Team Leader Nov 2020 – May 2023
Moto Manipal – Electric Superbike Team *Manipal, Karnataka, India*
- Led the development and manufacturing of a 10kW PMSM-powered electric superbike for MotoStudent International
- Designed and manufactured the Li-ion battery pack; performed powertrain modeling and range calculations using MATLAB and Simulink
- 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 **PID** control system for maintaining the temperature of a hydroponics system

Traffic Sign Classification using Cross Stage Partial Network ⌂ **GitHub** PyTorch, Python, Open CV , Matplotlib
- Developed a traffic sign classification model using CSPNet to boost computational efficiency and gradient flow by 20%
- Implemented Mish activation function to enhance gradient propagation and improve model performance
- Applied data augmentation techniques to improve generalization, achieving 87% accuracy on the German Traffic Sign Dataset

RRT* Path Planning and Following for Obstacle Avoidance on TurtleBot3 ⌂ **GitHub** 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

A* Path Planning with PID Control on TurtleBot4 and Simulation on TurtleBot3 ⌂ **GitHub** 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.