Utkarsh Gupta

(832) 814-4935 utkarshpgupta@outlook.com linkedin.com/in/utkarshpgupta utkarshpgupta/portfolio

Education

University of Houston **May 2025**
Master of Science in Electrical Engineering *Houston, Texas*

University of Mumbai **May 2023**
Bachelor of Engineering in Electronic Engineering *Mumbai, India*

Technical Skills

Languages: C, C++, Embedded C, Python, MATLAB, ROS2

MCU & SBC: STM32 (Cortex-M, Mbed), ESP32-S3 (FreeRTOS via ESP-IDF), Raspberry Pi 4/5, Jetson (Linux)

Protocols & Buses: Wi-Fi, I^2C, SPI, UART, CAN

Tools: Git, Mbed Studio, Oscilloscope, Docker, KiCad, Onshape

Work Experience

University of Houston **Feb 2024 – May 2025**
Research Assistant *Houston, TX*

- Designed and programmed a Self-Driving Lab that orchestrates a **SCARA robotic arm**, syringe pumps, and electrochemical test equipment, boosting experimental throughput by **8x**. *(Project Video)*
- Developed **C/C++** firmware and **Python** control software to integrate **ESP32-S3**, stepper-driven actuators, and RS-485 Modbus devices for fully automated fluid-handling workflows.
- Implemented a dual-camera system with **AprilTags** for automated workbench calibration and **OpenCV**-based deposition area measurement, improving consistency across experiments.
- Created data dashboards with **Matplotlib, Plotly** and Flask, enabling monitoring of electrochemical performance across all experiments.

Samsung **June 2022 – Aug 2023**
Network Engineer *Mumbai, India*

- Monitored a **100,000-site** LTE network across **21** regions, writing Python scripts that parsed KPI alarms and flagged critical faults **120 min sooner** than the legacy manual workflow.
- Built Excel/Python dashboards that visualized eNB health and trending faults, enabling field teams to reduce unplanned outages by **12%** quarter-over-quarter.

Projects

Real-Time CO_2 Monitoring System | *Website* **ESP32-S3 | FreeRTOS | Flask | Wi-Fi**

- Programmed **ESP32-S3** firmware in C++/**FreeRTOS** to acquire sensor data (SCD30/40 via I^2C) and publish packets over Wi-Fi every 2s.
- Deployed **10+** wireless nodes and a Raspberry Pi Flask dashboard that streamed live CO_2 and VOC index metrics.
- Optimized task scheduling and non-blocking I^2C drivers, achieving 24/7 uptime for three months with zero watchdog resets. This system helped secure a **$100 K USDA Climate-Smart** grant by enabling data-driven soil management for farmers.

4-DOF Robotic Arm with Magnetic Encoder Feedback **STM32 | Mbed OS | I^2C Encoders | PID**

- Designed and assembled a stepper-driven 4-DOF arm; integrated **AS5600** magnetic encoders via I^2C for feedback.
- Implemented inverse kinematics and **PID** loops in Mbed C++, driving GPIO step/dir outputs at up to 5 kHz.
- Achieved **sub-degree positioning accuracy** and smooth trajectory execution across 1000+ point-to-point moves.
- Debugged timing jitter using logic analyzer traces and refined control code to cut overshoot by 60%.

Wall-Following TurtleBot 3 Robot | *Certificate* **ROS2 | Python | LiDAR & Odometry**

- Developed an autonomous wall-following system using the ROS2 Navigation Stack and Python, enabling the TurtleBot 3 to navigate complex indoor environments.
- Integrated LiDAR and wheel odometry to support real-time obstacle avoidance and smooth trajectory correction.
- Manually tuned a PI controller to minimize lateral deviation, optimizing wall-following stability through iterative testing.
- Validated system in real-world test environments, demonstrating core skills in robotic control, sensor fusion, and autonomous mobility.