

# Ashrith Edukulla

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## Education

### University of Michigan, Ann Arbor

Aug 2024 – Dec 2026

B.E. in Robotics | GPA: 3.96/4.0

- Honors: Rank 3 (WRO), 4× IYRC medalist, 3× AMC qualifier, 2× AIME qualifier.
- Current (Fall 2025): ROB 415 (Control), ROB 320 (Planning/ROS), ROB 330 (SLAM), EECS 281 (Data Structures).
- Completed: Circuit Design, Robot Optimization, SLAM, Linear Algebra, Robotic Differential Equations.

## Work Experience

### Synergic Adaptive Machinas (SAM) Lab @ University of Michigan

Aug 2025 – Dec 2025

Robotics Research Engineer

- Developing a reconfigurable swarm-robotics testbed using a **3×3 motor array** to study motion and coordination.
- Designed decentralized firmware for **9-motor independent actuation** with **PWM** control and direction handling.
- Built a **control UI (C++/Sockets/Serial)** to visualize swarm states, issue commands, and debug behaviors.
- Investigating multi-robot behaviors using **distributed control**, modeling, and micro-macro swarm interactions.
- Co-authoring a research paper on emergent coordination, **energy-aware motion**, and reconfigurable swarms.

### ROB 201: Robot Differential Equations @ University of Michigan

Aug 2025 – Dec 2025

Instructional Aide

- Supported instruction in **ODE modeling**, **state-space systems**, and **feedback control** for undergraduate robotics.
- Led weekly office hours using **Julia** simulations, visualizations, and interactive differential-equation problem solving.
- Assisted with labs and grading; clarified **Laplace transforms**, **transfer functions**, and **stability analysis**.

### DSC Lab @ UM–SJTU Joint Institute

June 2025 – July 2025

Robotics Research Engineer

- Simulated a robotic-leg testbed in **MATLAB** using a 6-DOF arm model to study dynamic charging.
- Evaluated **multi-port wireless charging** and motion–energy trade-offs for energy-efficient legged robots.
- Prototyped **energy-aware control** that predicts battery drain and optimizes foot placement for charging efficiency.

### Michigan Mars ROVER

Nov 2024 – May 2025

Embedded Software Engineer

- Programmed **STM32 firmware** for servos, LEDs, and accelerometers to support real-time actuation and feedback.
- Built and integrated **ROS** nodes enabling subsystem communication, and data streaming for mobility-focused tasks.
- Contributed to navigation system development using **sensor-based localization**, **IMU** filtering, and control tuning.

## Projects

### Full-Stack SLAM on Differential-Drive Robot

Aug 2025 – Dec 2025

- Built a **2D SLAM** system on an **MBot** using **motion models**, **sensor models**, and **occupancy-grid** mapping.
- Tuned **log-odds** updates, **ray-casting**, and **likelihood-field** parameters to achieve consistent robot localization.
- Analyzed **noise** patterns and parameter sensitivity to detect divergence and strengthen overall SLAM robustness.

### Motion-Sensing Robotic Limb

Dec 2024 – Mar 2025

- Developed an **accelerometer-based** finger-control interface enabling smooth and precise robotic-limb motion.
- Calibrated **sensor feedback** loops to reduce noise, improve responsiveness, and stabilize continuous actuation.
- Evaluated motion **accuracy**, **latency**, and consistency across repeated trials and varied conditions.

### FROST

Aug 2024 – Dec 2024

- Built an autonomous ice-detection robot with **IR sensors**, **thermal camera**, and controlled **salt-dispensing**.
- Implemented **MBot**-based navigation and **perception** modules for reliable detection and targeted ice mitigation.
- Designed and tested robust **CAD assemblies** to improve stability, weight distribution, and weather resistance.

## Skills

**Languages:** C++ (STL, multithreading), Python, Julia, MATLAB

**Robotics & Embedded:** ROS 2 (rclcpp, topics/services/actions), Gazebo, RViz, Isaac Sim, Arduino, STM32, PWM, I<sup>2</sup>C

**SLAM & Perception:** Odometry, 2D SLAM, occupancy grids, likelihood-field models, particle filters, coordinate transforms

**Control & Dynamics:** State-space models, linearization, PID, LQR/LQI, feedback linearization, ODE modeling

**Software & Tools:** Linux, Git, CMake, Sockets/IPC, serial protocols, VS Code Remote, SolidWorks

**Math & Algorithms:** Linear algebra, optimization, numerical methods, dynamic programming, graphs/heaps