

Ayush Sharan

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EDUCATION

Carnegie Mellon University

Master of Science in Robotics Systems Development
GPA: 4.08/4.00

Pittsburgh, PA
May 2027

Relevant current coursework:

16-720 Computer Vision, 16-665 Robot Mobility (Legged locomotion dynamics and control (LIPM, spring mass models))
16-833 Robot Localization and Mapping

National Institute of Technology Karnataka, Surathkal

Bachelor of Technology in Mechanical Engineering
GPA: 9.47/10.00

Mangalore, India
October 2022

SKILLS

Programming Languages: Python, C++, MATLAB

Tools & Software: ROS2, PyTorch, OpenCV, Gazebo, MoveIt, RViz, Git, MATLAB Simulink, Linux

PROJECTS

Imitation Learning and Perception for a Tic Tac Toe Robot

May 2025 – July 2025

- Implemented a computer vision pipeline for board detection and classification followed by a hierarchical system for playing by integrating a Tic Tac Toe Minimax strategy engine with an Action Chunking Transformer (ACT) policy, deployed on the LeRobot SO100 6-DOF manipulator.
- Developed the computer vision pipeline using ORB feature matching and homography estimation to detect and rectify the Tic Tac Toe board, followed by HSV-based classification to infer the game state.
- Extended the ACT architecture with language conditioning, enabling execution of different moves through simple natural language input under a single policy.
- Integrated spatial attention maps to visualize action selection and improve the interpretability of the learned policy.

Dual-Arm Robot for Medical Inventory Labeling

September 2025 – Ongoing

CMU – Capstone Project

- Developing a dual-arm robotic system with two X-Arm 7's in collaboration with UPMC for applying RFID labels to medical items, to improve item tracking efficiency within the Operating Room supply rooms.
- Focusing on designing the motion and grasp planning pipeline for item pick-and-place operations and the precise application of RFID stickers for medical items of varying form factors, rigidity, and transparency.

EXPERIENCE

Caterpillar Inc

Bengaluru, India

Senior Associate Engineer

July 2022 – April 2025

Reinforcement Learning Based Microgrid Controller

- Developed a Soft Actor-Critic (SAC) reinforcement learning-based microgrid energy management controller, achieving a median 5% reduction in operating costs over the rule-based controller across diverse 24-hour cycles.
- Curated and processed rule-based controller field data to bootstrap model learning via off-policy training.
- Built a high-fidelity microgrid simulation model in MATLAB Simulink for online training and validation.

Scheduling and Route Planning for EV Mining Trucks

- Developed a rule-based charging scheduler and A*-based route planner in ROS2 for electric mining trucks, integrated with the microgrid and its controller.
- Presented analysis showing a 5% reduction in operating costs to senior leadership, driving inclusion of the feature in the product roadmap.

Hardware-in-the-Loop (HIL) Test Bench Development

- Defined system requirements and architecture, and led a team of 3 engineers in designing and delivering a HIL test bench for Microgrid controller validation.
- Integrated 7 embedded ECUs with a real-time simulation platform through CAN, Modbus, and digital/analog I/O.
- Developed microgrid simulation models in MATLAB, implementing generator control systems with PI frequency control (Governor), PI voltage control (AVR), and droop-based load sharing.
- Collaborated with cross-functional teams to define requirements, plan, and execute validation, achieving a 95% defect detection rate.

PATENTS

[Sharan, Ayush] [Dissociated Microgrid Controller] [20250260235] filed [Feb 08, 2024] and issued [Aug 14, 2025]

[Sharan, Ayush] [Dynamic Reserve Evaluation for Microgrid Controls] [19/289465] filed [Aug 4, 2025] Patent Pending