Sauman Raaj

sauman@bu.edu | +1 8576059552 | https://www.linkedin.com/in/sauman-raaj/ | Boston, MA, US| https://react-portfolio-sauman.vercel.app/

EDUCATION

Boston University, Master's in Robotics and Autonomous Systems, Boston, MA, US ***Aug 2024 - Jan 2026***
Courses: Machine Learning, Robot Learning, Embedded Systems, Computer Vision, Probabilistic Analysis

Anna University, Bachelor's in Manufacturing Engineering, Chennai, India ***Jun 2020 - Apr 2024***
Courses: CAD, Rapid Prototyping, SLAM, Python, Control Systems, Robot Kinematics, Mechatronics

Warsaw University of Technology, Certification in Modern Robotics, Warsaw, Poland ***Jun 2023 - Jul 2023***
Courses: Robotics, Robot Operating System (ROS), Autonomous Vehicles, Deep Learning, CARLA

WORK EXPERIENCE

Agency Robotics, Cambridge, MA | SOFTWARE ENGINEERING INTERN ***Jun 2025 - Present***

- Developed a modular two-layer simulator to model multi-robot parcel sortation, with zone-based routing and task assignment logic optimized for throughput.
- Designed Python-based scheduling and control APIs for testing autonomous decision-making, fault recovery, and route optimization in ambiguous, high-load environments.
- Collaborated cross-functionally to align system behavior with real warehouse constraints, contributing to an ongoing physical deployment effort.

Caterpillar Inc., Chennai, India | INTERN TRAINEE ***Jul 2022 - Aug 2022***
Led defect reduction and assembly optimization using lean methods

- Applied lean methodologies like Six Sigma, reducing assembly inefficiencies by 30% through process optimization.
- Implemented defect analysis to enhance quality control, reducing assembly errors by 50% & improving efficiency.
- Developed and implemented automation solutions using industrial robots (SCARA), resulting in a 2x increase in production efficiency and demonstrating practical application of automation principles.

PROJECTS

Graduate Researcher, Boston, MA | ***Sept 2024 - Present***
Research in integrating LLM with robot manipulators

- Developed an LLM-based control system for the Sawyer robot using GPT models to generate high-level task plans and dynamic responses.
- Integrated ROS and Intera SDK with real-time feedback loops, enabling closed-loop control across 15+ manipulation tasks.
- Reduced planning time by 30% and demonstrated reliable execution in vision-guided object manipulation using JSON-structured API calls.
- Used MoveIt and inverse kinematics to execute manipulation tasks based on LLM-generated pose targets, validating reasoning-to-action pipelines in simulation.

VLM-powered Robot manipulator **Jan 2025- Present**
Simulation of a robot arm using VLM

- Built a robotic arm simulation in Gazebo that uses vision-language models to convert images and natural language into structured action plans.
- Used camera input for object detection and pose estimation, integrated with ROS 2 and MoveIt to perform autonomous pick-and-place actions.
- Demonstrated multimodal grounding and action planning through VLM inference pipelines, validating AI-agent-style robotic control.

LocusEdge, Boston, MA | TECHNICAL LEAD ***Sept 2024 - Dec 2024***
An offline LLM-controlled mobile robot

- Fine-tuned a quantized LLaMA 3 model for offline inference and deployed it on a Jetson-based mobile robot using Whisper for speech input.
- Built a real-time ROS navigation stack triggered by natural language commands parsed via LLM, enabling autonomous navigation in indoor spaces.
- Reduced inference latency by 40% and achieved >95% command accuracy in low-power environments, simulating NeMo-like multimodal use cases.

Amphibious Robot, Chennai, India | TEAM LEAD ***Sept 2022 - Jul 2023***
Military surveillance robots capable of moving in terrestrial and water environments

- Designed and 3D-printed a lightweight chassis, reducing weight by 20% while maintaining structural integrity under varying load conditions.
- Integrated Raspberry Pi 4, IMU, and ultrasonic sensors for real-time environmental awareness and control.
- Used Python, OpenCV, and SLAM for onboard perception, and implemented image restoration techniques to improve visual clarity and reduce system latency by 35%.
- Simulated diverse mission scenarios using CARLA and Gazebo, modeling sensor noise and environmental physics for sim-to-real validation.

TECHNICAL SKILLS

Core Robotics: ROS, ROS 2, Python, C++, Sensor Integration (IMU, encoders, cameras, ultrasonic), Motion Control, Real-Time Systems, URDF, TF2, Robot Kinematics, Inverse Kinematics, **Simulation & System Design:** Gazebo, RViz, Hardware-in-the-Loop (HIL) Simulation, Multi-Robot Coordination, Autonomous Navigation, Task Scheduling, Latency Debugging, Symbolic Map Logic, **AI & Autonomy:** LLMs (GPT, LLaMA 3), Whisper, Vision-Language Models (VLM), Prompt Engineering, Action Planning, Pose Estimation, Image Restoration, Object Grounding, **Optimization & Infrastructure:** Heuristic Search, Resource Scheduling, Parcel Routing, Linear Programming, Performance Benchmarking, Real-Time Metrics Collection, **Software Systems & Deployment:** Git, Docker, Linux, NVIDIA Jetson, Embedded Inference, Python APIs, Multithreaded Simulation, Event Queuing, Modular System Architecture, **Tools & Frameworks:** MoveIt, OpenCV, TensorFlow, PyTorch, CARLA, Intera SDK, RViz, SLAM, Experiment Tracking, Data Logging & Replay