ADITHYA RAJENDRAN

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Education

Master of Science in Robotics (CS) - Northeastern University, Boston, MA   Dec 2026
Course work: Reinforcement Learning and Sequential Decision Making, Robot Sensing and Navigation, Mobile Robotics

Bachelor of Engineering in Robotics and Automation - PSG College of Technology, India   June 2023
Course work: Control Systems, Automation system designing, Vision systems, Mobile Robotics, Industrial Robotics

Technical Skills

Physical AI: SmolVLA, RL, ACT, PyTorch, TensorFlow, OpenAI Gym, Huggingface, Weights & Biases, Model Fine-Tuning.
Robotics Simulation & Control: ROS 2, MoveIt, Nav2 (AMCL, Costmaps), Gazebo, PyBullet, CARLA, URDF, PID Control, Sim2Real
Perception & Navigation: SLAM, Sensor Fusion (LiDAR/IMU/GPS), Path Planning (A*, RRT*, Waypoints), Depth & Stereo Vision
Languages & Tools: C++, Python, SolidWorks (CSWA), Linux, Git, CMake, MATLAB, TCP/IP
Hardware: SO-101 Manipulator robot, Intel NUC, Raspberry Pi, Depth Cameras.

Projects

Vision-Language Manipulation Policies (ACT, SmolVLA, SO-101 Robot– Github)   Dec 2025
- *VLA Training:* Fine-tuned SmolVLA (500M parameter Vision-Language-Action model) for language-conditioned manipulation. Iteratively improved real-world deployment success from 0% to 33% by resolving 7 critical deployment issues actively expanding generalization via mixed-dataset training.
- *Imitation Learning Pipeline:* Implemented Action Chunking Transformer (ACT)—the core policy behind Mobile Aloha—achieving 80% task success on manipulating deformable irregular object.
- *Data Collection & MLOps:* Engineered a custom data pipeline collecting 100k+ frames (241 episodes) across dual camera views. Utilized Weights & Biases for hyperparameter tuning and experiment tracking to optimize policy convergence.

Assistive Feeding Robot Simulation (Cartesian Motion planner, Moveit 2, ROS 2 – Github)   Nov 2025
- *Hybrid Manipulation Design*: Architected a ROS 2 + MoveIt2 simulation environment to validate end-to-end planning algorithms. Developed a hybrid motion pipeline combining joint-space optimization with Cartesian constraints, utilizing semantic IK seeding to ensure high-reliability solver convergence.
- *Safety & Force Control*: Implemented sensorless impedance control and force estimation algorithms to mimic compliant behavior. Engineered an automatic emergency stop system (25N threshold), achieving 0 safety violations (19.12N peak) across all evaluation runs.

RL Based Robotic Arm Trajectory Planning (RL policy – PPO, SMDP, MPC - Github)   Dec 2024
- *Deep Reinforcement Learning (RL):* Architected a hybrid Physical AI framework combining PPO (Proximal Policy Optimization) and SMDP (Semi-Markov Decision Processes) with Model Predictive Control (MPC). Successfully optimized 6-DOF trajectories for energy efficiency and smoothness.
- *Simulation Training Pipeline:* Developed modular Gym-compatible environments in PyBullet with YAML-driven configuration. Established a scalable simulation pipeline for training continuous control policies, directly transferable to high-fidelity simulators like Isaac Sim.

Path-Planning Algorithm Benchmarking (C++ & ROS - Github)   Apr 2024
- *Motion Planning Stack:* Engineered a modular motion planning library in C++ and Python, implementing high-performance sampling-based solvers (RRT, RRT*, Bi-directional RRT*) for 3D navigation.
- *Performance Analysis:* Conducted rigorous benchmarking of path smoothness, optimality, and computational latency. Validated Bi-directional RRT* as the superior solver for real-time constraints, significantly reducing search time while maintaining path quality.

Work Experience

Research Assistant | Silicon Synapsis Lab, Northeastern University   Jan 2025 - Present
- Gazebo Simulation & Validation - Engineered and validated control policies for a hybrid multi-modal robot (legged and aerial) in Gazebo simulation before physical deployment, ensuring seamless mode transitions and collision-free navigation across >600 graph nodes.
- *Motion Planning Optimization* - Accelerated robot path-planning by 40% by porting Probabilistic Roadmaps (PRM) and A* algorithms from MATLAB to optimized ROS 2 C++
- *Energy-Aware Algorithms* - Developed custom cost functions within the navigation stack to prioritize energy efficiency during trajectory generation, directly reducing onboard CPU usage and power consumption.

Research Intern | SeiAnmai Tech, IIT Delhi   Nov 2023 – Jul 2024
- *GenAI & LLM Integration (Language-to-Action):* Architected an LLM-driven agent on the edge (Raspberry Pi) using OpenAI Whisper (ASR) and ChatGPT. Optimized inference for 2x lower latency, enabling real-time natural language command execution and robot orientation control.
- *Perception & Navigation Stack*: Reduced collision incidents by 90% by implementing a LiDAR-based perception pipeline and tuning Nav2 parameters (Behavior Trees, Costmaps, AMCL) for dynamic environments.
- *Autonomous Mapping*: Developed a wavefront-frontier exploration algorithm integrated with SLAM, achieving 95% automated map coverage and eliminating the need for human-in-the-loop teleoperation.

Honors & Certifications

National Rank 2, Drone Aviation | International Aviation Games Board (BIAG)   Apr 2023
Certified SOLIDWORKS Associate (CSWA) | Mechanical Design & CAD   Oct 2021