# Aditya Potnis

Email: apotnis2@illinois.edu
LinkedIn: linkedin.com/in/adityapotnis/
Github: github.com/adipotnis Website: adipotnis.github.io
Champaign, IL

## Summary

CS & Robotics graduate student with 4.5+ years experience in robot learning, motion planning and control systems for autonomous vehicles and mobile robots. Proficient in C++, Python, ROS2. Passionate about building safe, intelligent technology at scale.

## Education

- **University of Illinois, Urbana-Champaign** — **Urbana, IL**
  *Candidate for Master of Science - Computer Science. GPA: 4.0/4.0* — Expected May 2026
  **Courses:** Humanoid Robotics, Autonomous Vehicle System Engineering, Deep Learning for Computer Vision, 3D Vision, Artificial Intelligence, Networked Internet of Things, Software Engineering

- **College of Engineering Pune** — **Pune, India**
  *Bachelor of Technology - Mechanical Engineering. CGPA: 8.01/10.0* — Aug 2018 - Jun 2022
  **Courses:** Mechanical Measurement and Automatic Control, Robotics and Automation, Engineering Mechanics, Linear Algebra, Calculus, Object Oriented Programming & Data Structures and Algorithms (Minor in Computer Engineering).

## Skills

**Programming**: C++, Python, MATLAB, ROS, ROS2 , Bash, PyTorch, Tensorflow, MS Excel

**Tools & CAD Software**: Gazebo, IsaacSim, Git, Docker, Linux, Fusion360, SolidWorks, ANSYS, Rapid Prototyping

**Core Areas**: Motion Planning, SLAM, Computer Vision, Deep Learning, Vision LLMs, Affordance Mapping, Control Theory

## Experience

**Woven by Toyota** — **Palo Alto, CA**
*Software Engineering Intern, Motion planning* — May 2025 - Aug 2025

- Identified performance metrics and developed analysis tool to compare Rapidly-Exploring Random Tree (rule-based) and Data Driven Planning methods for Trajectory Optimization Warm Start with optimal safety and comfort constraints.

**Distributed Autonomous Systems (DAS) Lab, UIUC** — **Urbana, IL**
*Research Assistant* — Aug 2024 - Present

- Training Vision Large Action Models (VLAs) for motion planning and generalized multimodal robotic navigation, including motion primitives such as jumping, walking, and non-holonomic steering.
- Prototyped heuristics for Sampling-based motion planning algorithms (RRT, RRT*) to navigate Octree based occupancy and affordance map generated by VLM-assisted behavior-driven semantic segmentation using CLIPSeg and utilized MPPI for control.
- Implemented Zero-Shot Affordance estimation and SLAM using OpenVINS for the Salto-1P Jumping Robot.

**Earthsense Inc.** — **Champaign, IL**
*Robotics Engineer* — Ju1 2022 - Aug 2024

- Led firmware development for Dual-Ackermann steering with 4-wheel torque vectoring on a 600kg payload AGV, optimizing runtime performance 20% via Eigen3::Spline interpolation over Peak CAN bus; contributed to Vision Keypoint-based row following in GPS-denied Palm Orchards.
- Migrated MPPI controller from ROS1 to ROS2, reducing CPU thread usage by 40% and message bandwidth by 30% via QoS tuning; built software-in-loop simulations in Gazebo with Docker and behavior trees, improving initialization by 10% and reducing data corruption by 30%.
- Conducted field tests across India and Malaysia; applied FMEA and DFM principles to co-design robot steering with the hardware team.

**Earthsense Inc.** — **Pune, India**
*Robotics and Autonomy System Development Intern* — Jun 2021 - Aug 2021

- Developed error diagnostic suite using ROS bag data to plot robot waypoints, navigation statistics & collision detection using Python, OpenCV and Matplotlib, reducing batch processing by 3 times (15 minutes to 5 minutes).
- Implemented automated robot performance monitoring pipeline using docker and AWS to keep track of Key Performance Indicators, reducing overall workflow analysis time by 20%.

**Bajaj Auto, Machine Tools and Robotics Dept.** — **Pune, India**
*Design Engineering Trainee (Intern)* — Jun 2019 - Jul 2019

- Optimized assembly test fixture using Siemens NX for engine cylinders, enabling 3x faster leak testing compared to manual methods; Design implemented on the production line.

## Projects

**Perceptive Locomotion in Humanoid Robots via Mixture of Experts** Oct 2025 - Dec 2025

- Worked on a Mixture of Experts based multi task RL training for humanoids using Proximal Policy Optimization. Implemented IsaacLab + RSL_RL simulation with 16% better stability metrics than baseline.
- Tested Sim2Real transfer on Unitree Go1 and G1. Conference manuscript in progress.

**Low-Rank Adaptation for Video Generation with descriptive relative pose prompts** Oct 2025 - Nov 2025

- Fine-tuned Wan 2.2 (1.3B) with LoRA to generate robot-POV navigation videos from text + motion plans (e.g., "move forward 1.6 m, turn 14° right near a brick wall") for scalable outdoor data synthesis.
- Collected a multimodal outdoor robot dataset (RGB, GPS+IMU EKF poses, motion captions) for training.
- Evaluated motion fidelity and failure modes, identifying memory artifacts and noise sensitivity; proposed hierarchical motion-primitive curriculum training to improve alignment.

**Training-free 3D Consistent Video Generation (3D Vision)** Oct 2025 - Dec 2025

- Worked on a Training-Free video diffusion with a VGGT / CUT3R loss optimization at inference time on a FlowChef style setup to enable Geometrically Accurate Video Generation.

**GhibliDream – Studio-Ghibli Stylization of Stable Diffusion (CS 444)** Jan 2025 - May 2025

- Fine-tuned StableDiffusion-2.0 for stylization with DreamBooth on curated images using a T4/A100 instance. Built a LLM-assisted (Gemini-2.0/GPT4o based) image auto-captioning workflow to generate variation of text length, tone and styles.
- Stress tested system via targeted ablation of samplers & prompt length. Reached 0.90+ CLIP-I cosine similarity on foreground characters while retaining backgrounds quality.

**Simulating parabolic trajectory jumping robots** Feb 2025 - Present

- Implemented and designed a parabolic jumping robot simulation using Gazebo to simulate Salto-1P as a point object to test indoor unstructured autonomous navigation using VLM based prompting (Gemini 2.0 and Qwen2.5).

**Robotic serial arm manipulator using Bowden cables & Mechanical multiplexing** Sep 2021 - May 2022

- Led the development of a compact, waterproof, 6-DOF Bowden cable-driven robotic arm with a novel mechanical multiplexer, enabling control of multi-jointed arms using only two stepper motors, reducing cost and size.
- Developed FK/IK control using C++ and ROS, structural analysis in ANSYS FEA and design in Fusion 360.

## Publications

**CATNAV: Cached Vision-Language Traversability for Efficient Zero-Shot Robot Navigation**
*Aditya Potnis, Francisco Affonso, Shreya Gummadi, Naveen Kumar Uppalapati, Girish Chowdhary*

- Under Review: *IROS 2026*

**Visual-Language-Guided Task Planning for Horticultural Robots**
*Jose Cuaran, Kendall Koe, Aditya Potnis, Naveen Kumar Uppalapati, Girish Chowdhary*

- Under Review: *Computers and Electronics in Agriculture*

## Honors and Awards

- Best Working Project Award (Mechanical Dept.), COEP. Provisional patent filed (IN202321006687) Aug 2022
- Team India Coach, 2018 FIRST Lego League European Championships at Tallinn, Estonia. Team stood 2nd place for Best Project Research and 4th in Overall Robot Game. Jun 2018
- Team Lead, Team India Representative in World Robot Olympiad Internationals 2017,Costa Rica (Top 15
- Team Lead, Team India Representative in World Robot Olympiad Internationals 2016,India (Top 40), Gold Medal in 2016 Nationals.
- Team Lead, Top 10 in First Lego League Open European Championship, Spain(2016)(fully sponsored by Tata Motors)

## Volunteer Experience

- **Coach & Educator, Robominds**: Developed STEM curriculum for ages 5 to 15. Taught STEM robotics courses to 200+ children across Pune city. (Mar 2017 - Jun 2024)

**Work Authorization**: U.S. Citizen