

# Ansh Bhansali

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## EDUCATION

**University of Illinois Urbana-Champaign**, IL, USA

Aug 2025 – Jul 2026

*Master of Engineering in Autonomy and Robotics* | GPA: 3.77/4.0

Coursework: Humanoids, Deep Learning, Computer Vision, Safe Autonomy, Control Systems

**Sardar Patel Institute of Technology**, Mumbai, India

Dec 2021 – Jul 2025

*Bachelor of Technology, Electronics and Telecommunication* | GPA: 3.9/4.0

## SKILLS

- Languages:** Python, C++, MATLAB, Bash
- Planning & Control:** ROS2, SLAM, MoveIt, Sensor Fusion, Motion & Path Planning, MPC, Control Barrier Functions
- Learning & Perception:** VLA, Transformers (CLIP, Whisper), Computer Vision (SAM, YOLO), PyTorch, TensorFlow, RL (PPO)
- Simulation & Tools:** Gazebo, MuJoCo, PyBullet, Isaac Sim, AI2-THOR, Git, Ubuntu, Docker, KiCad, Fusion 360

## EXPERIENCE

**Electronics Engineering Intern - Dimension Six Technologies**, Mumbai, IN

May 2024 – May 2025

*Project: STM32-based E-Bike Conversion Kit*

- Developed production-ready embedded firmware with battery optimization and regen. braking, achieving **40%** range increase.
- Designed and routed a 4-layer PCB in **KiCad** for a custom **ESC**, reducing real-time power losses by **15%** under peak load.
- Implemented IoT solution using **ESP32S3** with RFID sensor integration for remote monitoring and secure payments via MQTT.

**Robotics Research Intern - Indian Institute of Technology, Bombay**, Mumbai, IN

Jan 2024 – Jun 2024

*Project: Autonomous Rugged Robot for Military Applications*

- Developed **SLAM**-based autonomous robot, with path planning, achieving **95%** navigation accuracy in indoor environments.
- Improved localization by 20% through multi-sensor fusion (IMU, GPS, RGB-D cam) using EKF for state estimation.
- Integrated **YOLOv3** model for real-time human detection and adaptive gait controller for robust stair-climbing navigation.

## PROJECTS

**Embodied Vision-Language-Action (VLA) Kitchen Agent** (*CLIP, Whisper, GPT-4V, AI2-THOR*) ([GitHub](#))

- Built end-to-end VLA converting **YouTube** cooking videos to robot commands; generated novel Indian-cooking dataset.
- Trained **19M**-parameter Transformer, trained on 1.6k+ clips, achieving **77-85%** accuracy on unseen real-world videos.
- Attained **90%+** precision on key primitives, **60-70%** zero-shot transfer to Western cuisine, with **85-90%** success in AI2-THOR.

**Open-Vocabulary 6D Pose Estimation** (*FoundationPose, SAM-3, Moondream2*) ([Report](#))

- Developed **zero-shot** 6D tracking architecture with VLM-based **semantic inventory** and Gemini API query enrichment.
- Integrated **SAM-3** prompt segmentation with **Objaverse** mesh retrieval, achieving **76.5-100%** ADD-S AUC on YCBV dataset.
- Built RGB-D variant using **LangSAM** with **InstantMesh** and median-volume ensemble selection for mesh consistency.

**Dynamic Object Handover System** (*MuJoCo, MediaPipe, ROBOTIS AI Worker*) ([Demo](#))

- Built a vision-based system with real-time dynamic hand tracking for adaptive **human-robot handover**.
- Implemented **Jacobian-based IK** with velocity limiting and command smoothing for stable object transport.
- Integrated **MediaPipe** gesture recognition enabling the robot to mirror hand movement and trigger release.

**Pedestrian-Aware Autonomous Vehicle Safety System** (*ROS2, YOLOv11, LiDAR*) ([Demo](#))

- Fused LiDAR clustering and RGB-D detection for real-time pedestrian behavior tracking on a **GEM e4** autonomous vehicle.
- Implemented **trajectory prediction** with Time-to-Collision estimation, enabling proactive speed adaptation.
- Achieved **90%** success rate in pedestrian scenarios using a state-machine safety controller with **Stanley control**.

**Humanoid Whole-Body Motion Planning** (*RL, MPC, Unitree G1, MuJoCo*) ([Github](#))

- Implemented motion planning stack using **ZMP** preview control, A\* footstep planning, and **MPC** balance optimization
- Achieved **49%** lower energy use than PD control with MPC balance control, while remaining stable under **70-80N** perturbations.
- Integrated **RL**-based locomotion with Jacobian IK manipulation for coordinated walk-and-reach tasks, achieving **75%+** success.

**Terrain-Aware Locomotion Pipeline** (*ROS2, Gazebo, MoveIt*) ([Github](#))

- Developed a perception pipeline for a quadruped using a depth camera to generate an elevation map for terrain analysis.
- Integrated a terrain classifier with a footstep planner in **MoveIt**, successfully navigating **95%** of the tested complex terrains.
- Demonstrated a gait strategy that reduced fall rates by **50%** compared to a baseline blind-walking controller on uneven surfaces.

**RL Locomotion with Safety Layer** (*PPO, Control Barrier Functions*) ([Github](#))

- Trained a terrain-adaptive locomotion policy using **PPO** and integrated **CBF** as a real-time safety filter.
- Achieved zero-fall locomotion, with the CBF layer rejecting **99%** of unsafe actions proposed by the PPO policy.
- Maintained **90%** of the original PPO policy's traversal speed, demonstrating high efficiency with a verifiable safety guarantee.