

Sunny Deshpande

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EDUCATION

University of Illinois Urbana-Champaign

Master of Engineering in **Autonomy and Robotics** (GPA: 3.75/4.00)

Urbana-Champaign, USA

Aug 2025 - Sep 2026

- Current Coursework: Reinforcement Learning, Advanced Robotic Planning, Autonomous Vehicle Safe Autonomy, Humanoid Robotics

Singapore University of Technology and Design

Bachelor of Engineering (Engineering Product Development), **Robotics Focus, Minor in Computer Science**

Singapore, Singapore

Sep 2021 - May 2025

- SUTD Honours and Research Programme (SHARP) with Global Distinguished Scholarship

TECHNICAL SKILLS

Robot Learning: Deep Learning, Reinforcement Learning (PPO), Vision-Language-Action (VLA) / VLM integration; PyTorch, TensorFlow.

Autonomy: ML-based Robot Navigation, Autonomous Exploration, Path Planning (A*), SLAM (GMapping), Mapping/Costmaps, Trajectory Generation & Tracking, Controllers (Pure Pursuit, PID, MPC), Sensor Fusion.

Languages: Python, C++, MATLAB, Bash.

Robotics Tools: ROS 2, Nav2, TF/URDF, OpenCV, Linux, Git, Docker, CMake, RViz, Rosbag, REST, MQTT, CUDA.

Simulation: Isaac Sim / Isaac Lab, Gazebo, MuJoCo, Virtual Test Drive (VTD), Domain Randomization, Scenario Generation.

WORK EXPERIENCES

Hyundai Motor Group Innovation Centre Singapore

May 2024 - Sep 2024

Robotics Fleet Software Engineer Intern - Robotics Centre

- Overhauled **deployed** fleet communication pipeline for **logistics AMR fleet** using **REST and MQTT**, improving critical real-time reliability and latency.
- **Increased junction navigation speed by 40%** via redesigned motion planner and trajectory follower **using trajectory smoothing and pure pursuit-based controller**.
- Designed novel traffic path planner to **improve fleet routing of 200 AMRs** using congestion and time-of-arrival prediction, resulting in **10% increase in missions**.

Venti Technologies

Sep 2023 - Dec 2023

Autonomous Vehicle Simulation Engineer Intern - Planning & Control Team

- Built vehicle **dynamics-informed simulation pipelines** in Virtual Test Drive (VTD) to validate planning, control, and prediction algorithms.
- Developed scenario scripts and agent behaviors to stress-test MPC controllers, **expanding scenario coverage** involving various realistic pedestrian and puk traffic.

Agency for Science, Technology and Research

May 2019 - Aug 2019

Robotics and Artificial Intelligence Research Intern - Perception Team

- Designed **end-to-end CNN-based indoor navigation and obstacle-avoidance model (10Hz frequency)** using **stereo RGB-D and robot-goal pose input**, deployed on **Pioneer P3-DX mobile robot** with **embedded Intense PC Pro Barebone** using with **95% success rate in obstacle course**.

SELECTED PROJECTS

Maze Frontier Exploration Simultaneous Exploration and Mapping (SLAM) with Object Tracking

Sep 2024 - Dec 2024

- Implemented a **Frontier-Based exploration** algorithm integrated with **GMapping SLAM** to autonomously **map and explore** unknown maze environments.
- Developed **custom object tracking and memory** algorithm for robot to **remember unseen key landmark objects** in maze.
- Engineered a global path planner using A* search to navigate to detected frontiers while performing simultaneous object detection and tracking.

Hierarchical Multi-Agent Reinforcement Learning for Humanoid Robot Interaction

Oct 2025 - Dec 2025

- Designed a hierarchical control architecture for **Sim-Unitree G1 humanoids**, decoupling **high-level PPO** navigation policies from **low-level PPO** dynamics policies governing active 29-DOF joint actuation for locomotion.
- Engineered a **curriculum learning** schedule and height-scan state observations to train robust locomotion gaits capable of **traversing jagged, uneven terrains** in **Isaac Lab** simulations with **domain randomization**.

Vision-Language-Action Model for Language-Guided Humanoid Loco-Manipulation with Navigation

Oct 2025 - Dec 2025

- Developed a **CLIP-based Vision-Language-Action (VLA) architecture** extending **HumanVLA**, achieving **62.1% success** on unseen tasks by **jointly aligning visual and language encoders** for improved cross-modal reasoning with instruction.
- Designed a **Teacher-Student distillation** pipeline using **Behavior Cloning** and **DAgger** to compress expert RL policies, enabling successful execution of 615 long-horizon rearrangement tasks in the **HITR simulation** environment within **Isaac Lab** using a **humanoid agent with reliable navigation**.

AutoShield - Real-Time Pedestrian-Intent Prediction with Safety-Filtered Autonomous Driving

Oct 2025 - Dec 2025

- Developed **end-to-end ROS2-based** predictive autonomous driving control pipeline on **Polaris GEM e4 Autonomous Vehicle**, achieving **91% success rate** across diverse pedestrian scenarios.
- Implemented **LiDAR/RGB-D multi-sensor fusion** (0.8 distance, 0.7 direction) to power a TTC-driven decision state machine for risk-aware behavior planning.
- Integrated **YOLOv11** with **DBSCAN** clustering for pedestrian **behavior tracking** and **trajectory prediction**, enabling proactive motion planning using a **Stanley Controller** and PID-based velocity regulation, reducing emergency braking events.

C.A.R.E. - Companion Autonomous Robotic Entity Humanoid Robot

Oct 2025 - Oct 2025

- Developed **full-stack AI-powered** embodied robotics pipeline integrating a **Gemini VLM API**-driven task planner with a **ROS2 Navigation2 backend** for semantic goal navigation on **Booster K1 Humanoid Robot**, synchronizing Snap AR Spectacles **Teleop** via **WebSocket** communication architecture with **sub-100ms latency**.

Deep-Learning Visual Odometry for Autonomous Vehicles in Rain

May 2023 - Aug 2023

- Developed **DL-based Visual Odometry** models (e.g., DROID-SLAM) for **Localization** in adverse weather with **Oxford RobotCar, 4Seasons datasets**
- Built benchmarking pipeline and **co-authored paper** presented at the **2023 IEEE 19th International Conference on Automation Science and Engineering (CASE)**.