Sunny Deshpande

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EDUCATION

University of Illinois Urbana-Champaign   Urbana-Champaign, USA
Master of Engineering in **Autonomy and Robotics** (GPA: 3.75/4.00)   Aug 2025 - Sep 2026
- Current Coursework: Reinforcement Learning, Advanced Robotic Planning, Autonomous Vehicle Safe Autonomy, Humanoid Robotics

Singapore University of Technology and Design   Singapore, Singapore
Bachelor of Engineering (Engineering Product Development), **Robotics Focus, Minor in Computer Science**   Sep 2021 - May 2025
- SUTD **Honours and Research Programme** (SHARP) with Global Distinguished **Scholarship**

TECHNICAL SKILLS

Navigation & Planning: Robot Navigation, Autonomous Exploration, Global Planning (A*), Motion Planning, Trajectory Generation & Tracking, Behavior Planning, Costmaps/Occupancy Grids, Finite State Machines, Controllers (Pure Pursuit, Stanley, PID, MPC).

SLAM & Localization: SLAM (GMapping), Visual Odometry / Learning-based VO (DROID-SLAM), Mapping, Localization, Sensor Fusion (Kalman Filter), LiDAR–RGB-D Fusion.

Robotics Stack: ROS 2, Nav2 / Navigation2, TF/URDF, rosbag, RViz, Linux, Git, Docker, CMake, DDS.

Programming: Python, C++.

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

ML for Autonomy: Reinforcement Learning (PPO), Imitation Learning (Behavior Cloning, DAgger), VLM/VLA integration

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 pulk 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

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.

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**.

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)**.

Lane-Tracking and Object Detection of Outdoor Scaled 4WD Race Car   Jan 2025 - Apr 2025
- Optimized a vision-based lane perception pipeline on an NVIDIA Jetson, utilizing adaptive thresholding and radial-scan algorithms to handle variable outdoor lighting.
- Implemented a real-time lateral controller via polynomial curve fitting, achieving 45+ FPS inference and control loop rates for high-speed lane keeping.

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.**