Sunny Nitin Deshpande

+1 (217) 200 0792 | sunnydeshpande9900@gmail.com

Portfolio: sunnydeshpande.com | LinkedIn: linkedin.com/in/sunny-deshpande | GitHub: github.com/SunnyDeshpande

EDUCATION

University of Illinois Urbana-Champaign (UIUC)   Aug 2025 - Sep 2026

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

- Current Coursework: **Reinforcement Learning, Advanced Computer Vision, Autonomous Vehicle Safe Autonomy**, Humanoid Robotics

Singapore University of Technology and Design (SUTD)   Sep 2021 - May 2025

- B.Eng. (**Eng. Product Development**), **Robotics Focus, Minor in CS** | SHARP Honours, Global Distinguished Scholarship

TECHNICAL SKILLS

Robot Learning: PPO, SAC, Hierarchical/Multi-Agent RL, Curriculum Learning, Domain Randomization, Reward Shaping, **Sim-to-Real**, Imitation Learning (**BC, DAgger**), **Vision-Language-Action Models**, Vision-Language Models.

Deep Learning: PyTorch, TensorFlow, TensorRT, CUDA | CNNs, Transformers, VLMs (CLIP, Gemini, Moondream2), YOLOv11, SAM, **Teacher-Student Distillation**

Autonomy & Control: Sensor Fusion, SLAM, Motion Planning, Behavior Trees, PID, Stanley Controller, Admittance Control, Kalman Filter.

Languages & Tools: Python, C++, MATLAB | ROS/ROS2, **Isaac Lab**, **MuJoCo**, Gazebo, Docker, CMake, Git, GitHub Actions CI, Linux/Bash, CAN, DDS.

Hardware: **Unitree G1 (Sim), Booster K1**, Polaris GEM e4, Jetson Orin Nano, Ouster OS1-128 LiDAR, OAK-D Stereo.

WORK EXPERIENCES

Hyundai Motor Group Innovation Centre Singapore   May 2024 - Sep 2024

Robotics Fleet Software Engineer Intern - Robotics Centre | Singapore

- Overhauled fleet communication from REST to event-driven MQTT (QoS-1), cutting latency from **332ms to 151ms**; successfully deployed and actively running on **200+ production AMRs**.
- Replaced stop-and-wait intersection coordination with velocity-profiled trajectory blending (Bezier smoothing, adaptive-lookahead pure pursuit), increasing multi-robot intersection throughput **by 40%** via staged rollout to **200-AMR fleet**.
- Designed traffic-aware fleet path planner with corridor congestion scoring, ETA-based rerouting, and kinematic feasibility validation for constrained warehouse aisles; increased completed missions **by 10%** via staged canary deployments.
- Created custom node-based path planning emulator to evaluate traffic-based planning algorithms using C++.
- Performed fleet failure analysis via internal simulator log replay of failed missions, diagnosing trajectory tracking and coordination faults; findings fed directly into planner parameter tuning and intersection logic refinements.

Venti Technologies   Sep 2023 - Dec 2023

AV Simulation Engineer Intern - Planning & Control | Singapore

- Built physics-based simulation in VTD modeling port-specific dynamics (trailer articulation, wet-surface friction, restricted turning radii); authored 200 procedurally generated test scenarios from 50 parameterized templates, exposing MPC payload oscillation during high-speed turns.
- Supported on-site AV trial runs at port: performed system bring-up, observed live operations, and logged edge cases; pipeline adopted for regression testing.

Agency for Science, Technology and Research   May 2019 - Aug 2019

Robotics & AI Research Intern - Perception Team | Singapore (Solo Project)

- Built end-to-end CNN-based obstacle avoidance on Pioneer P3-DX: automated data collection via random waypoint patrol (saving ~80 hrs manual effort), custom ROS synchronization pipeline (36K+ samples), and 80x costmap acceleration (0.125 to 10 Hz); 95% avoidance success across 50 real-world trials.

PUBLICATIONS

Evaluating Visual Odometry Methods for Autonomous Driving in Rain – Published at CASE 2023   May 2023 - Aug 2023

- Benchmarked classical and learned VO/SLAM across 15+ rain sequences; proposed DROID-SLAM heuristic with map priors for robust long-horizon stereo localization under adverse weather.

Characterization of Focal EEG Signals: A Review - Elsevier Future Generation Computer Systems, 2019   May 2018 - Feb 2019

- Benchmarked nonlinear signal representations and CNN-LSTM models across **7,500 real-world EEG signals**; Engineered LSTM-CNN based model to predict epilepsy from EEG with **87% accuracy**.

SELECTED PROJECTS

Hierarchical Multi-Agent RL for Humanoid Robot Interaction   Oct 2025 - Dec 2025

- Designed hierarchical PPO architecture for dual Unitree G1 humanoids in Isaac Lab: **29-DOF locomotion** achieving **1.5 m/s omnidirectional walking** via **7-phase curriculum** (30M steps, 512 parallel envs) on **NVIIDA RTX 3060**.
- Engineered **25+ shaped reward terms** (gait symmetry, feet air time, contact penalties) with height-scan observations; **domain randomization across friction (+/-40%), terrain, and actuator delay (up to 30 ms)**.
- Trained goal-conditioned high-level navigation policy over frozen locomotion primitives: two agents converge from 10 m to 0.5 m target distance with **95% success** across randomized spawn configurations.

Vision-Language-Action Model for Humanoid Loco-Manipulation   Oct 2025 - Dec 2025

- Achieved **62.1% success on unseen loco-manipulation tasks** via frozen unified CLIP backbone (**+1.9% over baseline, -4.4% placement deviation**); diagnosed and resolved **catastrophic forgetting** in standard dual-encoder VLA fine-tuning.
- Designed **Teacher-Student distillation** pipeline (**BC + DAgger**) compressing expert RL policy; validated across **615 long-horizon rearrangement episodes** in Isaac Lab HITR environments.

AutoShield - Safety-Filtered Autonomous Driving on Polaris GEM e4   Oct 2025 - Dec 2025

- Owned pedestrian detection, tracking, and behavior prediction in 4-person team: built TTC-based trajectory prediction with EMA-smoothed centroid tracking and multi-modal LiDAR/RGB-D fusion (DBSCAN + YOLOv11 + ICP), gating 3-state safety FSM.
- Deployed on real vehicle with PACMod drive-by-wire and Stanley/PID control; achieved 91% pedestrian scenario success in field tests.

C.A.R.E. - Embodied AI on Booster K1 Humanoid (CalHacks 12.0)   Oct 2025 - Oct 2025

- Built embodied AI stack on **physical Booster K1 Humanoid**: **Gemini VLM**-driven semantic goal planning with ROS2 Nav2 and AR collaboration via Snap Spectacles (**sub-100 ms WebSocket latency**).

Curved Glass Cleaning Robot - Changi Airport Group   Aug 2024 - May 2025

- Led 7-person team: designed Kalman-filtered admittance controller (PD regulation < 150 N) for compliant curved glass contact; architected ROS2 stack with SMACH FSM on Jetson Orin Nano; validated in live airport deployment.