

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: **Advanced Computer Vision, AV Safe Autonomy, Reinforcement Learning, 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

Perception & Vision: 3D Object Detection, 6D Pose Estimation (**FoundationPose**), Visual Odometry (**DROID-SLAM, ORB-SLAM3**), Multi-View Geometry, **Sensor Fusion (LiDAR + RGB-D)**, Point Cloud Processing (ICP, NDT), Extrinsic Calibration.

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

Autonomy & Control: SLAM (GMapping, AMCL), Path Planning (A*), Behavior Prediction, PID, Stanley Controller, Kalman Filter, Occupancy Grids.

Languages & Tools: Python, C++, MATLAB, CUDA, OpenGL | ROS/ROS2, Isaac Lab, Gazebo, FoxGlove, Docker, CMake, Git, GitHub Actions CI, Linux/Bash, OpenCV, Nav2.

Hardware: **Ouster OS1-128 LiDAR, OAK-D Stereo**, Polaris GEM e4, Jetson Orin Nano/Xavier, **Intel RealSense, ZED2**, Hokuyo LiDAR.

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 policy (**RGB-D + goal pose to cmd_vel**) on Pioneer 3-DX: automated **36K+ samples** collection via random waypoint patrol (~40 hrs saved), custom ROS synchronization across RGB-D/odometry/planner streams, and real-time inference at **10 Hz; 95% avoidance** success across **50 real-world trials** including **sub-LiDAR-height and resolution** along with dynamic obstacles.

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

AutoShield - Safety-Filtered Autonomous Driving on Polaris GEM e4

Oct 2025 - Dec 2025

- Owned pedestrian detection, tracking, and behavior prediction in 4-person team on Polaris GEM e4: built LiDAR perception pipeline on **Ouster OS1-128** (voxelization, ground filtering, **DBSCAN, EMA-smoothed centroid tracking**, human filtering); performed **extrinsic calibration** between LiDAR and OAK-D stereo.
- Implemented RGB-D pedestrian estimation via **YOLOv11 + depth extraction + pixel-to-ego transform** with ICP alignment; fused with LiDAR using **weighted averaging (distance: 0.8/0.2, bearing: 0.3/0.7)** and Euclidean data association (0.1 s sync, 2.0 m threshold).
- Built TTC-based trajectory prediction with simulated ego rollout on GEM e4 with PACMod drive-by-wire; achieved **91% pedestrian scenario success** rate in field tests.
- Extended RGB-D pipeline with regulatory sign detection feeding high-level FSM; implemented 0.5s stale-data fail-safe triggering STOP_YIELD on sensor dropout — ensuring safety-critical behavior under intermittent perception.

Open-World Zero-Shot 6D Pose Estimation

Oct 2025 - Dec 2025

- Architected open-vocabulary 6D pose tracking pipeline extending FoundationPose: integrated **Moondream2 VLM** for semantic retrieval, **SAM-3** for instance segmentation, and **Objaverse-XL** mesh retrieval with **TripoSr** synthesis; achieved **88.31% ADD-S** across **44 YCB-Video sequences**.
- Implemented Gemini VLM relabeling loop to correct semantic drift during long-horizon tracking; diagnosed SAM-3 as primary zero-shot bottleneck through **systematic ablation**.

Vision-Based Lane Tracking for Outdoor Autonomous RC Car

Aug 2024 - May 2025

- Developed adaptive lane perception on Jetson Xavier with ZED2 stereo: Gaussian-weighted thresholding and **vanishing-point radial-scan** for variable lighting; sliding-window polynomial fitting; full autonomous laps across **6 lighting conditions**.

Autonomous Underwater Vehicle - SUTD SOAR, Software Lead

Sep 2022 - Apr 2024

- Architected cascaded PID control loop for 6-DOF underwater stability, fusing depth sensor and IMU via state-space control on embedded system; led integration of real-time CV nodes for autonomous target acquisition under low-visibility conditions; Enabled AUV to perform **vision-object based navigation underwater**.