Pradnya Sushil Shinde

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EDUCATION

Worcester Polytechnic Institute **Aug 2023 - May 2025**

*Master of Science in Robotics Engineering (**GPA: 4.0/4.0**)* *Worcester, MA*

Relevant Coursework: Computer Vision, Vision-based Robotic Manipulation, Motion Planning, Advanced Robot Navigation

Symbiosis Skills and Professional University **Aug 2019 - May 2023**

*Bachelor of Technology in Mechatronics Engineering (**GPA: 9.128/10.0**)* *Pune, India*

SKILLS

Languages: Python, C++, C

Libraries, Tools, and Software: Linux OS, ROS, ROS (2), Nav2, Gazebo, RViz, Blender, OpenCV, PCL, SLAM Toolbox, NumPy, Matplotlib, Sklearn, PyTorch, Eigen, CUDA, Git, Docker, CMake, Arduino, MATLAB, Visual Basic for Application, Solidworks, Jira, Confluence.

Hardware: Arduino, ESP32, ESP8266, Raspberry Pi, LiDAR

EXPERIENCE

Software Engineer I, Robotics **Jun 2025 - Present**

Nightingale Intelligent Systems *Newark, CA*

- Contribute to an aerial vehicle software stack, implementing new autonomy features and improving system performance, reliability, and runtime behavior through simulation-driven development.
- Build and maintain a UAV simulation and testing framework from the ground up using ROS and Gazebo, enabling safe validation of autonomy logic before flight testing.

Robotics Software Engineer Intern **Jan 2025 - April 2025**

Nightingale Security *Newark, CA*

- Optimized UAV path planning by implementing and tuning a **Multi-Heuristic A*** algorithm, improving route efficiency and planner robustness.
- Developed and integrated a simulation **Docker** environment to test UAV functionalities using **ROS** and **Gazebo**.

Graduate Student Researcher **Aug 2024 - Present**

Worcester Polytechnic Institute *Remote*

- Analyzed distributed **SLAM** techniques for agricultural robotics using Kimera, an open-source library for real-time metric-semantic localization and mapping.
- Designed and built a data acquisition pipeline to evaluate the library's applicability and performance in agricultural environments.

Robotics Software Engineer Intern **Aug 2024 - Dec 2024**

Celltrio Inc. *Fremont, CA*

- Conducted motion analysis of a **7-axis SCARA** robot to accommodate tool transform functionality for precise end-effector manipulation.
- Integrated software fixes to enhance the performance and efficiency of robotic tasks, streamlining overall system functionality.

Robotics Software Engineer Intern **May 2024 - August 2024**

National Robotics Engineering Center *Pittsburgh, PA*

- Deployed a localization and mapping pipeline for a warehouse mobile manipulator, integrating perception and navigation components.
- Performed **unit testing** and **hardware-in-the-loop** validation to ensure robust performance of the robotic sub-systems.

Robotics Engineer Intern **June 2022 - May 2023**

Technodune Pvt. Ltd. *Pune, IN*

- Led software testing and embedded systems integration for the "**Wirelessly Controlled Bionic Arm**" and "**Real-Time Robot Localization using Vision**" projects using **Python** and **C/C++**.
- Contributed to developing: A 7DOF robotic manipulator with wireless gesture control and web interface; A real-time robot localization platform with Fiducial markers and Yolo V5, achieving **85**% accuracy in robot pose detection.

PROJECTS

Einstein Vision: A Perception Pipeline for Autonomous Vehicles GitHub | Python **April 2024**

- Integrated lane detection, pedestrian pose estimation, road sign recognition, depth estimation, object detection, and scene classification into a unified perception stack, enabling seamless environmental visualization for an autonomous vehicle.

Motion and Trajectory Tracking of Aerial Vehicle GitHub | Python **March 2024**

- Implemented state estimation and global positioning algorithms such as **EKF**, **UKF**, **Particle Filter** and **GNSS/INS** to track the motion of an aerial vehicle effectively.

SfM: Structure from Motion GitHub | Python **March 2024**

- Engineered a robust a Structure from Motion (SfM) system to reconstruct 3D scenes and estimate camera poses from a monocular camera using images from multiple viewpoints.

3D Scene Reconstruction using NeRF GitHub | Python **March 2024**

- Developed a **NeRF**-based 3D scene reconstruction pipeline using a 5D coordinate system and **MLP** to optimize scene rendering from 2D images, and applied differentiable rendering to minimize residuals between synthesized and ground truth images.

Zhang's Camera Calibration: Optimizing Distortion Correction GitHub | Python **Feb 2024**

- Computed camera Intrinsic and Extrinsic Parameters by minimizing image distortion and reprojection error to perform Zhang's **Camera Calibration** method on checkerboard images.

Homography Estimation:Classical and Deep Leaning Methods GitHub | Python **Jan 2024**

- Designed a panorama stitching algorithm with corner detection, ANMS, feature matching, and **RANSAC**; trained CNN with TensorDLT and STN to predict homography, achieving $\mathbf{3.5 - 5.0}\%$ RMSE.

Probability-based Edge Detection: A Classical Approach to Boundary Detection GitHub | Python **Jan 2024**

- Developed a probability-based edge detection algorithm using filter banks, half-disc masks, k-means clustering for texture, brightness, and color features, and integrated with Sobel and Canny baselines for enhanced boundary detection.

Language Embodied Indoor Navigation GitHub | Python **Dec 2023**

- Deployed an Object Navigation system enabling robots to interpret spoken language for goal identification and navigate using **RRT*** and **A*** algorithms in the Habitat Simulation Environment, retrieving RGB, depth, and semantic data for sensory feedback.

Rigid Body Motion Planning GitHub | Python **Oct 2023**

- Developed and optimized **RRT**, **RRT***, **Informed RRT***, and **Probabilistic Roadmap**(PRM) based path planners tailored to a point robot, a 2D omnidirectional robot, and a 4-link kinematic chain.

Vision-based Object Grasping for Robotic Manipulation assuming Symmetry GitHub | C++ **Oct 2023**

- Engineered a vision-based grasp pose analysis algorithm for robotic manipulation by processing depth point clouds, estimating symmetry for grasp point computation, using **Gazebo** and **ROS 2** for simulation.

PUBLICATION

Paper Title: "Marathi Sign Language Hand Gesture Recognition Using Accelerometer and 3D Printed Gloves" Paper
Status: Published in 2022 14th International Conference on Computational Intelligence and Communication Networks (CICN)
Publication Date: January 13, 2023