Kshitij Sharma

Robotics Software Engineer

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in **LinkedIn**   ○ **GitHub**   Portfolio

Profile Summary

Seasoned Robotics Software Engineer with 4+ years in C++ and Python, specializing in ROS/ROS2 based autonomy. Expert in motion planning, perception pipelines, and multi-robot frameworks. Master's in Robotics Engineering from WPI, adept at delivering high-performance, modular software and real-time visualization tools.

Work Experience

C++ Software Developer, *Path Robotics (Contract)*   **OH, USA** *Mar 2025 – May 2025*
- Refactored legacy C++ code and designed a resource management system using modern C++ to enable multi-arm welding, scaling from a single-arm 6-DOF robot to a four-arm 6-DOF cell, while allocating and synchronizing resources across robots.
- Built robust test infrastructure using GTest and GMock for reliable robot controller testing and leveraged MoveIt and ROS1 for motion planning, robot state management, and planning interface access in autonomous multi-robot systems.

Robotics Software Quality Engineer, *Berkshire Grey (Contract)*   **MA, USA** *Jul 2024 – Mar 2025*
- Developed Python-based automation tools for the Cubiscan 325 machine, used by SQA team, reducing warehouse management time by 70%.
- Collaborated with cross-functional teams to assess and enhance robotic motion planning and perception algorithms, boosting system throughput upto 98%.

Robotics Engineer Intern, *Void Robotics*   **FL, USA** *Sep 2023 – Jun 2024*
- Designed and tested C++ software modules using GTest in a Linux environment, improving autonomous mobile robot functionality with ROS2's Nav2 integration and supporting team collaboration through Git in a CI/CD pipeline.
- Engineered a dual EKF setup that integrates high precision data streams of RTK GPS, Zed2 camera-based visual odometry, and IMU, utilizing modern C++ and ROS2 to improve localization accuracy for autonomous systems.

Research Assistant, *MER Lab, Robotics Engineering Department, WPI*   **MA, USA** *Aug 2022 – Dec 2022*
- Implemented vision-based grasp detection algorithms (GGCNN, ResNet50) using deep learning within the ROS1 framework and integrated these algorithms with a 7-DOF Franka Panda manipulator arm equipped with a real-sense RGBD camera on the end-effector for robust grasp planning and execution.
- Enhanced a benchmarking pipeline with a novel evaluation metric to assess and compare grasp algorithms on the 7-DoF Franka Panda Robot in real-world tests and ROS Gazebo simulations.

Team Lead, Design Engineer, *Nagarro Software*   **Haryana, India** *Aug 2014 – Jan 2017*
- Developed an MVP utilizing a 6-DOF robot arm with a camera end-effector for inspecting car chassis on a rotating platform, using C++ and Python for precise automation and high-accuracy defect detection in automotive manufacturing processes.
- Designed and implemented IoT systems for smart homes, integrating PIR, ultrasonic, infrared, and thermostat sensors.

Research Design Engineer, *Automation Systems and Solution*   **New Delhi, India** *Jan 2017 – Jun 2021*
- Developed an automated defect detection system for conveyor belts using Cognex Vision Systems, OpenCV, C++, and Python, enhancing quality control and reducing errors by 40%.
- Designed an automated product sorting system for 1D and 2D barcodes integrated with electric actuators using C++ and Python, boosting sorting efficiency by 60%.

Projects

3D Scene Reconstruction *NeRF SfM*
- Built an end-to-end SfM pipeline (SIFT, RANSAC, fundamental/essential matrices, pose estimation, triangulation, PnP, bundle adjustment) to reconstruct 3D scenes from 2D images.
- Implemented NeRF on synthetic LEGO data to optimize volumetric scene models for photorealistic novel-view synthesis.

One-Shot Object Detection *GitHub Video*
- Trained YOLOv5n, YOLOv5s, YOLOv5m, YOLOv5l variants on a custom basketball image dataset, comparing performance across multiple train–test splits.
- Achieved more than 85% average precision with YOLOv5n on multi-object, ambient-background basketball video.

Face Recognition/Verification Using Siamese Network *GitHub*
- Developed an end-to-end face recognition system using the Siamese Network in TensorFlow and achieved at least 85% accuracy.
- Implemented Google's FaceNet and a pre-trained random forest classification to compare accuracy with the results achieved with the Siamese Network.

Urban Scene Reconstruction — (Semantic Segmentation and ICP)
- Designed a robust pipeline to align LiDAR point clouds using ICP and integrate RGB camera data with semantic segmentation for accurate 3D urban reconstructions.
- Enhanced 3D point clouds with semantic labels, significantly improving object recognition and scene understanding in complex environments.

AutoCalib (Camera Autocalibration)
- Applied Z. Zhang's camera autocalibration technique enhanced with non-linear optimization algorithms to achieve high-precision intrinsic parameter estimation.

Autonomous Crown Preparation *GitHub*
- Modeled a 6-DOF arm, utilizing MATLAB's Robotics Toolbox, and generated waypoints around a tooth, using Solidworks.
- Applied a bi-directional RRT algorithm on generated waypoints after resolving inverse kinematics along with an advanced clearance algorithm to simulate a collision-free crowning procedure.

Autonomous Parallel Parking *GitHub*
- Engineered a C++ Hybrid A* planner node in ROS 2 combining an 8-connected flood-fill heuristic, sub-step motion-primitive collision checks, and Reeds–Shepp smoothing—to compute smooth, collision-free non-holonomic parking maneuvers.
- Built Python tools for on-the-fly environment publishing and real-time matplotlib visualization/animation of the planned trajectory.

Multi-Robot Path Planning in a Dynamic Environment *Presentation*
- Developed a synchronous system for 3 mobile robots using multi-processing for a restaurant service model, comparing A*, D*, LPA*, D* Lite, Sampling-Based A*, and Informed RRT* algorithms with collision testing and path optimization.

Joint Space Control of SCARA Robot *GitHub*
- Designed a PID controller for a 3-DOF SCARA robot in Gazebo and implemented cubic polynomial interpolation for precise trajectory tracking and stability analysis.
- Developed an LQR-based verification module by solving the Riccati equation, comparing its robustness and energy efficiency with PID control.

Sliding Mode Controller for UAV *GitHub*
- Developed and validated a boundary-based sliding mode control law in Gazebo simulations, ensuring robust trajectory tracking for a UAV under various simulated disturbances and conditions.

Autonomous Vehicle Control and State Estimation
- Utilized Model Predictive Control (MPC) to guide the vehicle along a predefined racetrack using preset waypoints.
- Implemented the Error State Extended Kalman Filter for accurate vehicle localization within the CARLA environment

Skills

Languages and Platforms: C++, Python, Linux, Git, ROS2, Docker, JIRA
Libraries and Frameworks: Nav2, MoveIt, OMPL, Eigen, OpenCV, PyTorch, TensorFlow, GTest, GMock
Expertise: Path Planning, Sensor Fusion, SLAM, Controls, 3D Reconstruction, System Design

Education

Worcester Polytechnic Institute, USA — Masters in Robotics Engineering — GPA: 3.9   Aug 2021 - May 2023
- **Coursework:** Motion Planning, Sensor Fusion, Robot Localization, Robot Dynamics, Robot Perception

I.T.S. Engineering College, India — Bachelors in Mechanical Engineering — GPA: 3.3   Aug 2010 - Jun 2014

Certifications

Deep Learning by DeepLearning.AI on Coursera *Certificate*
- Courses — Neural Networks and Deep Learning, Structuring Machine Learning Projects, Convolutional Neural Networks, Sequence Models, Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization

Machine Learning Course by Stanford University on Coursera *Certificate*