

Smit Dumore

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EDUCATION

University of Maryland, College Park, Masters in Robotics (GPA 4.0/4.0) 08/2022 – 05/2024 | USA
Control of Mobile Robots, Perception for Robotics, Machine learning, Planning for Robotics.

Vishwakarma Institute of Technology, 2017 – 2021 | India
BTech. Mechanical Engineering (GPA 8.48/10.0)

PROFESSIONAL EXPERIENCE

Robotics Software Intern, Onward Robotics 07/2024 – present | Pittsburgh, USA
• Prototyped localization algorithms and conducted trade studies on state estimation methods (Extended Kalman Filter, particle filter).
• Evaluated current state estimation methodologies to enhance system design standards.

Volunteer Open Source Developer, ROS/Nav2 11/2023 – present | Remote, USA
• Collaborating with **Steve Macenski** to enhance **ROS Nav2** functionalities.
• Designing a loopback simulator for ROS2, simplifying Gazebo for streamlined high-level behavioral testing.
• Utilized **Git** for version control, conducted unit testing, integrated code, and leveraged **CI/CD** practices to automate testing.

Robotics Software Engineer, Botysnc 07/2021 – 06/2022 | India
• Developed a **Hyper Accurate Docking Algorithm** for an AMR (Autonomous Mobile Robot) for autonomous recharging using 2D LiDAR in C++14. Experimented with **Iterative Closest Point** scan matching and reflective tape based docking. The docking accuracy obtained was $\pm 2\text{cm}$. (video)
• Worked on Landmark based **Extended Kalman Filter** for localization of AMR in long corridors. Obtained RMSE of 0.2m and 5 degrees.
• Successfully tuned and tested custom **Navigation Stack** for lifting and tugging applications up to 2 tonnes in various industrial sites.
• Collaborated within an **agile** team to develop a scalable and readable **perception stack**.

PROJECTS

Autonomous Racing Planning and Control stack, 03/2022
Vishwakarma Institute of Technology, Pune, India
• Implemented real-time **RRT and RRT*** path planning algorithms using C++11 for local planning in a head-to-head autonomous racing car. Implemented optimization technique using **Kd-Tree** to improve the algorithm's performance (github)
• Implemented a **Pure Pursuit** local planner for the vehicle to follow a global path on the racetrack.
• Implemented a **Model Predictive Controller (MPC)** to find optimal control inputs for trajectory tracking and obstacle avoidance. (github)
• Used **OSQP** library to obtain a solve time of **30ms** on a Nvidia Jetson NX for a linear MPC subject to linear constraints and a quadratic cost function.

Stereo Visual SLAM for Autonomous Driving, 06/2023 – present
University of Maryland, College Park. (github)
• Successfully implemented Stereo Visual SLAM to estimate globally consistent vehicle trajectory and build a sparse 3D map of the environment.
• Utilized **GFTT** algorithm for feature detection, **Triangulation** for 3D keypoint determination
• Implemented **Lucas Kanade** optical flow techniques for feature tracking.
• Utilized the **g2o** library for **Graph Optimization**, implementing **Bundle Adjustment** as a backend technique to obtain refined camera poses and 3D mapping.

YOLO From Scratch, University of Maryland, College Park. (github) 09/2023 – present
• Developed a custom implementation of the YOLO v1 (**You Only Look Once**) object detection.
• Implemented single-pass object detection and regression-based bounding box prediction using **Convolution Neural Networks (CNN)**.
• Utilized YOLO architecture with grid cells and anchor boxes for object detection.
• Calculated **Mean Average Precision (mAP)** to assess model accuracy across object classes.

RESEARCH EXPERIENCE

Semantic SLAM with LLM Integration, 02/2024 – present | College Park, MD
University of Maryland, College Park
• Implementing **Semantic SLAM** algorithms on a TurtleBot to enable real-time semantic mapping and navigation in indoor environments.
• Integrating **Large Language Models (LLMs)** into the SLAM pipeline to enhance environment understanding and navigation capabilities.