

# Smit Dumore

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## EDUCATION

**University of Maryland, College Park,** 08/2022 – Expected ( 05/2024)  
*Masters in Robotics (GPA 4.0/4.0)*  
College Park, MD  
Control of Mobile Robots, State Estimation and Visual Odometry, Machine learning.

**Vishwakarma Institute of Technology, Pune, India,** 2017 – 2021 | India  
*BTech. Mechanical Engineering (GPA 8.48/10.0)*  
Machine Design, Mechatronics, Kinematics of Mechanisms, Differential Equations.

## PROFESSIONAL EXPERIENCE

**Robotics Software Engineer, Botysnc** 07/2021 – 06/2022 | India  
• Developed a **Hyper Accurate Docking Algorithm** for an AMR (Autonomous Mobile Robot) for autonomous recharging 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 localisation 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 upto 2 tonnes in various industrial sites.  
• Developed a Teleoperator package in **C++** for controlling an AMR with a joystick.

## 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** for a linear MPC subject to linear constraints and a quadratic cost function.

**Stereo Visual SLAM, University of Maryland, College Park.** ([github](#)) 06/2023 – present  
• Successfully implemented Stereo Visual SLAM to estimate globally consistent camera trajectory and build a sparse 3D map of the environment.  
• Utilized **GFTT** algorithm for feature detection accurate feature identification across frames.  
• Employed **triangulation** to accurately determine the 3D positions of keypoints.  
• Implemented **Lucas Kanade** optical flow techniques for feature tracking.  
• Performed **Bundle Adjustment** as a backend optimization technique, to refine the camera poses and 3D feature locations.

**Reinforcement Learning Pacman Agent,** 01/2023  
*University of Maryland, College Park.* ([github](#))  
• Implemented a **BFS**, **Best first Search**, **Astar**, **Dijkstra** path finding algorithm to search Ghosts in a Pacman environment.  
• Modelled the Pacman environment as a **MDP** (Markov decision processes) and used Value Iteration to maximise score of Pacman against stochastic and adversarial ghosts.  
• Used Q-learning to learn optimal actions in a state to maximise Pacman score.

**Dynamic Window Approach Local Planner,** 10/2022  
*University of Maryland, College Park.* ([github](#))  
• Developed a kino-dynamic local planner for a turtlebot using the Dynamic Window Approach.  
• Planner is capable of dodging **dynamic obstacles**.  
• Planner generates paths that are **kinematically feasible** and locally optimal.

## SKILLS

### Programming Languages

C++11/14/17, Python, MATLAB, Julia

### Tools

ROS, OpenCV, PCL, Rviz, Gazebo, pytorch