# 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 ±2cm. **(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 **Pure Pursuit** to follow waypoints on the racetrack.
- Developed a **Model Predictive Controller** based racing strategy for better path following and obstacle avoidance performance. *(github)*
- Utilised multi-lane switching and opponent motion prediction for **safely overtaking** the opponent.

**Stereo Visual SLAM,** *University of Maryland, College Park* 06/2023 – present
- Successfully implemented Stereo Visual SLAM to estimate the 3D locations of keypoints in stereo images.
- Utilized **GFTT** algorithm for feature detection accurate feature identification across frames.
- Employed **triangulation** to accurately determine the 3D positions of keypoints
- Implemented direct method and optical flow techniques for pose estimation and 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*
- Implemented a **BFS , Best first Search, Astar, Dijkstra** path finding algorithm to search Ghosts in a Pacman environment. (github)
- Modelled the Pacman environment as a **MDP** (Markov decesion 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*
- Developed a kino-dynamic local planner for a turtlebot using the Dynamic Window Approach. (github)
- 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*