# Tanmay Dhasade

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## EDUCATION

**Worcester Polytechnic Institute** **08 2021 – 05 2023**
*MS in Robotics Engineering* - ***GPA - 4.0*** *Worcester, USA*

**K J Somaiya College of Engineering** **06 2017 – 05 2021**
*B.Tech in Mechanical Engineering* - ***GPA - 3.45*** *Mumbai, India*

## EXPERIENCE

**Berkshire Grey via VueData** **12 2023 – Present**
*SQA Engineer - Contract* *Bedford, USA*

- Assisting the SQA team with daily BAT testing, writing test case to evaluate different features of a system and provide support with testing on the System.

**Robots in Service of the Environment(RSE)** **06 2023 – 05 2024**
*Robotics Software Engineer Intern* *Bedford, USA*

- Led the migration of software packages to ROS2, achieving a notable 40% reduction in computing power. Additionally, engineered a specialized Linux-to-ARM deployment pipeline tailored for Raspberry Pi4.
- Managed collected dataset for training YOLOv7 and Deep SORT for Lionfish detection and tracking in marine coral regions achieving an 80% detection accuracy at 30 fps tracking inference on the robot.
- Contributed to the development of the PyQt5 GUI, delving into concurrency techniques like threading and asyncio to enhance software performance and address bottlenecks.
- Providing software support for the stack, resolving issues and integrating updates and software releases.

**Vision, Intelligence, and System Laboratory (VIS Lab) WPI** **01 2023 – 05 2023**
*Graduate Researcher* *Worcester, USA*

- Investigated dense depth prediction networks from sparse depth inputs and proposed a custom Network.
- Utilized Sparse Convolution with different dilation rates to reduce parameter size for online applications.
- Proposed a custom fused network comprising PENET and DPT transformer as an alternative backbone to U-net and was able to detect better local features around thin structures.

**Human-Inspired Robotics Lab (HIRO Lab) WPI** **08 2022 – 12 2022**
*Graduate Researcher* *Worcester, USA*

- Implemented $D^*$ lite algorithm for navigation and SRRT algorithm for manipulation, effectively utilizing Intel RealSense camera for object detection and grasping using PCL.
- Developed motion simulation for the Mobile PX100 manipulator using ROS and MoveIt to grasp objects using a parallel gripper, and packaged the system in a Docker container.
- Experimented the application of Deep Reinforcement Learning for autonomous navigation, starting with Q-learning and gradually introducing more advanced models like the actor-critic model. Trained an A2C model using TensorFlow on Gazebo for end-to-end planning with just vision input.

**Ubicept INC** **05 2022 – 08 2022**
*Robotics Software Engineer Intern* *Boston, USA*

- Highlighted the superior performance of proprietary SPAD sensor camera technology against CMOS sensors in Visual SLAM tasks, achieving a 90% trajectory tracking accuracy and outperforming other cameras by regaining tracking in 40% of the KITTI Dataset and simulated scenarios created in Unity for offroad vehicles.
- Created a comprehensive testing and benchmarking setup to compare the performance of SPAD cameras against other navigation cameras, and developed a camera calibration system for monocular and mono-inertial calibration to minimize the overall setup time and deployed in a Docker Container.
- Tested the deployed calibration system on Turtlebot3 using Jetson Nano.

**Team KJSCE Robocon** **05 2018 – 02 2021**
*Mechanical Team Lead* *Mumbai, INDIA*

- Designed and led the fabrication of Quadruped robots and rugby-playing robots, winning the Best Design award in ABU Robocon 2020 and All India Rank 5 in 2019.
- Collaborated with IIT-Bombay-based startup to design a prototype to detect sleep apnea among infants, impacting 13% of the population.
- Conducted interactive robotics workshops for 40+ college freshmen.
- Engaged industry experts for team funding through sponsorships and organized knowledge transfer seminars.

## TECHNICAL SKILLS

**Languages and Tools:** C, C++, Python, CMAKE, ROS, ROS2, MATLAB, RViz, Gazebo, Git, JIRA, Docker
**Libraries and Frameworks** Eigen, Boost, OpenCV, Pytorch, Tensorflow, TensorRT

## PROJECTS

**LionFish Localization on Collected Dataset** | Python, Pytorch, OpenCv, YOLO, DeepSORT **01 2024**
- Curated a dataset and corresponding labels in the YOLO format. Trained on YOLO-NAS and YOLOv8.
- Achieved 0.945mAP detection accuracy over 90%IOU to achieve realtime performance at 15fps.

**Custom Object Localization using Synthetic Data** | Python, Open3d, OpenCv, PyTorch **08 2023**
- Generated a pipeline to create a custom data-set in multiple orientations and distances from the camera given an object and save its 3D Bounding box in 7-point encoding and projected encoding similar to KITTI.
- Achieved 83% prediction accuracy by training a custom architecture in two phases: initial CenterNet-based detection and subsequent MonoDepth Network fine-tuning for improved depth perception and localization

**Navigation Stack** | C++, Python, CMake, ROS 2, Rviz, Git **05 2023**
- Implemented a motion planning module capable of generating state lattices, and a customised cost function to facilitate trajectory pruning of minimal jerk trajectories over 10-20 meters.
- Collaborated with a team of 3 to maintain and adhere to developing production-level C++ code and ROS2 best practices, while following an agile development cycle.

**Probabilistic boundary detection** | OpenCV, Python, Git, Numpy, CUDA **01 2023**
- Developed a boundary detection algorithm that uses probabilistic methods to analyze brightness, color, and texture information across 3-6 scales.
- Employed 3 filter banks, including Oriented Derivative of Gaussian (DoG), Leung-Malik Filters, and Gabor Filters, in numpy to build the perception stack.
- Obtained superior results with reduced false positives as compared to Canny and Sobel by testing on Berkeley Segmentation Dataset 500.

**End-to-End Reinforcement Learning for Navigation** | Python, Gazebo, Tensorflow **11 2022**
- Achieved 80% success rate using PPO and A2C networks for a goal-biased obstacle-avoiding agent.
- Reduced training time by 50% by incorporating Imitation and Inverse Reinforcement Learning.
- Deployed the agent on turtlebot3 in static-environment.

**Motion Forecasting for Agent vehicles** | Tensorflow, Cuda, Python, Git **05 2022**
- Conducted a comparative analysis of motion forecasting architectures, comprising custom VGG16 and Xception nets, and pre-trained networks like RESNET and INCEPTION.
- Achieved up to 95.7% estimation accuracy up to 150m on Lyft level5 dataset.

**Semantic Mapping on Lidar Data** | Pytorch, OpenCV, Python, Git **04 2022**
- Performed semantic segmentation using DeepLabV3+ neural network on raw point cloud input and the RGB image of the scene.
- Reprojected information from the image to the corresponding LIDAR points using camera intrinsic and extrinsic parameters.
- Generated semantic point clouds on the KITTI 360 dataset.

**3D Reconstruction using Stereo Images** | OpenCV, Python,Open3d,Numpy,Scipy **11 2021**
- Implemented 3D Reconstruction from stereo input using OpenCV stereo library on CO3D dataset and achieved a 78% accuracy.
- Utilized RANSAC and ICP techniques for extracting object point clouds.

**Motion Planning for Autonomous Parking** | Python, Pygame **12 2021**
- Implemented hybrid-A* with kinematic constraints for a di-wheel robot, unicycle model, Ackerman-steering, and car with a trailer.
- Performed trajectory optimization using gradient descent and using Dubin's curves.

**Turtlebot3 Localization and SLAM** | C++, OpenCV, Python, ROS, Gazebo **07 2021**
- Assessed Kalman filters and Monte Carlo Localization for global cost map generation in Gazebo.
- Deployed RTAB-Map on Turtlebot for 2D and 3D mapping, achieving 84% accuracy.

**Autonomous Wound Care** | OpenCv, Python, MoveIt, ROS, Gazebo **04 2021**
- Webscraped to collect wound dataset and trained a classifier network with a testing accuracy of 83% .
- Utilized data augmentation techniques to deal with lack of qualitative data and achieved a average 80% detection accuracy across 4 class of wounds.