PRATIK BHUJBAL

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Education

- **University of Maryland** — College Park, MD
  M.Eng. Robotics — *Aug 2021 - May 2023 (expected)*
  Courses: *Statistical Pattern Recognition, Deep Reinforcement Learning, Perception, Planning, and Controls for Robotics, Software Development.*
- **SRM Institute of Science and Technology** — Tamil Nadu, India
  Bachelor of Technology, Mechatronics — *July 2016 - June 2020*
  Courses: *Mechatronics Laboratory, Mobile Robotics, Data Structures and soft computing, Machine Vision and Image Processing, System dynamics, Probability and Statistics, Industrial Automation.*

Skills

- **Languages:** C++, Python, C, Bash, UML.
- **Tools/Libraries:** ROS, ROS2, OpenCV, TensorFlow, PyTorch, Keras, PCL, Matlab, CUDA, Gazebo, Git, Boost, GTest, Pytest, Unit test, CMake, CI/CD.
- **Platforms:** Linux, Jetson Nano, Jetson TX2, Raspberry, Arduino, AWS, Docker.
- **Domain Skills:** Path Planning, Motion Planning, Computer Vision, Deep Learning, Machine Learning, Mapping, Motion Control, Localization, and State Estimation.

Experience

- **Inception Robotics** — Jan 2023 - Present
  Robotics Software Intern — *College Park, MD*
  - Developed custom path planner for **socially-compliant** and safe navigation in dense crowd environments, integrating **human position estimation**.
  - Utilized **probabilistic cost** functions and **Kalman filters** for accurate human position estimation, ensuring efficient and non-disruptive robot navigation.
- **TRC Robotics** — Jun 2022 - Dec 2022
  Robotics Navigation Development Intern — *Milpitas, California*
  - Implemented Navigation stack using **behavior tree** to specify complex robot behaviors for a restaurant application.
  - Developed a custom **local planner** plugin in C++ and integrated it with move_base, supports holonomic and differential robots.
  - Developed a **grafana plugin** that uploads the robot's 3D world and loads it into Gazebo/GzWeb, which is also used to control it with a manual override and to schedule a job.
  - Created unit tests using gtest and rostest.
- **Gamma Lab** — May 2022 - Jun 2022
  Graduate Research Assistant — *University of Maryland, MD*
  - Implemented a nonlinear **state estimator** (**Extended Kalman Filter**) for a mobile robot fusing IMU, Visual Odometry, and Wheel Odometry.
  - Implemented outdoor waypoint navigation on husky using RTK GPS and the RL nav sat transform was used to create an outdoor GPS waypoint following, both with and without integration of other mapping methods.
- **Drishti Works** — Oct 2020- Jun 2021
  Robotics Software Engineer — *Mumbai, India*
  - Designed the **Diagnostics system** using ROS diagnostic package.
  - Implemented navigation system using ROS Navigation Stack.
  - Worked on **AWS CloudWatch metrics and logger** and created scripts for **custom metric** messages and logs.

Projects

- **Socially-aware-navigation (TensorFlow, Python, ROS):** Human **pose estimation** using deep learning method (an architecture similar to that of **VGG16**) for predictive pose estimation using **Kalman filter** and utilizing these predictions for **socially aware navigation**. GitHub
- **Hand-written Digits Recognition and Transfer Learning (TensorFlow, Python):** Implemented **Logistic regression** (from scratch), **SVMs**, and **Lenet-5** architecture for digits recognition and Fine-Grain Image Classification using **transfer learning** (**ResNet v2 50** architecture). GitHub
- **Face Recognition (Tensorflow, Python):** Implemented **Bayes'**, **k-NN**, **Kernel SVM**, and **AdaBoost** classifiers with **PCA** and **MDA dimensionality reduction** techniques from scratch to identify subject label and facial expressions. GitHub
- **PRM-Blended-Potential-Field-Path-Planning (PRM, APF, C++, ROS):** Developed **Probabilistic Road Map** mixed with **Artificial Potential Field** Path Planning algorithm to ensure a high density of sampling points around the obstacles by implementing a regional sampling strategy. GitHub
- **Lane detection for self-driving cars (OpenCV, Python):** Detected lanes using a curve fitting approach and estimated road curvature and predicted the turn based on it for **self-driving cars**. GitHub
- **Depth Estimation Using Stereo Cameras(OpenCV, Python):** Pixel-wise depth estimation using a stereo camera, depth is determined by using the concept of **triangulation** and **stereo matching**. GitHub
- **Robot Path Planning(C++, Python):** Implemented **BFS**, **DFS**, **Dijkstra**, **A***, **PRM**, and **RRT** for holonomic and non-holonomic robots.
- **Simultaneous Localization and Mapping (SLAM) (Matlab, Python):** Implemented **EKF** SLAM, **UKF** SLAM, **FastSLAM**, and **Grid-Based** SLAM with **Rao-Blackwellized Particle Filters**. GitHub
- **Faby: The Telepresence robot (Path planning, RTab, C++, ROS, Python, Gazebo):** Developed a **telepresence robot** that can autonomously navigate through an indoor environment.

Achievements

- **Bachelor Thesis Scholarship by NewGen-IEDC:** Fully funded for the thesis "Autonomous Telepresence Robot" by the Government of India, through SRM Innovation and Incubation Center (SIIC).
- Founder member of IEEE Robotics and Automation Society SRM Student Chapter, Madras Section.