Rishabh Bhattacharya

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Education

University of California San Diego *GPA: 3.98 / 4.00*

Master of Science (MS) in Mechanical Engineering *Sept 2021 - Mar 2023 (exp.)*

- **Courses:** Neural networks and pattern recognition, Computer Vision (A+), Mathematics for Robotics (A+), Planning and Learning, Robotics (A+), Sensing and Estimation, Non-Linear Systems, Linear Systems Theory (A+), Linear Control Design (A+), Non-linear control (A+), Safety in Autonomous Systems

Indian Institute of Technology (IIT) Gandhinagar *GPA: 8.53 / 10.00*

Bachelor of Technology (B.Tech) with Honours in Mechanical Engineering *Jul 2015 - Jul 2019*

Skills

Programming Python (PyTorch, NumPy, Scikit-learn, cv2, Pandas), C++, MATLAB, SQL

Miscellaneous Linux, ROS, LaTeX, Microsoft Excel, Git, Autodesk Inventor

Internships

OMRON Research Center of America (ORCA) *San Ramon, CA*

Robotics Research Intern *Jul 2022 - Sept 2022*

- [Python, C++, ROS] Developed a **trajectory planner** for a 7-DOF Franka Emika Panda robot to avoid moving obstacles by using motion prediction

Projects

Neural networks and pattern recognition Github

Python *Jan 2023 - Mar 2023*

- Achieved **92.37%** accuracy on classification of MNIST dataset by training a single layer neural network.
- Achieved $\sim$ **30%** accuracy on classification of CIFAR-100 dataset by training a neural network with one hidden layer.

Planning and Learning Github

Python *Apr 2022 - Jun 2022*

- Implemented **dynamic programming** to compute the optimal open-loop policy for a given doorkey environment. Used the optimal policy to instruct the agent to pick a key, unlock doors, avoid walls and reach the goal.
- Used a **weighted A*** path planning algorithm to determine the shortest path and intercept a moving target in an environment with obstacles.
- Applied a CEC controller to solve an infinite horizon discounted stochastic **optimal control** problem for reference trajectory tracking.

Sensing and Estimation Github

Python *Jan 2022 - Mar 2022*

- Trained a probabilistic color model to recognize and classify recycling-bin specific blue color using **Gaussian Discriminant Analysis**
- Implemented **particle filter SLAM** using odometry, 2-D LiDAR scans, and stereo camera measurements from an autonomous car. Used the odometry and LiDAR measurements to localize the robot and build a 2-D occupancy grid map of the environment
- Implemented **visual-inertial SLAM** based on an **Extended Kalman filter** (EKF) to localize a robot and map its environment using synchronized measurements from an inertial measurement unit (IMU) and a stereo camera

Computer Vision Github

Python *Sept 2022 - Mar 2023*

- Photometric stereo; Edge & corner detection; epipolar rectification, SIFT feature detection and matching; outlier rejection using RANSAC; Optical flow using Lucas-Kanade algorithm; MNIST classification using single and multi layer perceptrons and, convolutional neural networks (CNNs)

Robot Motion Control Github

MATLAB *Jan 2022 - Mar 2022*

- Implemented **trajectory generation and motion control** for a pick-and-place problem on a KUKA youBot 5 arm robot using coppeliaSim simulation package

Safety for Autonomous Systems

Link

MATLAB, Python

Sept 2021 - Dec 2021

- Improved safety guarantees in RRT/A* path planning algorithms using Hamilton-Jacobi reachability

Math for Robotics

Github

Python

Sept 2022 - Dec 2022

- Recovery of camera calibration matrix and camera pose; linear, quadratic and cubic interpolation; outlier rejection on 3D point cloud data using RANSAC; PRM, RRT, Safest and shortest path planning

Work Experience

SIM Advisory

Bangalore, Karnataka

Business Analyst

Jan 2020 - May 2021

- Reduced report generation time by **85%** by creating an automated dashboard using PowerBI
- Identified geographical hotspots in the United States where prices could be optimized for greater turnover using k-Means clustering and subsequent classification

Indian Oil Corporation Ltd.

Barauni, Bihar

Operations Officer

Jul 2019 - Jan 2020

- Supervised fuel receipts from the refinery (daily batch size $\sim$ 1850 Kgal worth $ 6.5M) and its subsequent dispatch from the control room
- Optimized the daily truck loading schedule for $\sim$ 500 trucks (1600 Kgal) while minimizing employee overtime