ISHAAN MALHOTRA

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Education

University at Buffalo, The State University of New York — Buffalo, NY
Master of Science in Robotics, CGPA 3.86 — Aug 2023 - Dec 2024 (Expected)

Manipal Institute of Technology — Manipal, India
Bachelor of Technology in Mechanical Engineering — Aug 2015 - May 2019

Technical Skills

Software: Python, MATLAB, Simulink, ROS, RViz, Solidworks, Unreal Engine, Git, JIRA, Confluence
Libraries & Frameworks: PyTorch, sci-kit learn, OpenCV, NumPy, pandas, Matplotlib
Specializations: Autonomous Vehicles, Deep Learning, Electric Vehicles, Reinforcement Learning, MLOps

Experience

Distributed Robotics and Networked Embedded Systems Lab- MOOG — Buffalo, NY
Graduate Research Assistant (P.I: Dr. Karthik Dantu) — Jan 2024 -Present

- Collaborating with MOOG Construction on developing an autonomous excavator, retrofitted with Nvidia Orin Jetsons running ROS2 for autonomous control.
- Integrated GPS, IMUs, LiDARs, and stereo cameras for enhanced perception and autonomous operation.
- Implemented teleoperated communication via WiFi routers for remote control and monitoring.
- Designed and built a stereo camera system using two monocular telephoto cameras with a high baseline to enhance depth perception and accuracy in challenging environments.

Danfoss Power Solutions — Ames, IA
Autonomous Simulation Engineer Intern — May 2024 -August 2024

- Simulated autonomous software for LiDAR-based off-highway robots using Unreal Engine, Simulink, and ROS.
- Implemented a structured data collection experiment to validate simulation results for an autonomous robot.
- Developed an LSTM-based pipeline for reduced-order black-box modeling of the vehicle plant.
- Leveraged Functional Mock-up Units (FMUs) to seamlessly integrate and simulate C++ code within Simulink.

Daimler Truck Innovation Center India (Mercedes Benz R&D India) — Bengaluru, India
Senior Engineer — Oct 2022 - May 2023

- Led an 8-member data-science team, analyzing Mercedes Benz e-bus powertrain operating in 5 German cities.
- Initiated Agile methodologies as Scrum master reducing analytics reports delivery time by 35%.
- Conducted research on Battery Lifetime Prediction of electric buses using data-driven methods.

Bosch Limited — Bengaluru, India
Assistant Manager — July 2019 - Oct 2022

- Led e-powertrain commissioning for 12 vehicles by diagnosing software issues utilizing CAN tools.
- Published “A Study of Parameters Influencing Energy Consumption of an Electric Vehicle”, IEEE ITEC-INDIA, 2019.
- Developed an electric powertrain simulation platform using Simulink and Python for efficient powertrain sizing.
- Conducted V&V for EV powertrain systems, including performance evaluation on chassis dynamometers.
- Generated drive cycles from test data using genetic algorithms to standardize controlled tests for EVs.

Intern — Jan 2019 - May 2019

- Innovated a precise 'Accelerator Pedal Calibration' method with Fuzzy Logic cutting calibration time by 20 hours.

Projects

Autonomous Highway Driving Using Deep Reinforcement Learning

- Developed an autonomous driving agent for the Highway environment, focusing on safe lane changing.
- Utilized Python with PyTorch and MuJoCo to train and evaluate the agent.
- Developed and evaluated variations of DQN, PPO, and DDPG algorithms to understand their strengths and trade-offs.

Autonomous Vehicle SLAM, Planning and Control

- Executed localization, path planning, and mapping for autonomous vehicles in a Unity simulation using ROS.
- Integrated Adaptive Monte Carlo Localization for precise vehicle localization within the mapped environment.
- Applied Hector SLAM for live mapping, enabling real-time environment mapping during navigation.
- Integrated RRT-based methods for planning and Pure Pursuit control for precise trajectory tracking.

Road Segmentation Using VGG-FCN8

- Developed a road segmentation model using VGG-FCN8, adapting VGGNet for autonomous vehicle perception tasks.
- Designed a fully convolutional network based on the VGG16 architecture, adapting it for segmentation tasks by adding upsampling layers and incorporating skip connections.

Stereo Visual Odometry

- Created ROS-based Stereo Visual Odometry module for precise camera pose estimation using stereo images.
- Conducted camera calibration to acquire intrinsic parameters.
- Utilized OpenCV for feature detection, optical flow, and stereo disparity computation.