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Portfolio

Bhushan Pawaskar

EDUCATION

Georgia Institute of Technology, Atlanta— M.S. Robotics **[GPA 3.84/4.00]**   **2024**
- **Relevant Coursework:** Computer Vision, Artificial Intelligence, Control Systems, Deep Learning for Robotics

University of Mumbai, Mumbai — B.Tech Mech. Engg. **[GPA 8.91/10.00]**   **2022**
- **Relevant Coursework:** Robot Kinematics, Fuzzy Logic, Neural Networks, Mechatronics

EXPERIENCE

◉ **Georgia Tech**, Atlanta

Head Teaching Assistant (AE4531: Aircraft Flight Dynamics)   **AUG 2023- DEC 2023**
- Held regular office hours to provide one-on-one or group tutoring, providing constructive feedback to students, solving their doubts.
- Collaborated with fellow TAs & the professor to ensure timely completion and consistency in grading, according to established rubrics.

VOLUNTEER EXPERIENCE

◉ **Robojackets,** Atlanta

Robo-racing Software Engineer   **JAN 2023 - MAY 2023**
- Worked with the software subteam to facilitate the transfer of Python and C++ libraries from ROS Noetic to ROS2 Humble in as a part of the team's transition season.
- Conducted a thorough examination of scholarly literature and software libraries like NAV2 to identify trajectory planning algorithms with the potential to enhance the current vehicle's planning functionality for the future season.

◉ **Agile Systems Lab,** Atlanta

Graduate Assistant   **AUG 2022 - DEC 2022**
- Modified a Pytorch based generative variational autoencoder framework for understanding flapping flight control signals in hawkmoths.
- Investigated the generative causal factors in a pre-trained recurrent neural network that predicts muscle spikes and timings.

◉ **Orion Racing India**, Mumbai

Controls Engineer [Driverless Subteam]   **DEC 2021 - MAY 2022**
- Participated in a collaborative effort with 12+ Formula Student(FS) engineers to integrate autonomous capabilities into a FS racecar. Used a kinematic bicycle model with PID and Pure Pursuit algorithms for longitudinal and lateral control respectively.
- Fine Tuned vehicle parameters extensively on IPG Carmaker, FSSim & FSDS simulators, and later validated the same on a self-made small scale prototype. This resulted in a 60% decrease in the lateral tracking error.

Battery Pack Lead [Mechanical Subteam]   **JAN 2021 - DEC 2021**
- Designed and optimized a 428V battery pack by reducing its weight down by 40% while ensuring powertrain requirements are met.
- Won the **best battery pack** and **best powertrain award** and **National Rank #2** at the Formula Bharat competition in January 2022.

EXTERNAL COURSES

- **Coursera -** Self Driving Cars Specialization - Introduction to Self Driving Cars (University of Toronto)
- **FastAI** - Practical Deep Learning for Coders (Jeremy Howard)
- **HuggingFace** - Deep Reinforcement Learning

CAPSTONE PROJECT

Autorally - Visual Inertial Odometry (VIO) based localization *(bhushanp.com/autorally.html)*
- Estimated stereo-camera intrinsic parameters like projection, distortion & IMU parameters like white noise, bias sigmas using Kalibr & Allan Variance ROS to calibrate 'autorally' testbed hardware for state estimation using a VIO system.
- Benchmarked various VIO implementations like ORBSlam3, Rovioli, Xivo, VINS on pre-recorded bag files for evaluating their performance and fine-tuned feature tracker and estimation filter variables to obtain reliable localization accuracy in real time.

PROJECTS

Closed Loop RRT for trajectory planning of an autonomous truck *(bhushanp.com/clrrt.html)*
- Modified an existing RRT algorithm framework to implement a Closed Loop RRT algorithm for an autonomous truck-trailer system to perform U-turn maneuver in compact spaces using MATLAB and Javascript.
- Reduced memory overheads in planning to achieve real-time planning and obtained more than 30% reduction in planning time.

Long-Horizon Task Planning with visual feedback *(bhushanp.com/vga.html)*
- Developed a hierarchical task planning agent using a Large Language Model (LLM), with success feedback of these tasks incorporated using a Visual Language Model (VLM). Tasks were a sequential combination of simple pick and place tasks in Raven's environment.
- Generated extensive testing data by modifying CLEVR and Blender APIs to finetune the OFA visual reasoning submodule of the agent to achieve 50-80% accuracy of the fine tuned model. This resulted in a 53-60% validation success rate on long horizon tasks for the agent.

Semantic segmentation of images for autonomous vehicles *(bhushanp.com/raidar.html)*
- Employed machine learning techniques like Gaussian Mixture Models, Hierarchical Clustering as well as Convolutional Nets like UNet to try to predict semantic image labels of photos taken by an autonomous vehicle camera in rainy weather. (RAIDAR dataset)
- Used multiple metrics like Jaccard Coefficient, Rand index, Mutual information to evaluate the segmentation performance of the models used and obtained a segmentation score between 0.6 to 0.9 for the best performing model.