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Portfolio

# Bhushan Pawaskar

## EDUCATION

**Georgia Institute of Technology**, Atlanta— M.S. Robotics (Expected) 2024
- **Relevant Coursework:** Artificial Intelligence, Machine Learning, Deep Learning for Robotics, Linear Systems Control.

**University of Mumbai**, Mumbai — B.Tech Mech. Engg. 2022
- **Relevant Coursework:** Robot Kinematics, Fuzzy Logic, Neural Networks, Mechatronics.

## EXPERIENCE

### VOLUNTEER EXPERIENCE

**Robojackets,** Atlanta
Robo-racing Software Engineer JAN 2023 - PRESENT
- Collaborating 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 ongoing transition season.
- Conducting a thorough examination of scholarly literature and software repositories like NAV2 to identify trajectory planning algorithms with the potential to enhance the current vehicle's planning functionality for the upcoming 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.

### INDUSTRY EXPERIENCE

**Nexilon Energy Systems**, Mumbai
Design Engineer OCT 2021 - MAY 2022
- Generated technical drawings & developed the mechanical CAD geometry for lithium prismatic cell battery assemblies utilized in the e-powertrain systems of material handling machinery such as forklifts and reach trucks.
- Adhered to stringent timelines and delivered designs for a diverse range of configurations spanning 24-80V, two weeks before time. This resulted in more time for the prototyping phase ensuring a smoother product development cycle.

## External Courses

- **Coursera** - Self Driving Cars Specialization - Introduction to Self Driving Cars (University of Toronto)

## CAPSTONE PROJECT (ONGOING)

**Visual Inertial Odometry based localization**
- Goal of the project is to implement a reliably working Visual Inertial Odometry (VIO) system for localization on the autorally testbed.
- Currently testing various ROS based VIO implementations like Maplab, Xivo, VINS for evaluating their performance.

## PROJECTS

**Closed Loop RRT for trajectory planning of an autonomous truck**
- Modified an existing Rapidly exploring Random Tree (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**
- 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 to achieve a long term goal.
- Generated extensive testing data by modifying CLEVR and Blender APIs to finetune the OFA visual reasoning submodule of the agent to achieve over 90% 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**
- Employed machine learning techniques like Gaussian Mixture Models, Hierarchical Clustering as well as Convolutional Neural Networks like UNet to try to predict semantic image labels of images 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.

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