Sahasrajit Anantharamakrishnan

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EDUCATION

Northeastern University, Boston, MA   **May 2024**
Master of Science in Robotics Engineering - **GPA: 4.0/4.0**
Courses: Legged Robotics, Graph Theory, Deep Learning, Autonomous Field Robotics, Mobile Robotics, Computer Vision, Reinforcement Learning & Sequential Decision Making

Anna University, Chennai, India   **May 2022**
Bachelor of Engineering in Electrical and Electronics Engineering - **CGPA: 8.66/10.00**

WORK EXPERIENCE

Autonomy & Intelligence Laboratory, Boston, MA, USA. - (Website)   **January 2023 - Present**
Research Assistant - **Project:** *High-Speed, Off-Road Autonomy Robot*

- Developed an innovative 2.5D terrain model accommodating uncertainties in both the shape and properties of challenging off-road environment
- Crafted a custom cost function for MPC and MPPI controls, prioritizing speed in unstructured environments while considering the robot's kino-dynamics, terrain traversability, and safety constraints
- Optimized the custom MPPI algorithm and optimized it using JAX python, slashing average runtime from 1000 ms to 1 ms
- Modified and Fine-tuned STEGO, a self-supervised semantic segmentation head for DINOv1 vision transformer, on RUGD, RELLIS, and a custom dataset to achieve clear class clusters for RGB image semantic segmentation
- Employed sensor fusion techniques to combine 3D-LiDAR data with semantically segmented RGB images, resulting in a Semantic Point Cloud, essential for downstream perception, control, and motion planning tasks
- Utilized Fusion 360 to engineer and assemble a customized compute and sensor suite payload, designed to meet the distinct needs of AgileX's scout and Clearpath's Warthog robotic platforms, to enable high-speed offroad autonomy capability

Rigbetal Labs LLP, Pune, India.   **August 2021 - November 2021**
Robotics Engineer, Intern

- Created a novel algorithm, Road Anomaly Detection System (RADS), in C++ to detect road anomalies (Potholes, Speed Bumps, etc.) using normal estimation
- Reduced cost by 90%, by generating a 3D Pointcloud from a series of moving 2D Laserscans
- Simulated a multi-agent (robot) mapping environment in Gazebo ROS to create a cohesive 2D map
  - Tested viability of the same in a cloud environment (AWS Robomaker) to enable multi-user control of an agent

Capgemini Technologies Services, Bangalore, India. - (GitHub)   **July 2020 - December 2020**
Robotics (Medical Devices), Intern

- Designed in Fusion 360 a ROS-based autonomous ground vehicle to sterilize and sanitize offices from SARS-COV2 virus with Ultraviolet (UV-C) irradiation
- Managed Communications and task delegation between the team and the client

SKILLS

Languagues / Libraries	Python, PyTorch, JAX, C++, C, MATLAB, OpenCV, Tensorflow, PCL, CUDA
Software and Tools	ROS, Ubuntu Linux, Git, LaTeX, CMake, Docker, Gazebo, Nvidia Issac Sim, MQTT, Simulink, Fusion 360, Blender

PROJECTS

Implementing Batch Informed Trees (BIT*) Motion planning Algorithm - (More Info)   **March 2023 - April 2023**
Batch Informed Trees (BIT*): Informed asymptotically optimal anytime search

- Optimized the intensive calculations in the algorithm using hash-maps, parallelization, and pre-computation in python.
- Designed intuitive visualization techniques to better analyze the BIT* algorithm.
- Tested the algorithm against baselines results such as RRT, RRT*, FMT*, and RRT Connect.

Learning Inverse Kinematics using Reinforcement Learning - (GitHub)   **October 2022 - December 2022**
A 7 DoF robot arm which will reach a goal location trained with Reinforcement Learning

- Implemented and evaluated Deep Deterministic Policy Gradients (DDPG), Twin Delayed Deep Deterministic Policy Gradients (TD3), and Soft Actor-Critic (SAC) algorithms, with TD3 demonstrating the best performance.