Sahasrajit Anantharamakrishnan

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Full-Stack Robotics Engineer with expertise in hardware design, perception, planning, and control. Specializing in motion planning, classical, and learning-based control of mobile robots, manipulators, and legged systems. Skilled in C++, Python, CUDA, and ROS, with experience in GPU acceleration, real-time perception, and system integration.

EDUCATION

Northeastern University, Boston, MA   **May 2024**
Master of Science in Robotics   **GPA: 3.939/4.000**
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 Electronics and Communication Engineering   **GPA: 8.66/10.00**
Courses: Digital Signal Processing, Embedded Systems, Robotics & Machine Vision System, Control Systems, and Data Structures

SKILLS

Languages / Libraries	Python, C++, Drake, CUDA, C, PyTorch, JAX, Tensorflow, MATLAB & Simulink, OMPL
Software and Tools	ROS, Ubuntu Linux, Git, CMake, Docker, Gazebo, Nvidia Issac Sim, PyBullet, MuJoCo, MQTT, Fusion 360, Blender, CI/CD, Automated Testing, gRPC, Protobuf
Proficient Concepts	Motion planning & Control, Trajectory Optimization, Kinematics & Dynamics Modeling, Deep Learning, Reinforcement Learning, Machine Learning, Computer Vision, State estimation/SLAM

WORK EXPERIENCE

Robotics and Intelligent Vehicles Research Laboratory (RIVeR), Boston, MA   **June 2024 - Present**
Robotics Research Assistant, **Project:** *Stochastic Model Predictive Control for bipedal loco-manipulation*

- Improved robustness against uncertainties in terrain and payload of Bipedal robot by adding soft-constraints to Model Predictive Control (MPC)
- Created novel simulation environments in NVIDIA Issac Sim and PyBullet, for simulating, and testing the humanoid robot
- Improved the constraints and the dynamics model to guarantee stability

Northeastern Autonomy and Intelligence Laboratory (NAIL), Boston, MA   **January 2023 - May 2024**
Robotics Research Assistant, **Project:** *High-Speed Off-Road Autonomy Robot*   Lab Link

- Set up the lab from scratch, showcasing full-stack expertise in hardware, perception, planning, and control
  Motion Planning and Control:
- Optimized the trajectory of AVs using a custom Model Predictive Path Integral (MPPI) algorithm, a costmap-based planner
- Formulated a custom cost function for the robot to account for kinematics & dynamic constraints, and terrain traversability
- Optimized algorithm runtime using GPU programming with CUDA C++ and JAX by 1000x
  Perception:
- Fine-tuned, using PyTorch, a Vision Transformer AI model on a custom dataset to semantically segment rough terrain
- Increased training ease by 38% using SLURM and Docker to train, and run inference on GPU server cluster
- Created a custom data pipeline for 50,000 RGB images that included data collection, logging, storage and training
- Monitored model training progress and performance using TensorBoard and Weights and Biases (WandB)
- Sensor fused a 3D-LiDAR and semantically segmented RGB images to create a 2.5D map used for navigation tasks
  Hardware:
- Fabricated a custom mobile robot using Fusion 360 to be used in high-speed off-road environments
- Engineered a custom electrical and network system of the robot to ensure safety and reliability

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

- Formulated a novel algorithm, Road Anomaly Detection System (RADS), in C++ to detect road anomalies
- Reduced cost by 90%, by generating a 3D Point cloud from a series of moving 2D Laser scans
- Developed a custom multi-agent path planning and mapping framework in AWS Robomaker and Gazebo
- Tested and Deployed the code using a custom CI/CD pipeline to ensure safe and reliable code

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

- Fabricated a ROS-based autonomous ground vehicle in Fusion 360 to sterilize and sanitize offices from SARS-COV2 virus with Ultraviolet (UV-C) irradiation
- Led communication and task allocation for cross-functional teams and clients, boosting team efficiency and client relations

PUBLICATIONS

[1] A. Trivedi, **S. Anantharamakrishnan**, S. Bazzi, and T. Padir. *"Chance Constrained Convex-MPC for biPedal lOcomanipulation (C3PO)"*. [In Progress]. Mar. 2025.

PROJECTS

Implementing Batch Informed Trees (BIT*) Motion planning Algorithm for Robot Arms   **March 2023 - April 2023**
Paper: Batch Informed Trees (BIT*): Informed asymptotically optimal anytime search   Project Link
- Increased run-time efficiency of the algorithm by using hash-maps, parallelization and caching
- Engineered intuitive visualization and analysis tools to validate the algorithm
- Tested and validated the algorithm against baselines algorithms such as RRT, RRT*, FMT*, and RRT Connect

Learning Inverse Kinematics using Reinforcement Learning   **October 2022 - December 2022**
A 7 DoF robot arm which will reach a goal location trained with Reinforcement Learning   Project Link
- Implemented and evaluated Deep Deterministic Policy Gradients (DDPG), Twin Delayed Deep Deterministic Policy Gradients (TD3), Proximal Policy Optimization (PPO) and Soft Actor-Critic (SAC) algorithms , with TD3 demonstrating the best performance.

Comparative Analysis of Cartographer and ORB SLAM Algorithms   **November 2022 - December 2022**
Comparing two different SLAM algorithms, Cartographer (3D) and ORB SLAM 3 on the NUance data set.
- Developed and Analysed ORB-SLAM3 on the NUance data set.

Intelligent Quads, `iq_gnc` (an Open source Project)   **June 2021**
An Ardupilot and ROS based quadrotor project with a Guidance, Navigation, and Control (GNC) System   Project Link
- Converted project from C++ to Python to make it more beginner-friendly
- Setup C.I. Pipeline in GitHub actions

Vargi Bots - e-Yantra Robotics Competition   **November 2020 - March 2021**
Controlled two robot arms to sort coloured boxes simultaneously according to their priority from a conveyor   Project Link
- Motion planned and Controlled robot dual-arms using ROS
- Utilized Computer Vision algorithms with OpenCV to recognize the color of the boxes and reading the QR codes.

Autonomous In-campus Drone Delivery   **June 2020**
A fully autonomous delivery drone that delivers essential and nonessential products across campus.
- Designed the drone in CAD software
- Chief Architecture Officer of the software subsystem.