Nikhil Sobanbabu

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EDUCATION

Carnegie Mellon University — Pittsburgh, PA
Master of Science in Electrical and Computer Engineering | GPA: 4.0/4.0 — May 2026
Coursework: Robot Learning, Optimal Control, Deep Learning for Computer Vision, Optimization
Graduate Teaching Assistant: Feedback Control Systems, Mathematical Foundations for Electrical Engineers

Indian Institute of Technology Madras — Chennai, India
Bachelor of Technology in Electrical Engineering | GPA: 9.39/10.0 — May 2024
Coursework: Reinforcement Learning, Motion Planning, Linear Dynamical Systems, Non-Linear System Analysis

SKILLS

Languages: C/C++, Python, Julia, Unix/Linux, Git and Bash Scripting
Tools and Frameworks: Git, Docker, MATLAB, Isaac Gym/Sim, MuJoCo, Robot Operating System (ROS1 and ROS2), Gazebo, MoveIt, Pytorch, Tensorflow, CasADi, sci-kit learn, NumPy, Pandas and Altium
Key Competencies: Deep Reinforcement Learning, Algorithm Design and Optimization, Root Cause Analysis

WORK EXPERIENCE

Di-facto Robotics and Automation — Bengaluru, India
Robotics Intern — June 2024 – July 2024

- Engineered a natural-feature navigation system with recovery features for an in-house AMR using **ROS** NavStack.
- Optimized waypoints for a palletization task reducing cycle time by **23.6%** using teach-pendant of a **FANUC** robot.

Robert Bosch Centre for Cyber-Physical Systems — Bengaluru, India - Remote
Intern — January 2023 - May 2023

- Implemented **Visual-Inertial Odometry** for **localization** of a **quadruped robot** around structured multi-level terrains.
- Designed a perception-pipeline using **YOLOv6** and **stereo-LiDAR** fusion of 3D point clouds for staircase detection.
- Applied PCA-based plane detection to extract stair geometry and to detect corner points for improved localization.

RESEARCH EXPERIENCE

Carnegie Mellon University | LeCAR Lab | Prof. Guanya Shi — May 2024 - Present

- Developed a parallelizable **Sampling-based Sys-ID** framework enhancing precise locomotion in legged robots.
- Trained and deployed highly agile RL locomotion policies with identified parameters and a novel Domain Randomization range based on **Uncertainty Quantification** improving performance by **67.82%** over baselines.
- Developing techniques for parameter **sensitivity** analysis using **Fisher Information** and training exploratory policies for active real2sim in legged robots to reduce the **sim2real** gap.

University of Southern California | Dynamic Robotics and Control Laboratory — May 2023 – July 2024

- Created a task-driven planner for a **multi-modal RL** policy using Monte Carlo rollouts with receding-horizon optimization and **multiprocessing** resulting in online planning and robust bipedal locomotion in MuJoCo.
- Constructed a model-based prior based on **preview control** to guide a reinforcement learning policy, enabling agile, **parkour-inspired motions** crossing blocks over 20% robot's nominal height and **Froude number** of 0.72.
- Extended the framework with a **hybrid automaton** to solve Uni-object **whole-body bipedal locomanipulation** tasks.

ACADEMIC PROJECTS

Motion Imitation with DIAL-MPC | CMU — August 2024 – December 2024

- Generated reference trajectories for Unitree Go2 using motion retargeting from motion capture data of dogs.
- Implemented a Full-order **Sampling based MPC** framework enhancing trajectory tracking performance by **22.73%.**

Terrain Travesability Analysis with Image Dehazing | CMU — August 2024 – December 2024

- Integrated a Generative Adversarial Network (GAN)-based dehazing model with a terrain segmentation (GANav) framework improving **mIoU** by **61.29%.**
- Analysed and compared Physics and Learning based dehazing techniques as an input to the GANav framework.

Multi-player Pursuit-Evasion Games | IIT Madras — January 2024 – May 2024

- Deployed a 1vN **Differential game-based controller** on custom designed omni-directional Lego Mindstorm robots.
- Implemented MAPPO on a custom Petting Zoo environment for a 1v1 Pursuit-Evasion-Target game.

Intro to Motion Planning | IIT Madras — January 2023 – May 2023

- Implemented **RRT*** and Bi-Directional RRT for manipulator motion planning of the KUKA Mobile manipulator.
- Integrated these planners with an **A*** and **TSP**-based navigation for optimal pick and place of scattered objects.

Anveshak | IIT Madras — May 2021 - May 2023

- Led a 40+ team in building a competitive **Mars Rover** capable of Autonomous traversal over extreme terrains.
- Designed interposer PCBs with MPC2515 CAN Bus for precise manipulator control via Nvidia **Jetson Xavier NX**.
- Engineered an efficient power distribution and monitoring framework, reducing energy consumption to **86%.**