Aditya Parameshwaran

aparame.github.io
LinkedIn: linkedin.com/in/adi2810

Email : adiparamesh@gmail.com
Mobile : (765) 418-6709
Address: Clemson, SC

Professional Summary

PhD candidate specializing in the intersection of Robotics, Controls, and Machine Learning with expertise in developing autonomous systems enhanced by Generative AI. Experienced in runtime safety verification and navigation for robotic manipulation and autonomous vehicles in complex environments.

Education

Clemson University — Jan 2022 - Present
Ph.D. Candidate in Mechanical Engineering — *Expected Graduation: May 2026*
Relevant Courses: Advanced Linear Programming, Robust Control, Optimal Control, Data-Driven Learning

Purdue University — Aug 2019 - Dec 2021
Master of Science in Mechanical Engineering — *GPA: 3.9/4.0*
Relevant Courses: Autonomous Systems, Modern Robotics, Engineering Mathematics

Experience

Department of Mechanical Engineering — Clemson University, SC
Graduate Research Assistant — *Jan 2022 - Present*

Reinforcement Learning for Robotic Manipulator: Engineered PPO and SAC networks that achieve 85% success rate in object manipulation tasks using RGBD sensors on a UR5 arm. (`C++, ROS 2, Isaac Sim, skrl`)

Semantic Mapping with Off-Terrain Vehicles: Collaborated to integrate stereo cameras and LiDAR sensors on a ground vehicle and improved off-road path planning using 3D semantic terrain maps (`C++, ROS 2, Octomap`).

Runtime Safety Monitoring using Generative AI models: Pioneered a novel verification framework using attention-enhanced GAN networks, reducing formal safety verification time by 70% for image-based neural network controllers in both robotic manipulation and autonomous driving scenarios. (`PyTorch, ROS 2, Isaac Sim`)

Drone Navigation with Guaranteed Safety: Developed a drone navigation system constrained by formal methods combining temporal logic and optimal controls, achieving complete collision avoidance in complex environments while optimizing flight paths. (`MATLAB, Gurobi`).

WABTEC Corporation — West Lafayette, IN
Autonomy Intern — *May 2021 - Dec 2021*

Robotic Train for Railway Monitoring: Spearheaded a cross-functional team to design a sensor-integrated robotic train using `Solidworks` and `Nvidia Jetson`, improving track monitoring efficiency by 30% and reducing inspection costs by $45K annually.

Sensor Fusion for GPS-Denied Navigation: Architected an Extended Kalman Filter for multi-sensor fusion, reducing position error by 65% in GPS-denied environments and enabling robust autonomous navigation in tunnels and urban canyons.

Technical Skills

Programming Languages: C/C++, Python, MATLAB
Robotics & Simulation: ROS 2, Gazebo, Isaac Sim, Isaac Lab, Mujoco, CARLA, MoveIt
Tools: Git, Docker, Gurobi, SolidWorks, CasADI
Machine Learning & AI: PyTorch, TensorFlow, OpenCV, AutoML, scipy, pandas, gym, skrl

Selected Projects

Imitation Learning for Autonomous Driving: Developed a Deep CNN model on *PyTorch* achieving expert policy emulation for autonomous vehicle navigation in `CARLA`, with robust performance across varied urban scenarios and weather conditions.
Physics-Informed Neural Network Controller: Enhanced neural path planner performance by 2x using physics-based loss functions, resulting in smoother trajectories and faster convergence, implemented in `PyTorch` and `OpenCV` on L5Kit dataset.
Robust Control for Lane Changing: Engineered a robust MPC controller using *CasADI* and *Gurobi*, achieving successful lane changes under tested noise conditions while maintaining passenger comfort metrics within human preference thresholds.
Pick and Place Tasks for Robotic Manipulators: Designed hierarchical task-based planning approach for picking and placing objects using a UR5 robot arm and gripper in *C++*, *MoveIt* and *IsaacSim*.

Selected Publications

Parameshwaran, A., Wang, Y., "Scalable and Interpretable Verification of Image-Based Neural Network Controllers for Autonomous Vehicles", *ICCPS,* 2025. *(25% Acceptance Rate)*

Parameshwaran, A., Wang, Y., "Temporal Logic Guided Safe Navigation for Autonomous Vehicles", *IFAC-PapersOnLine*, 2024.