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Aditya Parameshwaran

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

Jan 2022–Present **Ph.D. Candidate in Mechanical Engineering**, *Clemson University*, Expected Graduation: May 2026

Relevant Courses Advanced Linear Programming, Robust Control, Optimal Control, Data-Driven Learning

Aug 2019–Dec 2021 **Master of Science in Mechanical Engineering**, *Purdue University*, GPA: 3.9/4.0

Relevant Courses Autonomous Systems, Modern Robotics, Engineering Mathematics

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.

Parameshwaran, A., Wang, Y., "Safety Verification and Navigation for Autonomous Vehicles Based on Signal Temporal Logic Constraints", *SAE Technical Paper*, 2023.

Lewis, E., **Parameshwaran, A.**, et al., "Terrain Roughness-Based Controller for Off-Road Mobile Robots", *SAE Technical Paper*, 2025.

Parameshwaran, A., et al. "Undergraduate Track: Foundational Robotics" *Clemson University e-pub, 2024*.

Experience

Jan '22–Present **Graduate Research Assistant**, *Department of Mechanical Engineering*, Clemson University, SC

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. (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. (MATLAB, Gurobi)

May '21–Dec '21 **Autonomy Intern**, *WABTEC Corporation*, West Lafayette, IN

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.

Aug '19–'20 **Graduate Research Assistant**, *Mechanical Engineering Tribology Lab*, Purdue University, IN

Dynamical Analysis of Cam Follower System: Developed a software-in-loop model for a Valve Train system to conduct dynamic analysis on MSC Adams. Investigated a Cummins v16 diesel engine test rig and created numerical models for Transient Non-Linear dynamics.

Technical Skills

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

Selected Projects

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.

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.

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.

Robust Control for Autonomous Lane Changing: Engineered a robust MPC controller using CasADI and Gurobi, achieving successful lane changes under tested noise conditions.

Optimal Control for Landing Reusable Rockets: Deployed a path-tracking model predictive controller to land a non-linear rocket model safely for different landing scenarios and employed an Extended Kalman Filter for state estimation.

Co-Curricular Activities

M.E. Graduate Student Council — Head of Charter and Bylaws, with the responsibility of updating and ratifying the student council handbook, and organizing social and academic events for the ME graduate students.

Awards

June 2024 **3 Minute Thesis Competition - 2nd Position**, *Clemson University*

April 2018 **SAE BAJA Maryland**

2nd Position: Suspension and Traction

3rd Position: Overall Ranking

Jan 2018 **SAE BAJA India**

1st Position for developing a custom single piston brake caliper integrated with a locked differential drive gearbox