

SUMMARY

Robotist with 3+ years' experience in real-time motion control, system integration, and planning algorithms. Skilled in C++, Simulink, and ROS, with a focus on safety-critical control and simulation workflows for autonomous robotic systems.

ACADEMICS**Master of Science in Mechanical Engineering ([Thesis link](#))****Aug 2023**

Virginia Polytechnic Institute and State University, Blacksburg

GPA – 3.95/4.0

-Adaptive Control, Nonlinear Systems, Machine Learning, Robotics, Optimization Techniques, Applied Linear Systems, Computer Vision,

Bachelor of Technology in Mechanical Engineering**May 2020**

Sardar Vallabhbhai National Institute of Technology, Surat

CGPA - 9.37/10 (Rank 12/231)**PUBLICATIONS**

- **Darshit**, Azim, **2025**, "Sampling-Based Planning Algorithms At Non-Signalized Intersections With Traffic For Autonomous Vehicles," to be submitted to IEEE journal of Transactions on Intelligent Vehicles
- **Darshit**, Azim, **2023**, "Probabilistic RRT Connect with intermediate goal selection for online planning of autonomous vehicles," IFAC-PapersOnLine, vol. 56, no. 3, pp. 373–378, 2023. <https://doi.org/10.1016/j.ifacol.2023.12.052>
- Shathushan, **Darshit**, and Azim, **2022**, "Nonlinear model predictive control for optimal motion planning in autonomous race cars," IFAC-PapersOnLine, 55(37), pp. 645–650. <https://doi.org/10.1016/j.ifacol.2022.11.255>
- Goodarz, Prasenjit, Ce, Anshul, **Darshit**, Shathushan, Azim, **2022** "X-CAR: An Experimental Vehicle Platform for Connected Autonomy Research," IEEE ITS Magazine. <https://doi.org/10.1109/MITS.2022.3168801>

WORK EXPERIENCE**MathWorks Inc. | Full-Time | Engineering Development Group***July 2023 – present*

- Contributing to feature development for the Simscape Multibody Toolbox using **C++** and **Simscape languages** to enhance functionality, especially for the force and joint blocks
- Developed a robust data-driven Battery SOC Estimation demo using **Extremum Seeking Control (ESC)** with **Simulink**
- Enhanced **VSLAM algorithms** by integrating the Bag of Words (BoW) technique to improve loop closure efficiency in the **Automated Driving Toolbox**
- Providing technical support for **Simulink** products as an Application Support Engineer, resolving customer issues and expanding product knowledge. SME for Validation & Verification (V&V) products like Simulink Test

MathWorks Inc. | Summer Intern | Stateflow Semantics Team*May 2022 – Aug 2022*

- Developed a feature to convert Stateflow graphs to Directed Acyclic Graphs (DAGs) for error analysis using DFS, and implemented error detection using the new feature

RESEARCH & PROJECTS**Motion Planning for autonomous vehicles (MS Thesis) | Prof. Azim Eskandarian***Aug 2021 – June 2023*

- Developed **real-time motion control** algorithms for autonomous vehicles navigating unsignalized intersections using sampling based **probabilistic RRT (pRRT)**, emphasizing system safety and collision avoidance
- Integrated **Gaussian Process Regression** for dynamic obstacle prediction and **Model Predictive Control (MPC)** for **real-time trajectory control** of a mechatronic system
- Led **system integration** of sensors, perception, and control modules for closed-loop autonomous navigation

Trajectory optimization for autonomous racing using NMPC | Prof. Azim Eskandarian*Mar 2021 – May 2022*

- Developed a MATLAB program to obtain a **time-optimal trajectory** around any given arbitrary racetrack using a **non-linear model predictive control** architecture
- Used a **non-linear bicycle model** to define the dynamics of a racecar and designed custom constraints and cost function to obtain an optimal solution
- Incorporated **safety algorithms** within the NMPC framework by enforcing stability limits (e.g., maximum lateral acceleration, tire slip constraints) to ensure safe, failure-resistant vehicle operation at high speeds

Development of Autonomous Vehicle & mobile robots | Prof. Azim Eskandarian*Aug 2021 – May 2023*

- Contributed to converting a Ford Fusion Hybrid into an autonomous vehicle for experimentation and algorithm testing, focusing on the **V2V communication module** using SAE J2375 DSRC standards
- Developed control algorithms (e.g. cruise control) for scaled **F1tenth cars** used in planning and control experimentation

Development of Air Shock Absorbers | Prof. Hemant Nagarsheth*Aug 2019 – May 2020*

- Designed and developed models for three **air shock absorber** configurations to improve ride comfort and handling.
- Created **quarter-car suspension models** to evaluate dynamic behavior and vibration attenuation.
- Simulated system response using MATLAB to compare damping effectiveness and optimize P-V relationships.

SKILLS & INTERESTS

Tools:	C++ (Modern C++11/14), Simulink, MATLAB, Simscape, Python 3, JIRA, git, ROS, CARLA, REST API
Core Competencies:	Robotic Motion Control, Robot Motion Planning, Vehicle Dynamics, Mechatronic System Integration, System Validation & Testing, Model Predictive Control (MPC), Trajectory Optimization
Additional:	Real-Time Systems, Computer Vision (Object Detection), System Integration, V2V Communication

EXTRA-CURRICULARS & ACHIEVEMENTS

- Won the 6th **Electric Go-Kart Design Challenge** held at the Indian F1 track, "The Buddh International Circuit."
- Won "The Grand Robo Prix 2016" with a **line following robot** in freshmen year against 30 other teams.