DARSHIT PATEL
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ACADEMICS

Master of Science in Mechanical Engineering — **May 2023 (anticipated)**
Virginia Polytechnic Institute and State University, Blacksburg — **GPA – 3.95/4.0**
-Machine Learning, Robotics, Optimization Techniques, Adaptive Control, Applied Linear Systems, Computer Vision, Non-Linear Systems

Bachelor of Technology in Mechanical Engineering — **May 2020**
Sardar Vallabhbhai National Institute of Technology, Surat — **CGPA - 9.37/10 (Rank 12/231)**

WORK EXPERIENCE

MathWorks Inc. | Summer Intern | *Stateflow Semantics Team* — *May 2022 – Aug 2022*
- Worked on problems of **graph traversal** and developed a feature for converting any Stateflow graph to a Direct Acyclic Graph for error analysis and added an error using the new feature.
- Created a class for DFS traversal of any Stateflow model to return various properties of the graph using Visitor Pattern Design. Used **C++ and MATLAB** for programming.

Virginia Tech | Graduate Teaching Assistant | *ME Department* — *Fall '21, Spring '22, Fall '22, Spring '23*
- GTA for ME-2004 Numerical Methods and Engineering Analysis (**MATLAB** course) for 3 consecutive semesters.
- My tasks included conducting MATLAB lectures, office hours, setting-up assignments, and grading the assignments.
- GTA for ME-3414 Fluid Dynamics Lab for the spring semester. Setting up the experiments, supervising the lab sessions, and grading of the lab reports are some of my tasks as a TA for the course.

University of Guelph | Mitacs Research Intern | *Prof. Shohel Mahmud* — *May 2019 - Aug 2019*
- Developed a scaled-down model of a passive battery thermal management system for electric vehicles using metal foam.
- Analyzed the natural convection phenomenon and the effect of foam morphology on heat transfer experimentally.

PUBLICATIONS

- 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 Intelligent Transportation Systems Magazine. https://doi.org/10.1109/MITS.2022.3168801

RESEARCH & PROJECTS

Motion Planning for autonomous vehicles (MS Thesis) | *Prof. Azim Eskandarian* — *Aug 2021 - Present*
- Using **probabilistic RRT** for motion planning of autonomous vehicles at an unsignalized intersection using MATLAB.
- Used Gaussian Process Regression for prediction of obstacle states and MPC control for the control of the ego vehicle.
- Comparing sampling-based path planning algorithms at an unsignalized intersection using MATLAB simulations.

Development of Autonomous Vehicle & mobile robots| *Prof. Azim Eskandarian* — *Aug 2021 - Present*
- Our lab is converting a Ford Fusion hybrid to autonomous vehicle for experimentation and algorithm testing. I am worked on the communication module for **V2V communication** using SAE J2375 DSRC standards.
- Developing multiple scaled cars (F1tenth) for experimentation of planning and control algorithms. Responsible for adding **control algorithms** to the robot, like lane keeping, cruise control, etc.

Object detection for Autonomous Vehicles | *Computer Vision Course Project* — *Sept 2022 – Nov 2022*
- Developed a **modified Faster R-CNN model** for two-stage detection and classification of road environment objects such as car, pedestrians, trucks, cyclists, etc.
- Modified the first stage to learn the localization property using centerness as the parameter to improve the proposals.

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.

Electric Go-Kart | FSAE Project | *Dr. Hemant Mehta* — *July 2018 - Feb 2019*
- Did the dynamic analysis of the kart and designed the steering system and the wheel hubs.
- Did track analysis to obtain the entry and exit speeds on each turn to prevent rolling and skidding effects.
- Worked as a 3D modeler and CAE engineer. Modeled the whole kart using Solidworks and performed CAE simulations.

SKILLS & INTERESTS

Software: Solidworks, Simulink, CARLA Simulator, ANSYS Mechanical, AutoCAD.
Programming: MATLAB, C++, Python 3, Robot Operating System (ROS), Linux Systems.
Interests: Behaviour planning, Deep Learning & Neural Networks, Reinforcement Learning, Autonomous and Connected Autonomous Vehicles, Model Predictive Control.

EXTRA -CURRICULARS & ACHIEVEMENTS

- **Recruiting & Mentoring Chair** for the Mechanical Engineering Graduate Student Council at VT since April 2022.
- Hobbies include **Endurance Running** and **Bouldering.** Finishing a full marathon is my short-term goal.
- 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.