Nicholas Mohammad

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Work Experience

Graduate Research & Teaching Assistant   *Dec 2020 – Present*
University of Virginia   Charlottesville, Virginia

— Graduate Researcher in the Autonomous Mobile Robots (AMR) lab at UVA under the advisement of Dr. Nicola Bezzo.
— Perform research on robust and fast motion planning and exploration in unknown, cluttered environments. The work I have done demonstrated improvements in both the reliability and efficiency of autonomous navigation. To this end, I have developed C++ code for state-of-the-art hard- and soft-constrained motion planners and developed both PID and Model Predictive Controllers for precise trajectory tracking on both ground and aerial vehicles.
— First project focused on leveraging occluded regions in LiDAR data to improve throughput over frontier-based methods in autonomous exploration. Furthermore, I developed an algorithm to generate, at runtime, approximately shortest distance paths to re-explore the entire environment. The methods I developed demonstrated considerable exploration time reductions compared to traditional state-of-the-art frontier-only based methods.
— Most recent project focused on a model and sensor agnostic framework to proactively detect motion planning failures at runtime using Gaussian Processes. The vehicle is then recovered to a region of likely planner success to continue nominal operation. The result of this work was a state-of-the-art, robust, hard-constrained motion planner for cluttered navigation on both ground and aerial vehicles.
— Competed in the international BARN challenge at the Intelligent Conference on Robotics and Automation (ICRA). Our team designed a mapless, LiDAR-only based motion planning scheme to quickly and safely navigate cluttered, unknown environments. Our team qualified in 2022 and 2023 for the physical competition, with a second place finish in 2022.
— Working with the CoStar Group to develop an autonomous real-estate inspection algorithm for the DJI Matrice M300 based on LiDAR and thermal-camera data. The end goal is for the drone to autonomously examine structures for thermal leaks while avoiding obstacles like trees and power lines.
— Experience with both C++ and Python ROS development in Linux environments. Robotic platforms include: Boston Dynamics SPOT, Clearpath Jackal, Asctec Hummingbird, DJI Matrice M300 and Bitcraze Crazyflie.

Teaching Assistant   *Sep 2018 – Dec 2021*
University of Virginia   Charlottesville, Virginia

— Served as the head teaching assistant for CS 2150, Program and Data Representation. Covered topics include: C/C++ language, x86 Assembly and calling conventions, data-type representation, and memory systems.
— Responsibilities were to grade exams and hold office hours to complete coding assignments. During COVID, I developed a Bash-based autograding system for automatically testing and grading student's submitted coding assigments. Furthermore I developed a PHP and Javascript-based exam application which was able to generate randomized exam questions for each student. Both of these systems were deployed for automatic testing and grading over 4 semesters for nearly 2000 students, until the class was retired.
— Nominated by students and faculty for the All-University Graduate Teaching Award.

Python Package Development Intern   *Jun 2018 – Aug 2018*
Swift, Inc.   Manassas, Virginia

— Developed a driver client using PyTest and Tox that connected to the development application via gRPC and SSL to run through message flows.
— The final result was a suite of regression tests which could be performed automatically during installation and upgrading of Swift's Store and Forward (SNF) service application.
— Work was done exclusively on RHEL host systems through the terminal, and code was developed exclusively in VIM.

Education

University of Virginia   *Dec 2025 (Expected)*
Doctor of Philosophy - Computer Engineering, GPA: 3.98   Charlottesville, Virginia

University of Virginia   *May 2022*
Master of Science - Computer Science, GPA: 3.98   Charlottesville, Virginia

University of Virginia   *May 2020*
Bachelor of Science - Computer Engineering, GPA: 3.97   Charlottesville, Virginia

Skills

— C/C++
— ROS
— Research

— Motion Planning
— Optimization
— Control Theory

— Robotics
— Python
— Data Structures

— x86 Assembly
— Bash
— VIM