

Arjun Raja

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SUMMARY

Robotics Engineer, my proficiency lies in applying complex mathematical and physics problems into effective code. My goal is to leverage these skills to create innovative solutions that can improve the efficiency and sustainability of autonomous vehicles.

EDUCATION

New York University (NYU), Tandon School of Engineering, Brooklyn, NY May 2023
Master of Science, Mechatronics and Robotics, GPA 3.75 / 4.0

Coursework: Advanced Mechatronics, Foundations of Robotics, Simulation Tools for Robotics, Reinforcement Learning and Optimal Control for Robotics, Robot Localization and Navigation, Computer Vision.

Vellore Institute of Technology (VIT), School of Mechanical Engineering, Vellore, India. June 2020
Bachelor of Technology, Mechanical Engineering GPA 8.21 / 10

TECHNICAL SKILLS

Coding Languages: C, C++, Python, MATLAB
CAD: Solidworks, Fusion 360
Software Development tools: Docker, Bamboo, Git, CMake
Other Skills: ROS, Simulink, Simscape, Linux, Cura, Jira, OpenCV, NumPy, Matplotlib

WORK EXPERIENCE

Software Engineering Intern, Surgical Robotics | Medtronic | *Jira, Git, Agile Scrum* | May-August 2022

- Worked on HUGO Surgical robot and its controllers and aided in the development of its end effector, the surgical instrument.
- Used Simulink to implement a controller to govern robot logic when a surgical instrument is exchanged.
- Designed and conducted surgical instrument torque and force control tests to analyze instrument data during operation.
- Used Stateflow to integrate a state machine that performs error logging during operation.
- Utilized MATLAB Simulink, Stateflow, and Atlassian collaboration tools to develop, test and deploy software on HUGO.

Graduate student researcher AI4CE Lab | NYU | September 2022 - Present

- Building a dataset containing real-world LiDAR, 360-degree camera, and GPS data from the perspective of two cars.
- Captured point cloud data using the Velodyne Puck Hi-Res LiDAR and RGB data using an Insta360 One X2 camera.
- Utilized rapid prototyping and CAD to develop a sensor mount to carry the LiDAR camera system.
- Achieved LiDAR-camera sensor calibration.

RELEVANT PROJECTS

Quadrotor simulation, motion planning, and optimal control | *Python, Numerical Optimization* | [\[Link\]](#) November 2022

- Developed a controller to make a quadrotor perform acrobatic moves and keep it stable under random wind disturbances.
- Performed acrobatic moves by using the iterative linear-quadratic regulator algorithm to find the locally optimal trajectory.
- Implemented an infinite-horizon linear-quadratic regulator to stabilize the quadrotor under random wind disturbances.

Q-Learning to invert a pendulum | *Python, Reinforcement Learning* | [\[Link\]](#) November 2022

- Implemented Q-Learning to find the optimal sequence of controls to swing a pendulum up, invert and balance it upside down.
- Used an epsilon-greedy policy to search the state space randomly and improve the learning progress.

Micro Aerial Vehicle state estimation | *MATLAB, Localization, Sensor Fusion* | [\[Link\]](#) April 2022

- Developed a vision based 3D pose estimator which calculates the position and orientation of a drone via perspective projection.
- Utilized the optical flow of tracked features on the April tag mat to estimate the linear and angular velocity of the MAV.
- Implemented an Extended Kalman Filter to accurately track MAV state using the onboard IMU and Vicon data.

Line follower object detection and avoidance robot | *C, Python, Fusion 360, Parallel processing* | [\[Link\]](#) April 2022

- Developed an automated bot that can follow visual lines and detect objects.
- Programmed a multicore Propeller-1 microcontroller to simultaneously execute line-following, object detection, and avoidance.
- Achieved ArucoTag detection using OpenCV on a Raspberry Pi 4 while establishing cross-microcontroller communication in real-time.

Robotic knee brace | *C++, Solidworks, Arduino* | June 2020

- Built a 3D printed robotic knee brace using an array of force sensitive resistors and a servo motor intended for rehabilitation and support for the elderly by helping reduce the load on their knees.