Allan Garcia-Casal

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EDUCATION

Northwestern University **Evanston, IL**
M.S. in *Robotics* *December 2023*
Courses: Robotic Manipulation, Sensing and Navigation for Robotics, Embedded Systems in Robotics, Theory of Machine Dynamics, Intro to Mechatronics, Intro to Artificial Intelligence, Machine Learning, Biomedical Applications in Machine Learning, Machine Learning Applications with Wearable Devices

Boston University **Boston, MA**
B.S. in *Biomedical Engineering* *May 2022*

SKILLS

Programming Languages*:* C++, Python, C, MATLAB
Robotics*:* Robot Operating System (ROS2/ROS), SLAM, Robot Kinematics and Control, Motion Planning, Simulation, Gazebo, Moveit, Computer Vision, Machine learning, CoppeliaSim
Software*:* Git, Linux, Bash, CMake, Docker, PyTorch, Keras, Real Time Operating Systems (Zephyr), Point Cloud Library (PCL), MeshLab
Hardware*:* Circuit Design, CAD/SolidWorks, PCB Design (KiCAD), Teensy 4.x

WORK EXPERIENCE

Stryker, Robotic Platform Accuracy and Registration **Weston,FL**
R&D Engineering Intern *June 2023 - September 2023*
- Designed and built a physical system that tests the dynamic cutting accuracy of the Mako surgical robotic platform
- Used MATLAB/C for control of the dynamic test setup and for data analysis
- Built a new surgical probe prototype that will allow for more accurate bone registration for the robot

Brigham and Women's Hospital, Department of Radiology **Boston, MA**
Image Guided Surgery Software Research Intern *June 2021 - August 2021*
- Enhanced 3D mesh registration from MRI scans using Python Point Cloud Library's ICP methods
- Utilized the point cloud library for segmentation and registration, optimizing 3D mesh processing from MRI scans

SELECT PROJECTS

Simultaneous Localization and Mapping (SLAM) from Scratch (ROS2, C++) *Winter 2023*
- Implemented Extended Kalman Filter SLAM pipeline from scratch in a ROS2 C++ package for use on a Turtlebot3
- Developed C++ libraries for differential drive kinematics and rigid body transformations
- Utilized lidar data, odometry, and data association to evaluate the pipeline in a simulated environment

Adroit Robotic Arm Teleoperation (Python, ROS, PyTorch) *Winter 2023*
- Developed a Python ROS control package for teleoperation of an Adroit Robotic Arm using EMG/ IMU signals
- Integrated a CNN gesture recognition machine learning model for EMG signal classification
- Used Rviz for real time simulation of the robot arm and IMU movements

Prosthetic Elbow for Balance Adjustment (C, RTOS) *Spring - Fall 2023*
- Designed a prosthetic elbow that maps real time movements to a corresponding motor torque
- Created the embedded software stack using C with the Zephyr real time operating system (RTOS)
- Implemented a control algorithm that utilizes a PID controller to output calculated motor torque commands
- Developed a walking speed detection algorithm using filtered IMU data for real time motion monitoring

Franka Robotic Arm Motion Planning (Python, ROS2) *Fall 2022*
- Wrote a ROS2 package that allows a 7 DOF robot arm to autonomously prepare a cup of hot chocolate
- Created a Python API for ROS2 MoveIt that was utilized for trajectory planning and execution

KUKA YouBot Motion Planning Simulation (Python, CoppeliaSim) *Fall 2022*
- Developed a motion planner for the robot in Python using forward/inverse kinematics and PID control
- Tested different pick and place trajectories in simulation using CoppeliaSim

Robotic Arm Pen Tracker (Python, OpenCV) *Fall 2022*
- Implemented an object detection and tracking algorithm using the OpenCV Python library
- Utilized robot kinematic libraries for a px100 arm that allowed it grab the pen within its workspace

Pulse Oximeter Prototype (C, Arduino) *Spring 2021*
- Designed a prototype pulse oximeter using CAD
- Developed analog signal filtering and detection software on Arduino IDE

Human Tissue Cell Incubator (C, Arduino) *Fall 2019*
- Programmed an Arduino UNO to control the ambient temperature of a tissue cell incubator
- Developed basic control algorithm that used thermistor temperature data to control heaters and fans in the enclosure

AWARDS

Hispanic Scholarship Fund Scholar 2021, 2023