

# ALLAN GARCIA

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## EDUCATION

### Northwestern University

*M.S in Robotics*

**Evanston, IL**

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

*B.S in Biomedical Engineering*

**Boston, MA**

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

*R&D Engineering Intern*

**Weston FL**

June 2023 - August 2023

- Designed and built a physical system that tests the 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

*Image Guided Surgery Software Research Intern*

**Boston, MA**

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

## SELECTED PROJECTS

### Simultaneous Localization and Mapping (SLAM) from Scratch (ROS2, C++)

January 2023 - March 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)

January 2023 - March 2023

- Created 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
- Simulated real time movements of the arm and IMU in Rviz

### Prosthetic Elbow for Balance Adjustment (C, RTOS)

March 2023 - December 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)

October 2022 - December 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)

October 2022 - December 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)

September 2022

- Integrated an object detection and tracking algorithm using the OpenCV Python library
- Employed robot kinematic libraries for a px100 arm that allowed it grab the pen within its workspace