

# Allan Garcia-Casal

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## **EDUCATION**

### **Northwestern University**

*M.S. in Robotics*

*Select Courses:* Machine Learning, Intro to AI, Robotic Manipulation, Embedded Systems, Sensing and Navigation for Robotics (SLAM) in C++

**Evanston, IL**

*December 2023*

### **Boston University**

*B.S. in Biomedical Engineering*

**Boston, MA**

*May 2022*

## **SKILLS**

*Programming:* C++, Python, C, MATLAB

*Robotics:* Robot Operating System (ROS2/ROS), SLAM, Robot Kinematics and Control, Simulation, Gazebo, Moveit, OpenCV, Machine learning

*Software:* Git, Linux, CMake, Docker, PyTorch, Keras, Real Time Operating Systems (Zephyr)

*Hardware:* Circuit Design, CAD/SolidWorks, PCB Modeling

## **PROFESSIONAL EXPERIENCE**

### **Stryker, Robotic Platform Accuracy and Registration**

**Weston, FL**

*R&D Engineering Intern*

*June 2023 - September 2023*

- Created 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
- Developed 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 Research Intern*

*June 2021 - August 2021*

- Optimized the registration of 3D meshes from MRI and CT scans
- Used Python point-cloud libraries for image segmentation and registration

## **SELECT PROJECTS**

### **EKF SLAM For Differential Drive Robot**

- Implemented Extended Kalman Filter SLAM from scratch on a Turtlebot3 using ROS 2 and C++
- Utilized lidar data, odometry, and data association to evaluate the pipeline in a simulated environment

### **Adroit Robotic Arm sEMG Teleoperation**

- Developed control package in Python and ROS that allows for teleoperation of an Adroit Robotic Arm using a Myo Gesture Armband
- Integrated a CNN gesture recognition machine learning model into a ROS control pipeline for the Adroit
- Used Rviz for real time simulation of the robot arm and IMU movements

### **Prosthetic Elbow for Balance Adjustment**

- Creating a prosthetic elbow that maps real time movements to a corresponding output motor torque for balance adjustment
- Developing the motor control software using C with the Zephyr RTOS on the Teensy 4.1 board
- Designed a PCB for the system components

### **Franka Robotic Arm Motion Planning**

- Developed software in Python and ROS2 that allows a 7 DOF robot arm to autonomously prepare a cup of hot chocolate
- Created an API in Python for the ROS2 MoveIt motion planning package to use for the trajectory planning

### **Robotic Arm Pen Tracker**

- Used an Intel RealSense camera to detect a pen and then had a px100 robotic arm grab it
- Implemented an object detection and tracking algorithm using the OpenCV Python library

### **MRI Compatible EEG Layer Design**

- Designed MRI compatible EEG cap layer that helps attenuate noise from EEG/MRI readings
- Developed several cap designs using different insulating fabrics and conductive inks
- **Submitted for Publication:** Levitt, Yang, Williams, Lutschg, Garcia-Casal, Lewis, "EEG-LLAMAS: an open source, low latency, EEG-fMRI neurofeedback platform"

### **Pulse Oximeter Prototype**

- Designed a prototype pulse oximeter using CAD
- Developed analog signal filtering and detection software on Arduino IDE