

# ADRI RAJARAMAN

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## EDUCATION

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### Worcester Polytechnic Institute, MA

Master of Science in Robotics Engineering

Aug 2021 – Dec 2023

### Manipal University, India

Bachelor of Technology in Electronics Engineering (Minor in Embedded Systems)

Aug 2015 – Jun 2019

## SKILLS

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**Control & Estimation:** PID, Adaptive Control, Robust Control, MPC, Feedback Linearization, EKF, Sensor Fusion

**Embedded & Programming:** C++, Embedded C, Python, MATLAB/Simulink, Real-Time Systems

**Signal Processing & Sensors:** IMU, ToF, LiDAR, Cameras, EMG, Filtering & Feature Extraction

**Mechatronics & Hardware:** Motors, Heaters, Fans, PCBAs (Eagle, KiCAD), Electromechanical Prototyping

## EXPERIENCE

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### SharkNinja | Robotics Engineer

Mar 2024 - Present / Jun 2022 – Dec 2022

- Depth Estimation with a Single Camera: Zero-shot transfer for relative depth by creating a dense point cloud for object detection. Developed a sensor-fusion algorithm using a RGB camera and 2D LiDAR for 3D depth.
- Implemented, tested, validated, and shipped a new robot UI using capacitive touch buttons.
- Developed heated pad dry and pad wash features for a robot vacuum, including PID control of heaters and boilers to meet KPIs while complying with IEC standards.
- Evaluated and iterated on PCBAs for sensors and motors, supporting system-level optimization and reliability
- Implemented, tested, validated, and shipped a new robot UI using capacitive touch buttons, ensuring robustness, usability, and safety

### Harvard Medical School | Research Intern

May 2023 – Aug 2023

- **Magnetically Actuated Suturing Device** (under *Prof Nobuhiko Hata*)
- Designed and built a prototype electromechanical device to actuate magnetic suturing needles using custom-designed electromagnets.
- Designed and fabricated electromagnets from scratch; modeled magnetic field intensity in MATLAB to inform hardware geometry and control limits.
- Developed closed-loop control algorithms with feedback linearization for precise needle actuation under sensing and actuation constraints.
- Implemented real-time needle tracking using probabilistic Hough transforms and validated system performance on agar and gelatin phantoms using camera and fluoroscopic imaging.

### Worcester Polytechnic Institute | Research Assistant

Sep 2021 – Dec 2023

- **Concentric Tube Robots for Minimally Invasive Surgery** (under *Prof Loris Fichera*)
- An open-source *robot and framework*, using additive manufacturing techniques for designing patient-specific devices
- Implemented inverse kinematics using Euler-Bernoulli beam equations & Energy Minimisation for a two tube robot.
- Used a stereo camera for motion capture to validate the beam mechanics and inverse kinematics.

### Indian Institute of Science (IISc) | Research Assistant

Jan 2019 – Feb 2021

- **Wearable Motion Capture and Musculoskeletal Assessment System**
- Designed and deployed a wearable sensing system using inertial sensors for full-body motion tracking.
- Implemented real-time state estimation using Extended Kalman Filters with gait calibration.
- Developed and deployed embedded software in Embedded C and C#, operating under real-time and wireless communication constraints.
- Implemented real-time mapping of human motion to a virtual mannequin in Unity3D, with WiFi-based data transmission from embedded sensor nodes.

### Chinese University of Hong Kong (CUHK) | Junior Research Assistant

Jun 2018 – Jul 2018

- **Functional Electrical Stimulation for Rehabilitation:** A rehabilitative cycling system for stroke patients with surface electrodes for muscle actuation and EMG sensors for feedback. Developed a *mixed-domain algorithm* to remove real-time artefacts in EMG data and adaptive control for electrical stimulation (under *Prof Raymond Tong*).

## PROJECTS FOR COMPETITIONS

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**QuickTri (2020):** Non-contact estimation of heart rate, respiratory rate and blood-oxygen saturation levels using photoplethysmography through the camera sensor of a smartphone or laptop (*Winners at MIT COVID-19 Hackathon*).