ADRI RAJARAMAN
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EDUCATION

Worcester Polytechnic Institute, MA
Master of Science in Robotics Engineering   *Aug 2021 – Dec 2023*

Manipal Univeristy, India
Bachelor of Technology in Electronics Engineering (Minor in Embedded Systems)   *Aug 2015 – Jun 2019*

SKILLS

Languages & Software: Python, C++, C#, OpenCV, MATLAB, ROS, Gazebo, ITK/VTK, 3D Slicer, Unity3D

Design and Prototyping: Control Algorithms: *Robust, Adaptive, Impedance, Feedback Linearization, Motion Predictive Control*, EMG sensors, IMU's, Medical Imaging (*Fluoroscopy, Ultrasound*), CAD and Simulation (using SolidWorks, Autodesk Fusion360 and Inventor), PCB Design and Fabrication (using Altium, Eagle and KiCAD)

EXPERIENCE

SharkNinja | Robotics Engineer   *Mar 2024 - Present/ Jun 2022 – Dec 2022*
- **Depth Estimation with a Single Camera**: using a deep learning and an encdoder-decoder architecture.
- Zero-shot transfer for absolute and relative depth by creating a dense point cloud for object detection/classification.
- Developed a sensor-fusion algorithm using a RGB camera and 2D LiDAR for 3D depth perception.

Harvard Medical School | Research Intern   *May 2023 – Aug 2023*
- **Magnetically Actuated Needles for Subcutaneous Suturing** (under *Prof Nobuhiko Hata*)
- Developed a prototype device and control algorithms to actuate magnetic suturing needles using electromagnets.
- Implemented needle tracking using probabilistic Hough transforms with feedback linearization.
- Validated the model on agar and gelatin phantoms using a webcam & fluoroscope imaging under a C-Arm fluoroscope.

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.

Radical Health | Hardware Design Engineer   *Mar 2021 – Jul 2021*
- **Non-mydriatic Fundus Imaging:** Designed and developed a camera to capture the image of the retina of the human eye using infrared spectrum imaging. Worked on segmentation of the retinal vasculature using openCV.

Indian Institute of Science (IISc) | Research Assistant   *Jan 2019 – Feb 2021*
- **Ultrasound Probe Pose Estimation with an articulated arm:** (under *Prof Manish Arora*)
- A deep-learning algorithm to estimate the relative pose between consecutive images in an ultrasound scan/sweep.
- Obtained a 3D reconstruction of the ROI from the scaneed images using voxel filling algorithms in 3D Slicer.
- **Musculo-Skeletal Burden Assessment:** Determining the burden on body segments using motion capture.
- A suit with inertial sensors were used with an Extended Kalman filter, along with a gait tracking calibration.
- Implemented real-time mapping to a virtual mannikin in Unity3D, using WiFi for data transmission from sensors.

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

SpaceGoat (2022):   A quadruped with a novel transmission system using a centralised actuator that decouples the input torque and speed for each degree of freedom, for the NASA BIG Idea Challenge (*YouTube video submission*)

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

Drishya (2018):   A headset to help the visually impaired better navigate roads in India by classifying nearby objects as obstacles and giving non-intrusive feedback to the user (*Winners at Provenance, MUTBI Business Plan Competition*).

Pole Climbing robot (2017):   Designed and manufactured a working prototype for a 3 DOF pole climbing robot using pneumatic systems which mimic the motion of caterpillars. (*Stood 10th out of 115 teams at ABU Robocon 2017*)