# BHARATH KUMAR RAMESH BABU

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## EDUCATION

**Worcester Polytechnic Institute** (WPI) August 2021 - August 2023
Masters Degree, Robotics Engineering.

**Relevant Courses:** Current Semester: Computer Vision, Vision Based Robotic Manipulation, Foundation of Robotics, Spring Semester: Robot Dynamics, Motion Planning, Deep Learning.

**National Institute of Technology, Trichy** (NIT-T) (CGPA: 7.8/10) July 2016 - September 2020
Bachelor Degree, Instrumentation and Control Engineering.
Minor Degree, Computer Science Engineering.

**Relevant Courses:** Control Systems, Image Processing, Neural Networks, Engineering Mechanics, Embedded Systems, Data Structures and Algorithms.

## TECHNICAL SKILLS

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|---|---|
| **Programming Languages** | **Proficient:** Python, **Intermediate:** C, C++, C#, Embedded C |
| **Software Skills** | **Proficient:** ROS, Matlab, Simulink, Linux<br>**Intermediate:** Unity, Gazebo **Beginner:** Blender, Fusion 360 |
| **Areas of Interest** | Robotics, Perception, Control Systems, Motion Planning, AI |

## WORK EXPERIENCE

**Robotics Engineer, Flytbase**, Pune, India July 2020 - May 2021

- Developed a drone-based warehouse inventory automation product (FlytWare) end to end. Developed features for a drone surveillance product (FlytNow) as per customer needs.
- Created segmentation models, designed pose estimation algorithms, implemented slam module, implemented barcode detection pipeline to progress FlytWare to the stage of deployment.
- Developed web APIs for path planning and navigation of drone across flight restricted areas and improved the reliability of the drone fleet management feature in FlytNow.

## RESEARCH EXPERIENCE

**Research Intern** (Fault Tolerant Control of a Quad-rotor using Super-Twisting SMC) May - July '19
*Artificial Intelligence and Robotics Lab,* **Indian Institute of Science** *,Prof Suresh Sundaram*

- Developed PID, LQR and SMC control for a Parrot drone model with and without an absent rotor and carried out comparative analysis in Matlab.
- Implemented and simulated Super-Twisting Sliding Mode Controller and designed a Control Allocation algorithm for robust trajectory tracking of the Quadrotor under faulty circumstances.
- Achieved stable landing of the drone in simulation with 70% underactuation in one of the rotors.

**Research Intern** (Control of Medical Assistive Devices using Electroocculography) May - July '18
*Biomedical Instrumentation and Signal Processing Lab,* **IIT Madras** *Prof Ramasubba Reddy*

- Designed a python interface to acquire and process the electrooculography signals obtained from the electrodes of ADS1299 signal acquisition board.
- Designed a filter to classify the eyeball movements using steady state visually evoked potential of electroocculography signals achieving 98% accuracy with realtime output.
- Developed a deep neural net to classify the processed signals into eye ball movements. Achieved an accuracy of 88%. Controlled a custom designed messaging software using the extracted eyeball movements.

## UNDERGRADUATE PROJECTS

**Autonomous Indoor Agricultural Robot** Dec 2017 - Mar 2018

- Built a wheeled robot that can map and navigate indoor farmlands using ROS navigation stack with Kinect's RGB-D data and wheel/IMU odometry.
- Built plowing, sowing and spraying mechanisms on the robot.
- Developed an android application for monitoring of the sensor data.

**Shadow Detection and Removal** Dec 2018 - Jan 2019

- Implemented an unsupervised segmentation algorithm for detection and segmentation of the image into sub regions.
- Designed a pipeline to extract the texture features from the sub regions, match the subregions and transfer the illuminance across subregions to remove the shadow.

**Robotic arm control using EEG** Dec 2018 - Dec 2019

- Designed a 4-DOF pick and place manipulator and simulated in Gazebo. Implemented end effector path planing and control using MoveIt ROS package.
- Designed a CNN classifiers for the classification of Motor imagery and EOG signals from OpenBCI ganglion.
- Developed a novel PDMS membrane for haptic feedback mechanism.

**Self Driving Autonomous Robot** Dec 2018 - Mar 2019

- Built a differential bot to drive through lanes using path segmentation and PID control with visual feedback. The bot also abides to traffic signs using image processing techniques.

**Impedance Control of a 2DOF upper arm exoskeleton** Dec 2019 - Apr 2020

- Designed a solid model of the exoskeleton in Fusion 360. Implemented impedance control and gravity compensation for end effector tracking of the exoskeleton. Implemented and simulated the exoskeleton model in MATLAB.

## POSITIONS OF RESPONSIBILITY

- Researcher at **Spider R&D**, Research and Development Club of NIT-T
- Robotics Teacher at, **Sensors**, Instrumentation and Control Engineering Symposium, NIT-T
- Teaching volunteer at **U&I**, a charitable organization for education of underprivileged students
- Deputy Manager at **Festember**, National level cultural festival of NIT-T
- Event Manager at **Pragyan**, ISO certified techno-managerial festival of NIT-T