

# Tharun V Puthanveetil

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## EDUCATION

### University of Maryland

*Master of Engineering in Robotics (3.87/4.0)*

Aug. 2022 – May 2024

*Maryland, USA*

### Vellore Institute of Technology

*Bachelor of Technology in Electronics and Communication (GPA:8.59/10.0)*

Jul. 2014 – Apr 2018

*Vellore, India*

## EXPERIENCE

### Robotics Intern

*CATT Labs*

Feb 2023 – Present

*Maryland, USA*

- Developing an anomaly detection model to identify and report behaviors that deviate from the robot's normal baseline nature.
- Analyzing and assessing security vulnerabilities in the autonomy stack of Unmanned Ground Vehicles(UGVs)
- Implementing custom autonomy stack in UGVs for search & exploration tasks.

### Graduate Research Assistant

*Perception and Robotics Group, UMD*

Nov. 2022 – Present

*Maryland, USA*

- Working on "Human-Robot Interaction using Multi-Modal interaction schemes" under **Dr.Yiannis Aloimonos**
- Implemented an Imitation Learning-based policy to learn robot action space from human demonstration, speech, and gestures.

### Research Intern

*Indian Institute of Science*

June 2021 – Dec. 2021

*Bangalore, India*

- Implemented a robotic manipulator based *Precision Weeding Robot* to optimize pesticide usage in indoor farms.
- Developed YoloR-based crack detection algorithm with 94% accuracy for asset inspection challenge at IROS21.
- Implemented an encoder-decoder-based Monocular Depth Estimation model using the NYU Dataset.
- Conceptualized a poster on "Event-based Dynamic Obstacle Avoidance in Outdoor Environments" for IROS21.

### Project Engineer

*CTO Office, Wipro Digital*

Jul. 2018 – May 2021

*Bangalore, India*

- Served as the **AI Team Lead** and designed the yearly project lineup for the Innovation team of Wipro.
- Implemented a 2D CNN-based real-time tool tracking and detection system using a Leap Motion controller to identify and track tools in the user's hand and provide real-time assistance with hardware assembly.
- Developed a Transfer Learning based car model detection module with 96% accuracy using Tflite for an insurance solution targeted for mobile apps.
- Implemented vision and learning-based algorithms for *My Style*, Wipro's top 2 retail solutions for the year 2020.

### IOT Specialist

*IB Hubs*

May 2017 – July 2017

*Bangalore, India*

- Performed functionality test for STM-based dev boards like *Maple Mini & Blue Pill* for *IB Cricket* smart bat.
- Used core IOT protocols like MQTT, and COAP to design IOT projects for educational demos.

## PUBLICATIONS

- [1] **Tharun V. P.**, Abhra Roy Chowdhury, (2021) "Application of Mobile Collaborative Robot using Deep Learning in Precision Weed Control of Large Farms". In: Big Data Analytics in Agriculture: Algorithms and Applications, Academic Press, Elsevier 2021 [manuscript]
- [2] **Tharun V. P.**, Ramya, P., Renuga Devi, S. (2021) "A Univariate Data Analysis Approach for Rainfall Forecasting". In: Communication and Intelligent Systems. Lecture Notes in Networks and Systems, vol 204. Springer, Singapore. [manuscript] [link]
- [3] **V. P. Tharun**, R. Prakash, S. R. Devi. (2018) "Prediction of Rainfall Using Data Mining Techniques". In: Second International Conference on Inventive Communication and Computational Technologies (ICICCT),2018 [link]
- [4] L. P. Pratap, P. M. Shailendrasingh, A. Anand and **V. P. Tharun** (2017). Wall climbing robot using soft robotics. In: IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI) [link]

## PATENTS

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### **AGGRIP** (*In Progress*) [link]

Oct 2021 – Present

- Developed an innovative gripper for manipulators to perform precision weeding(plucking and spraying) catering to the detected weed type.
- The unique design ensures minimal contact with non-weeds using an adaptive vision-based control mechanism.

## TECHNICAL SKILLS

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**Programming:** Python, C/C++, SQL (mysql), JavaScript, HTML/CSS, Matlab, Labview, Docker

**AI/ML/Data Science:** Tensorflow, Pytorch, OpenCV, Keras, Tableau

**Robotic Platforms:** Turtlebot 2, Turtlebot 3, Delta, OpenManipulator-X, Husky

**UI/UX/AR/VR/MR/Simulation:** Unity, Three.js, A-frame, AR.js, Vuforia, Gazebo, Rviz

**Embedded/IOT/Robotics:** ROS, MQTT, HTTP, Socket, Softrobotics

## PROJECTS

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### **Leonardo - Autonomous Retrieval UGV** | *Python, Arduino, OpenCV*[video]

June 2021 – Sep 2021

- Constructed a Barron robot equipped with an integrated IMU, Encoder, and Rpi camera.
- Developed a tailored software stack encompassing robotic controls, object detection, motion planning, object manipulation, localization, and mapping.

### **Auto Platoon** | *Python, Matlab, OpenCV, Tensorflow, Pytorch, Flask*[video] [link]

June 2021 – Sep 2021

- Deployed a bio-inspired multi-agent leader-follower system for energy-efficient transportation.
- Created a YoloV7-based custom agent tracking algorithm incorporating dynamic obstacle avoidance.
- Developed a connected-vehicle communication strategy featuring a customized motion planner and low-level controller.

### **Autonomous Weeding Robot** | *Python, Matlab, OpenCV, Tensorflow, Pytorch*[video]

June 2021 – Sep 2021

- Implemented a robotic manipulator-based precision weeding robot for optimizing pesticide usage in indoor farms.
- Created a YOLOR object detection model trained on augmented synthetic data for weed localization.
- Implemented an Inverse Kinematics solver based on a feed-forward neural network for precise manipulation.

### **AI Cricket Coach** | *Python, OpenCV, Tensorflow, HTML, CSS, Angular.js, Unity* [link]

Jul 2020 – Present

- An AI-backed solution that classifies bowl types based on video feeds and provides batsmen with end-to-end coaching assistance in a WebVR environment.
- Developed a Body Pose Estimation plugin to provide batting pose correction feedback.
- Implemented a custom bowl classification model using 3D CNN trained on synthetic data generated in a VR Game.

### **my Style** | *Python, OpenCV, Tensorflow, Pytorch, Mysql, Flask*[link] [video]

Jun 2019 – Sep 2019

- An end-to-end AI-powered shopping app.
- Implemented a human body measurement extraction module based on 2D photogrammetry & Body Pose Estimation that enables real-time 3D human body reconstruction(Customer Digital Twin).
- Modelled a Content-based recommendation engine for apparel recommendation.
- Developed a GAN-based product customization model for dynamic apparel styling.
- Implemented a fit analyzer model that evaluates the fit of the chosen apparel in terms of a 'Fit %' metric.

**Other Robotic Projects:** | [Pizzaro] | [ACO - RRT\*] | [Irona] | [Robobutler]

Aug 2022 – May 2023

**Other AI/ML Projects:** | [Virtual Try-On] | [RL Cricket Simulation Engine]

July 2018 – Aug 2019

## ACHIEVEMENTS

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### **RAMI Cascade Campaign - IEEE/RSJ IROS 2021**[link]

- Secured 3rd place for providing an aerial robotic solution for asset Inspection and Management (I&M).

### **Late Breaking Results - IEEE/RSJ IROS 2021**[link]

- Poster on "Event-based Dynamic Obstacle Avoidance in Outdoor Environments" accepted amongst the top 25 posters for a presentation.

### **Winter School Projects - IEEE RAS 2021**[link]

- Finished as one of the Top 2 teams to complete 4/4 tasks with a presentation for a challenge on "SLAM in Deformable Environments"

### **National Retail Federation 2020 - Top 2 Solution**[link]

- Led a team into developing and designing a retail solution that was shortlisted for a showcase at NRF 2020, a retail-based exhibition held at New York inaugurated by Satya Nadella, CEO of Microsoft.