

# PAVAN KALYAN MAJJIGA

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## EDUCATION

**M.S, Robotics and Autonomous Systems; Systems Engineering, Arizona State University, Tempe, AZ** **Graduated December 2024(4.0/4.0 GPA)**  
**B.tech, Mechanical Engineering, National Institute of Technology Warangal, India** **Graduated August 2020**

## SKILLS

- **Computer Science, Artificial Intelligence, Machine Learning, Deep Learning, Reinforcement Learning, CUDA Programming**
- **Perception in Robotics, Localization and Mapping, Motion Planning, Bayesian Learning**
- **Frameworks** : ROS, ROS2, TensorFlow, Pytorch, OpenCV
- **Hardware** : Arduino, Raspberry Pi, Jetson Nano, Event Cameras, Depth Cameras, Lidars
- **Programming** : Python, C++, JavaScript, HTML, CSS, MATLAB

## PROFESSIONAL EXPERIENCE

**Graduate Research Aide (Robotics Software Engineer): DREAMS LAB, Arizona State University** **Jan 2023-Present**

- **HDR SLAM:** Developed a High Dynamic Range SLAM system utilizing event cameras, intensity cameras, IMU sensors, LIDARS, improving localization and mapping capabilities in high dynamic scene areas by 30%.
- **Lunar Autonomy Challenge (LAC):** Developed an autonomous agent to navigate and map the lunar surface in a custom CARLA simulator, using sensor data from stereo cameras and IMU sensors, as a part of Lunar Autonomy Challenge (LAC).
- Achieved 3<sup>rd</sup> place in the first round of the challenge with my team, achieving mapping productivity of 100%, localization of 100%, and securing 75.4% of the top team's geometric and rock map score.
- Currently assisting in the design and execution of the Space Robotics and AI course, which is being taught by my mentor, contributing to the development and delivery of engaging, high quality content.

**Robotics Software Engineer: HC Robotics**

**Oct 2020- Dec 2022**

- Integrated computer vision systems for obstacle detection in UAVs using LiDAR and OpenCV stereo cameras, successfully preventing 15 potential collisions and ensuring safe navigation during flight missions.
- Engineered an advanced algorithm for precise target coordinate determination using a gimbal camera, significantly improving UAV target identification and tracking accuracy by 25%.
- Improved a highly accurate precision landing system using stereo cameras and AprilTag detection for the ArduPilot Flight Stack, achieving landings with an average error rate of less than 5 cm, ensuring safe landing.
- Supervised the assembly of 50 drones, conducted thorough pre-flight checks, expertly piloted drones during 100+ test flights, meticulously analyzed flight logs, and made necessary adjustments and enhancements to improve overall drone performance and reliability
- Developed an advanced person-tracking system using a Gremsy gimbal camera, significantly enhancing surveillance accuracy and boosting operational efficiency by 25%, enabling more effective monitoring.
- Enhanced localization and navigation accuracy by 20% by integrating visual-inertial odometry using OpenCV stereo cameras, combined with MAVLink protocols, utilizing ROS and PX4 to deliver robust UAV performance.
- Performed frame extraction and data cleaning on 500+ hours of video for person detection, boosting model accuracy by 20%. Utilized CVAT for labeling 10,000+ frames with bounding boxes and polygons, contributing to a 25% improvement in model performance.

## ACADEMIC PROJECTS

**Neural A\* Motion Planning for Differential Drive Robots**

**Jan 2024 – May 2024**

- Integrated and tested Neural A\* algorithm in a robot built by CAD modeling and simulated in ROS and Gazebo environments.
- Improved Neural A\* algorithms by changing the loss function to wasserstein function and compared the results with the original.
- Improved path-finding efficiency by 35%, and 40% reduction in node exploration, 30% increase in shortest path predictions, and 25% faster computation time compared to traditional Neural A\* algorithm.

**Edge Vision: User Defined Object-Counting**

**Aug 2023 – Dec 2023**

- Improved real-time object recognition and tracking by 40% by developing an innovative object-counting system that merged Raspberry Pi-4 and Camera Module V2 capabilities with the Faster R-CNN ResNet-50 model.
- Increased versatility of object detection applications by 60% enabling solutions for public safety and traffic monitoring across various scenarios.
- Validated system accuracy and reliability through extensive testing in diverse environments, achieving a 95% detection rate across different scenarios and confirming the solution's solid performance and real-world applications.

**Collaborative Scrabble Gaming: Cobot Interaction with Humans**

**Jan 2023 – Apr 2023**

- Enabled a cobot with a camera to autonomously compete against humans in Scrabble, enhancing interactive gameplay and automation.
- Developed a robust machine learning model to recognize English alphabet characters with 90% accuracy and decipher the game board.

**Comparative Analysis of GMapping and Cartographer SLAM Algorithms on ROS MasterX3 Robot**

**Jan 2024 – May 2024**

- Implemented Cartographer and gmapping SLAM Algorithms within ROS framework on the masterX3 robot platform
- Conducted comprehensive evaluations to determine the superior SLAM solution by comparing mapping accuracy, computational efficiency, and robustness of Cartographer and gmapping Algorithms.

**Sign Language Detection**

**Aug 2023 – Dec 2023**

- Developed a real-time sign language detection system using machine learning and computer vision to interpret live video feed into text.
- Leveraged image processing algorithms and an LSTM neural network, improving model efficiency by 50% over traditional neural nets.