Using AI and IoT to Optimize Smart Farming:

Integrating Robotics with Precision Agriculture

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Introduction/Background

- What is Internet of Things (IoT)?
- What is Smart Farming?
- Why IoT for Smart Farming?
- Importance of Agriculture in the Central Valley
- What is AI and Computer Vision?
- Automation Will Not Replace Jobs

Goal

- Objective:
  - Build a prototype of an IoT and AI-powered robot that reduces human intervention and detects plant diseases in row crops.
- Our Contribution:
  - Exploring TurboPi, an AI-powered robot
  - Designed and implemented a prototype and tested scenarios
  - Learned machine learning using Microsoft resources

Methodology

- Skill Set:
  - Python, Raspberry Pi, Azure Cloud, TurboPi, OpenCV
- Prototype Phases:
  - Implementing machine learning for image classification using Azure Custom Vision.
  - Using TurboPi, an AI-powered robot with a servo-mounted camera, to apply computer vision (OpenCV) for color recognition and autonomous navigation through line tracking.

Results

Image URL

Enter Image URL

or

Browse local files

File formats accepted: jpg, png, bmp
File size should not exceed: 4mb

Using model trained in

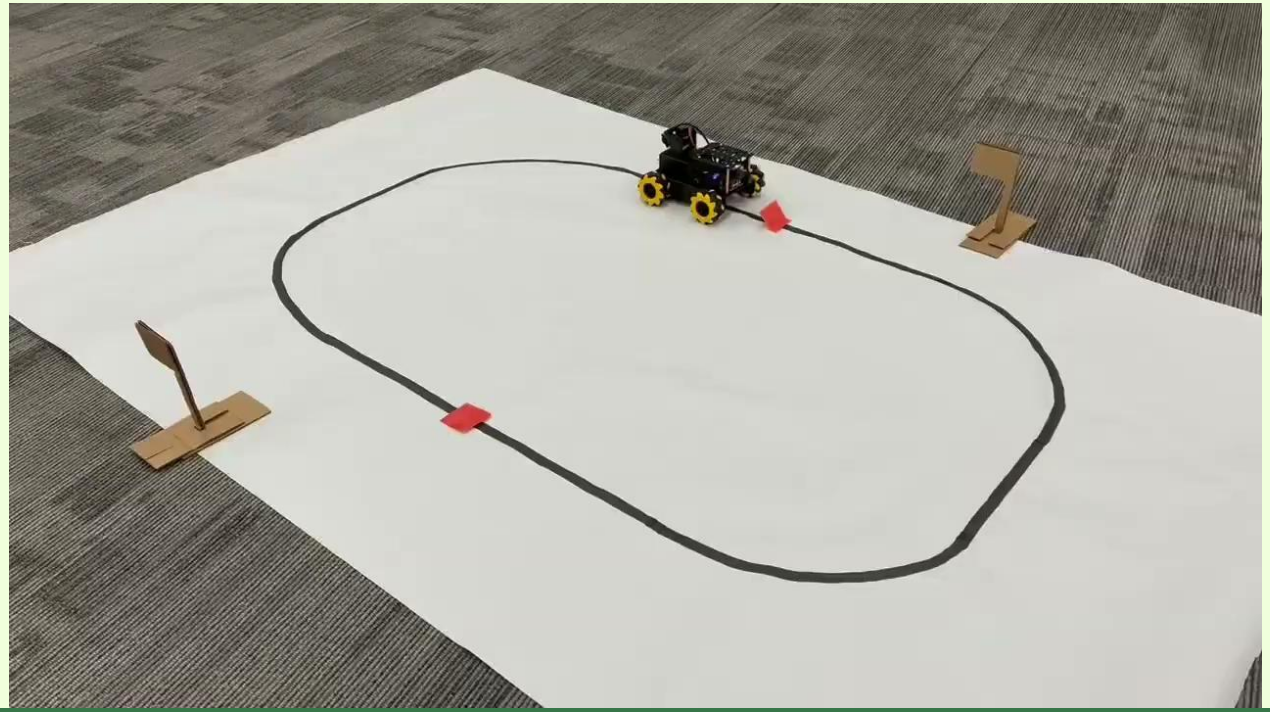
Iteration

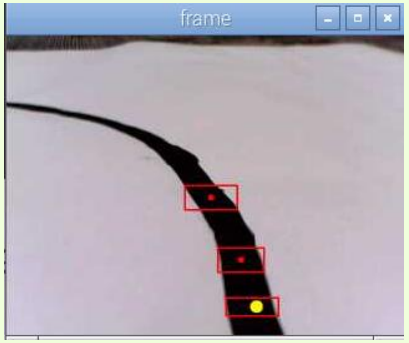
Iteration 1

Predictions

Tag	Probability
ripe	99.8%
unripe	0.1%

Demo/Results





Future Work

- Short-term Goals:
  - Integrate Machine Learning for Image Classification using Azure Custom Vision with TurboPi
  - Combine line tracking with color detection
  - Image Classification will be trained to detect tomato plants, determining which are unhealthy vs. healthy
- Long-term Goal:
  - Build a fully automated smart farm system with continuous real-time monitoring.

References

- Microsoft, Custom Vision, https://customvision.ai/
- Hiwonder, TurboPi, https://www.hiwonder.com/products/turbopi?variant=40112905388119&srsltid=AfmBOorjeOpNwwN59U4HQoguEGRlavDxtK-CNZ5pjcTlS67y6p8Md8Nz
- Raspberry Pi, Raspberry Pi 4B, https://www.raspberrypi.com/products/raspberry-pi-4-model-b/

Thank You

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