Zektor: AI in Vertical Farming
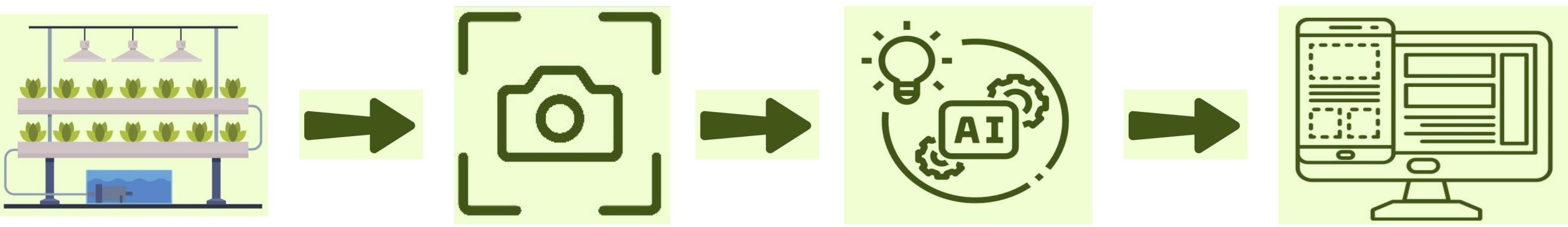
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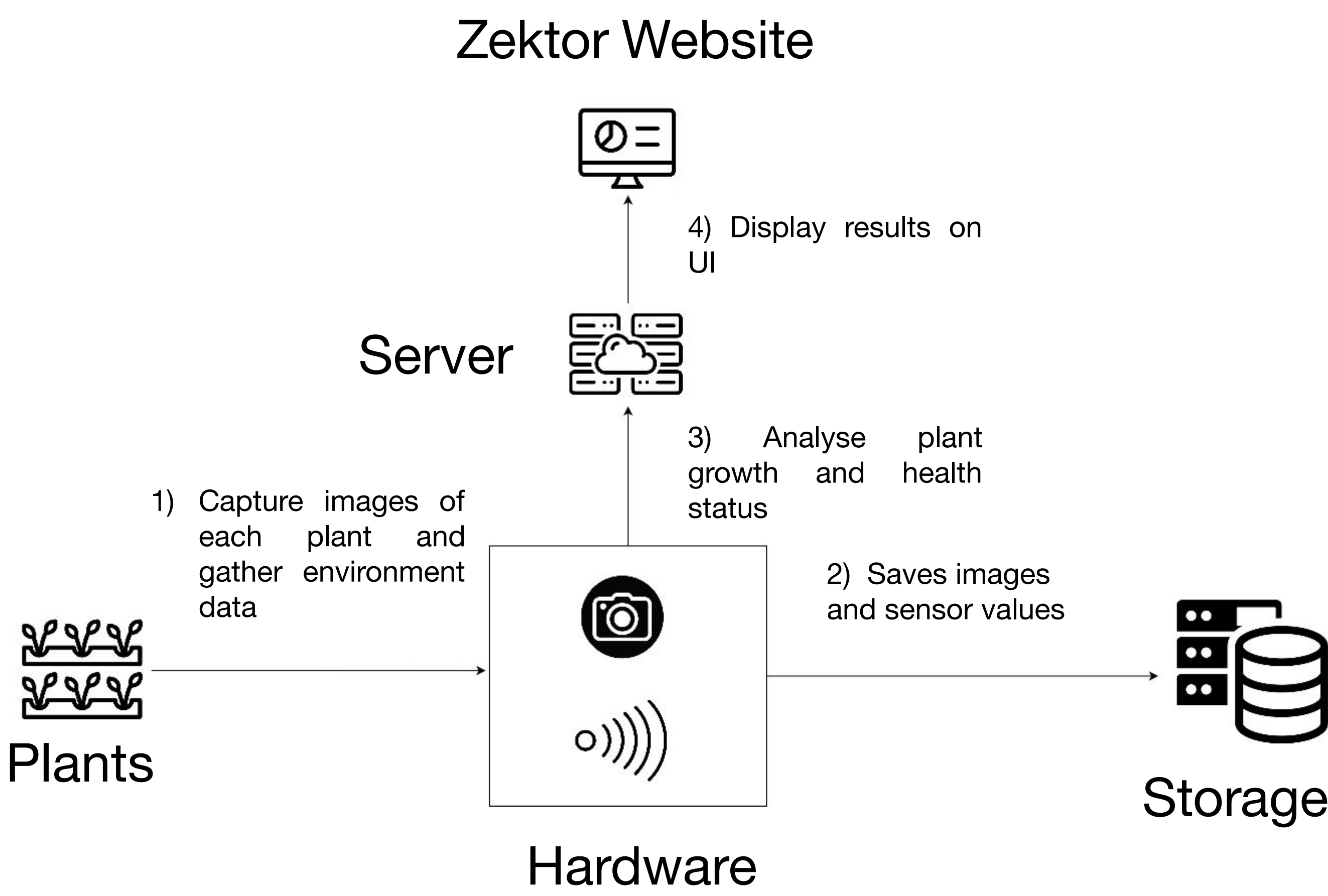Department of Computer Engineering

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Project Description / Objectives

- Zektor enhances agricultural efficiency and reduces human labor in hydroponic farming, through image processing, sensor technology and artificial intelligence.
- Zektor is a solution for the first step through automation: monitoring.
- Our automated image gathering system collects images of each lettuce plant regularly. The images are analyzed by AI to guess each plant's growth and health.
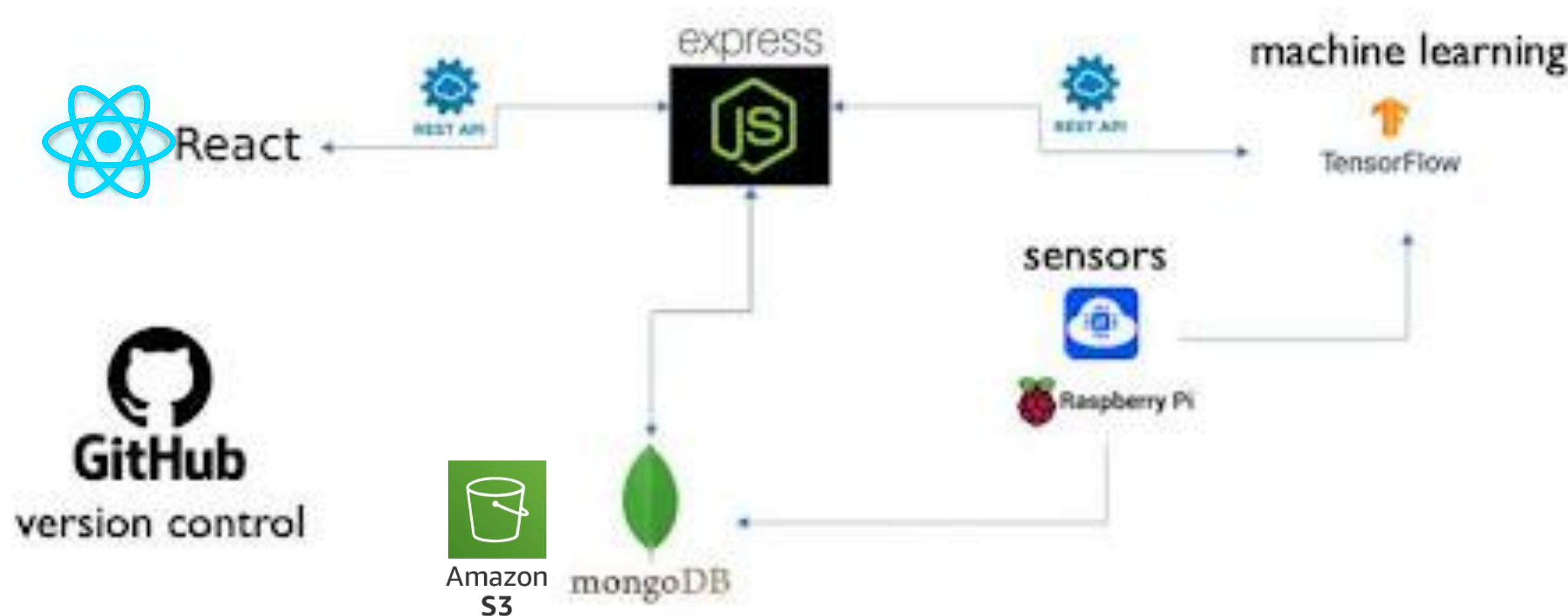- The results are displayed on a user-friendly UI.

System Design

Zektor Website

Server

4) Display results on UI

3) Analyse plant growth and health status

1) Capture images of each plant and gather environment data

2) Saves images and sensor values

Plants

Hardware

Storage

- Robotic part of the hardware moves along the rail, capturing images of each plant, while the stationary sensors gather environmental data for the entire setup.
- Model and Backend deployed on the virtual cloud computer, process the collected data to analyze plant growth (4-step development cycle) and healthy or unhealthy

System Architecture

React

express

machine learning

TensorFlow

REST API

REST API

sensors

GitHub version control

Amazon S3

mongoDB

Raspberry Pi

- NodeMCU controls the sensors and motor.
- Raspberry Pi controls the robotic hardware.
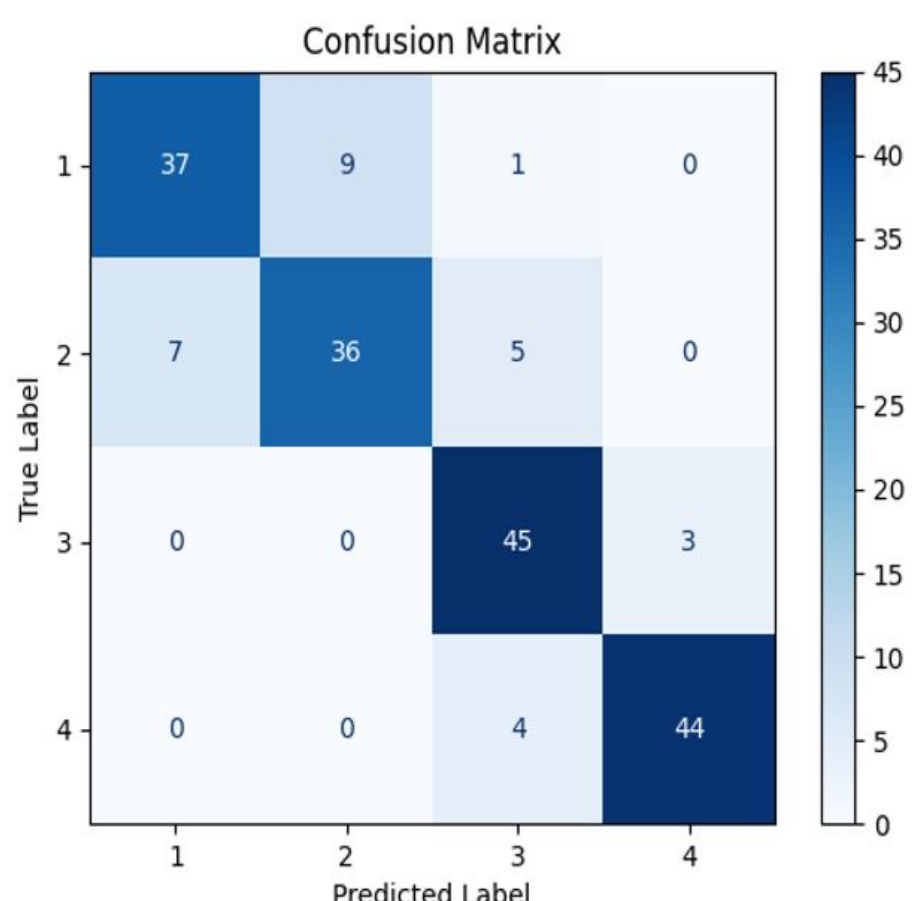- Images stored in the S3, metadata stored in the MongoDB.

Methods

- Hardware: Raspberry Pi & NodeMCU
- ML Models: Tensorflow
- Backend: Express & Node.js
- Frontend: React and Typescript
- Deployment: Amazon EC2
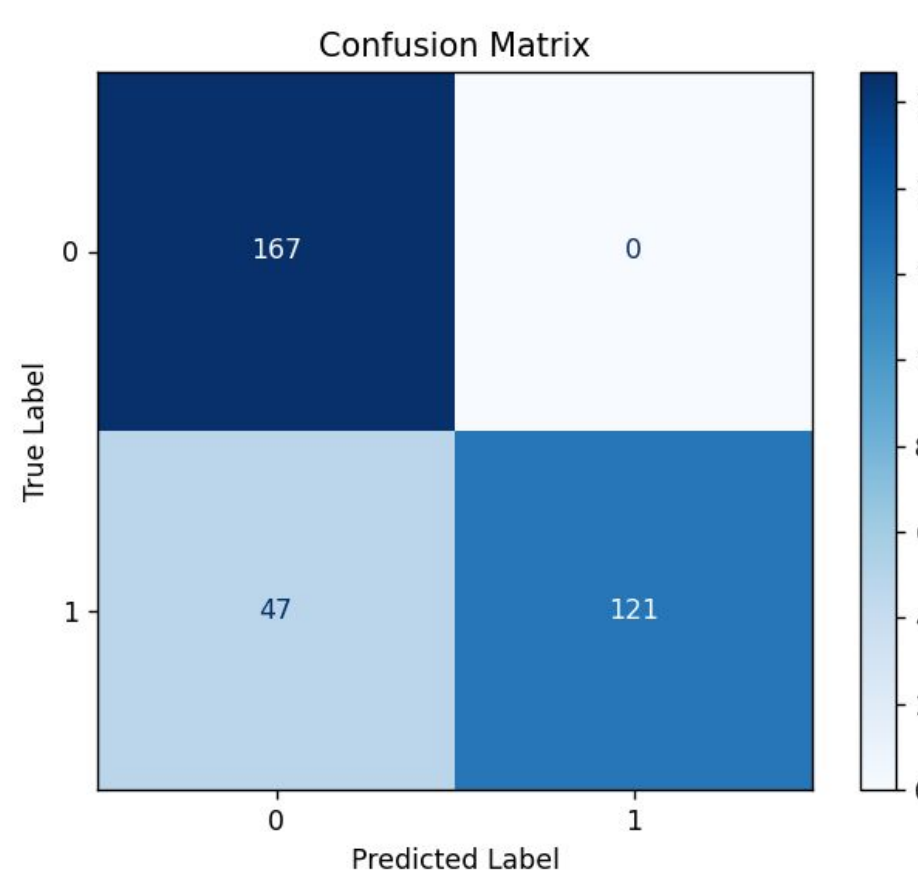- Storage: MongoDB Atlas & Amazon S3 Bucket

Results

Growth:

Health:

Accuracy: 0.85

Accuracy: 0.86

- Web Application Features
  - Predict Plant Harvest Time
  - Analyse Plant Health Status
  - 24/7 Controlled Farm Environment
  - Observe Plant Development Process

- Future Works
  - More Plant Types Analysis
  - Movement in Y and Z Axis