PROJECT REPORT

1. INTRODUCTION

1.1 Project Overview

The Freshness Detector of Fruits and Vegetables is designed to evaluate the freshness of produce using computer vision and machine learning models. By analyzing physical characteristics such as color, texture, and possibly gas emission data, this system enables real-time quality checks to assist retailers, suppliers, and consumers.

1.2 Purpose

The purpose of this project is to reduce food waste, improve food safety, and provide a reliable mechanism for assessing freshness without relying on manual or subjective evaluation methods.

2. IDEATION PHASE

2.1 Problem Statement

Manual inspection of fruits and vegetables is error-prone and inconsistent, leading to food spoilage, consumer dissatisfaction, and financial loss.

2.2 Empathy Map Canvas

Say: "I want the freshest produce."

Think: "I can't always tell what's good or bad."

Feel: Frustrated by spoilage at home.

Do: Sniff, squeeze, or visually inspect produce.

2.3 Brainstorming

- Computer vision models using color/texture cues

- Gas sensors for chemical detection

- Mobile app with camera-based detection

- Integration into retail quality systems

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

User → Open App → Scan Produce → Get Freshness Score → Take Action (Consume/Discard)

3.2 Solution Requirement

- Image acquisition (camera or webcam)

- Pre-trained ML model for classification

- Responsive user interface

- Backend to store logs and performance metrics

3.3 Data Flow Diagram

1. User uploads image

2. Preprocessing

3. Model inference

4. Score display and suggestions

3.4 Technology Stack

- Python

- TensorFlow/Keras for model training

- OpenCV for image processing

- Flask or Streamlit for deployment

- SQLite or Firebase for backend (optional)

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Addressing real pain points of food wastage and lack of reliable freshness indicators.

4.2 Proposed Solution

A web app that accepts fruit/vegetable images and returns a freshness score based on learned patterns.

4.3 Solution Architecture

Client → Image Preprocessing → TensorFlow Model → Output Score → Display/UI Layer

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Week 1–2: Research & Dataset Collection

- Week 3–4: Model Training & Evaluation

- Week 5: UI/UX Design

- Week 6: Backend Integration

- Week 7: Testing

- Week 8: Final Deployment & Reporting

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

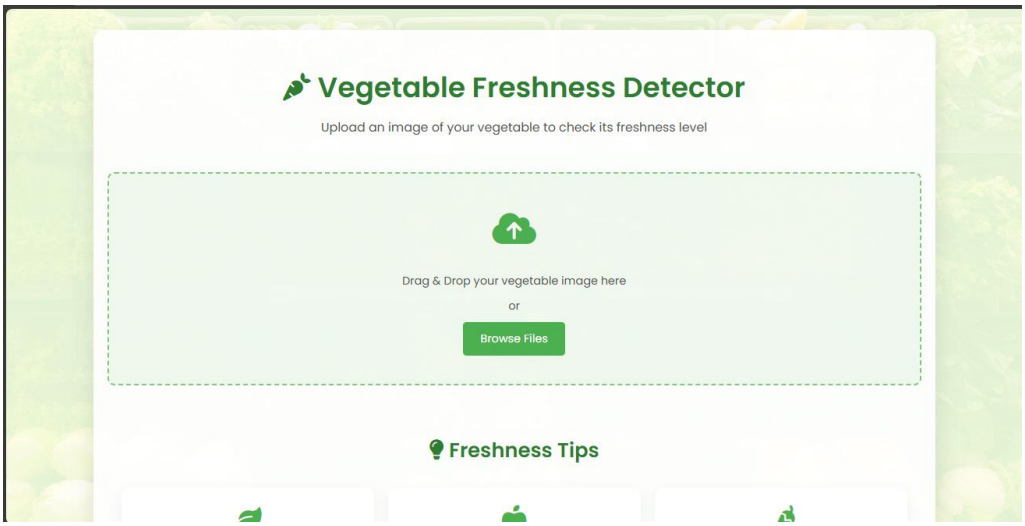
- Accuracy of model on test data

- Time taken per prediction

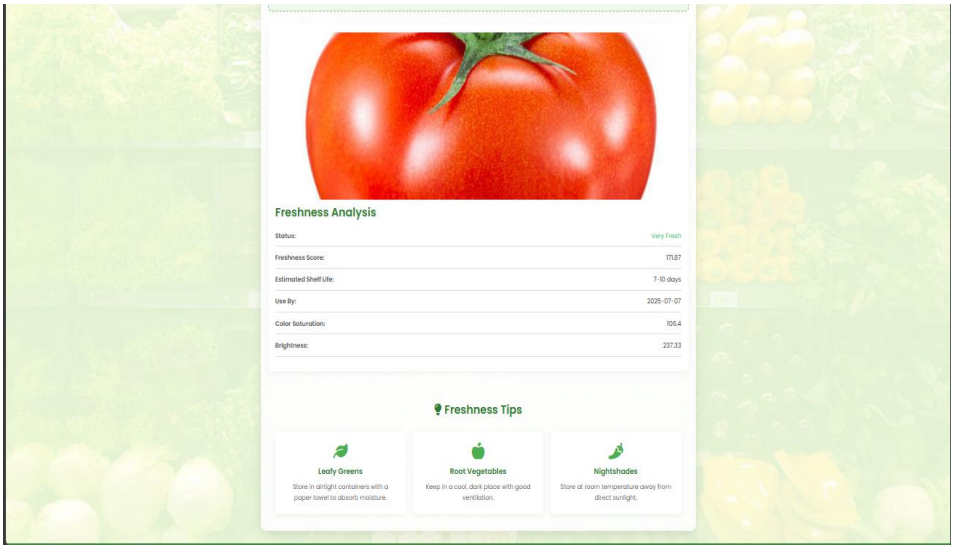
- UI responsiveness and edge-case handling

7. RESULTS

7.1 Input Screenshots



7.2 Output Screenshots



8. ADVANTAGES & DISADVANTAGES

Advantages

- Reduces human error

- Saves time

- Aids in decision-making

- Helps cut down food waste

Disadvantages

- Model accuracy may vary with lighting

- Limited to visible changes (can’t detect internal spoilage)

9. CONCLUSION

The Freshness Detector delivers a smart, efficient solution for judging produce quality, helping both consumers and retailers make informed decisions with ease and confidence.

10. FUTURE SCOPE

- Include gas sensors for ethylene detection

- Mobile app integration

- Support for multilingual voice feedback

- Wider dataset expansion for global produce types

Appendix:

github link: