Artificial Intelligence and Machine Learning

Project Documentation

1. Introduction

- **Project Title:** Smart Sorting: Transfer Learning for Identifying Rotten Fruits and Vegetables
- **Team Members:**
  1.B.Hari Ram (Team leader)
  2.VS Kiran
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  4.Shaik Ezaz Ahmed

2. Project Overview

- **Purpose:** Smart Sorting is an AI-powered web application that uses transfer learning to classify fruits and vegetables as fresh or rotten based on image inputs. This application is designed to aid farmers, retailers, and consumers in making quick and accurate decisions regarding food quality, thus minimizing food waste and maximizing efficiency in sorting and packaging.
- **Features:**

  Image upload and real time classification
  Deep learning based classification using pre-trained CNN models
  Clean and user-friendly interface
  Visual output with predicted class (fresh/rotten) and item name

3. Architecture

```
smart-sorting/

├── app.py
├── model_training/
│        └── data_sorting_and_trained_model.ipynb
│        └── healthy_vs_rotten_best_model.h5
│
├── static/
│      └── style.css
│      └── (user-uploaded images will go here)
└── templates/
       ├── index.html
       └── output.html
```

4. SetUp Instructions

- **Prerequisites:**

  1. Python 3.7 or above

2. Required Libraries: Flask, TensorFlow/PyTorch, OpenCV, NumPy

3. Project folders: static/, templates/, model/

4. Install dependencies: pip install -r requirements.txt

5. Running The Application

After setting up the dependencies and environment variables as described earlier, follow the steps below to run the Smart Sorting application locally:

Frontend :

1. Hypertext Markup Language

2. Client Slide Scripting

Backend (app.py server):

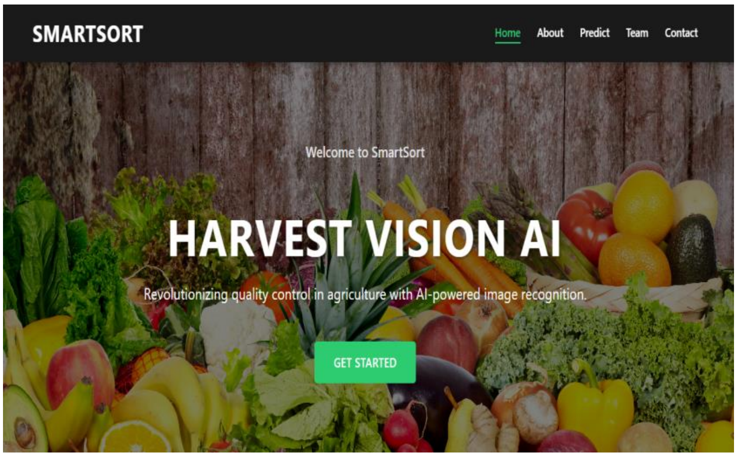
1.Python

2.Flask

3.TensorFlow

4.OpenCV

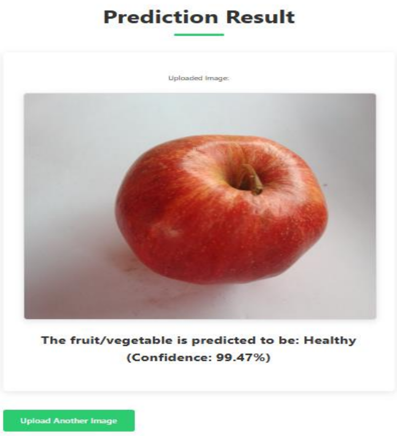
6. User Interface



Welcome to SmartSort

HARVEST VISION AI

Revolutionizing quality control in agriculture with AI-powered image recognition.



Prediction Result

Uploaded Image:

The fruit/vegetable is predicted to be: Healthy (Confidence: 99.47%)

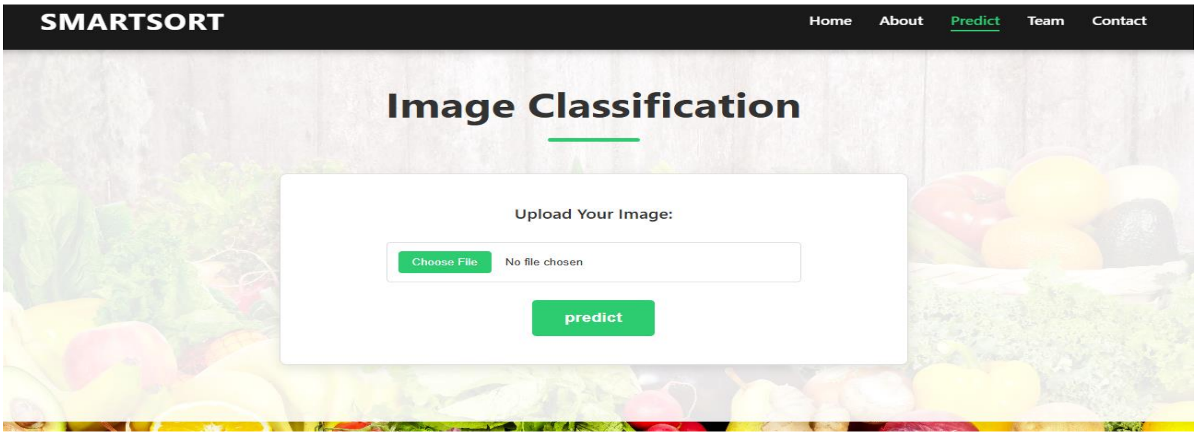


Image Classification

Upload Your Image:

No file chosen

7. Testing

Purpose of Testing:

To verify that the image classification model, backend routes, and frontend pages work seamlessly across devices and browsers.

Testing Strategy Overview:

🟩 ML Model Testing

🟩 Backend API Testing

🟩 Frontend (React) Testing

🟩 End-to-End Testing

8. Known Issues:

- May misclassify images with poor lighting or unusual angles
- File type validation not implemented robustly
- No database to store prediction history
- No user authentication or admin interface

9. Future Enhancements

- Expand dataset for more fruit/vegetable classes
- Improve accuracy using advanced models (e.g., EfficientNet)
- Add authentication & user dashboard
- Integrate database (e.g., MongoDB, Firebase)
- Deploy on cloud (Heroku, AWS, GCP)
- Mobile-friendly responsive UI

10. Conclusion

Smart sorting demonstrates how transfer learning and Web Intergration can provide a powerful solution for real-time food quality detection. With further enhancements, this project has the potential for real-world impact in agriculture, supply chain, and retail industries