

Smart Sorting: Transfer Learning for Identifying Rotten Fruits and Vegetables

Rayankula Lakshmi Chaithanya

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Project Overview

- **Purpose:** Automated system to classify fruits/vegetables as healthy or rotten using deep learning
- **Key Benefits:**
 - Reduces food waste through early spoilage detection
 - Accessible solution for supply chains and households
 - Sustainable food practices through AI
- **Core Technology:**
 - Transfer learning with pre-trained CNNs (VGG16/ResNet50)
 - Flask-based web interface

- **Image Classification:**

- 28 distinct classes (14 produce types \times 2 states)
- Identifies visual cues of spoilage/freshness

- **Transfer Learning:**

- Leverages pre-trained CNNs (ImageNet weights)
- Fine-tuned on specific produce dataset

- **Data Augmentation:**

- Random rotations (20°), width/height shifts (20%)
- Prevents overfitting

- **Web Interface:**

- Simple Flask application
- User-friendly image upload and results display

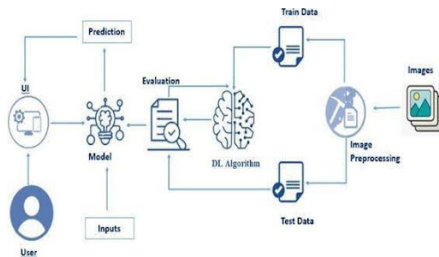
System Architecture

Frontend:

- HTML/Jinja2 templates
- CSS styling
- Basic form for image upload

Backend:

- Flask framework (app.py)
- Image processing pipeline:
 - Resize to 224×224
 - Normalization
 - Batch dimension
- Model inference
(healthy_vs_rotten.h5)



Implementation Details

- **Model Training:**

- Jupyter notebook (Transfer_Learning_Fruits_Vegs.ipynb)
- Data split: train/validation/test

- **File Structure:**

- static/uploads for temporary images
- templates/ for HTML
- data/ for training dataset

- **API Endpoint:**

- POST /predict
- Accepts image file (multipart/form-data)
- Returns classification result

- **Prerequisites:**

- Python 3.8+, pip, Git
- Libraries: Flask, TensorFlow, NumPy, Pillow

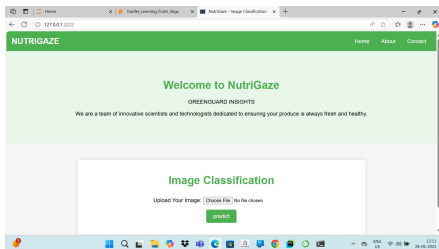
- **Installation:**

- Clone repository
- Create virtual environment
- Install dependencies

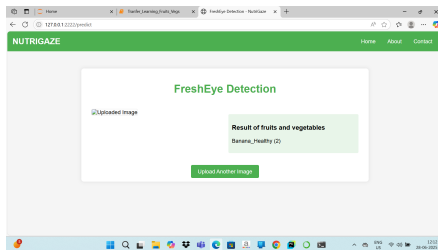
- **Running:**

- Activate virtual environment
- Execute app.py
- Access <http://127.0.0.1:5000>

User Interface



User Interface



Results Display