# Solution Architecture

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| Date | 29 June 2025 |
| Team ID | LTVIP2025TMID41462 |
| Project Name | Smart Sorting : Transfer Learning For Identifying Rotten Fruits And Vegetables |
| Maximum Marks | |

## Smart Sorting Solution Architecture

### 1. User Interface (Frontend)

- **Technology:** HTML5, CSS3 (Bootstrap or Custom CSS)
- **Functionality:**
  - User uploads an image (fruit or vegetable)
  - Displays prediction result with image preview
  - Displays class (fresh_fruit, fresh_vegetable, rotten_fruit, rotten_vegetable)

### 2. Flask Web Server (Backend)

- **Technology:** Python (Flask)
- **Functionality:**
  - Handles user requests (`/` for upload form, `/predict` for classification)
  - Loads `.h5` trained model
  - Preprocesses uploaded image
  - Sends image to model and returns prediction
  - Renders output to frontend with prediction class and image preview

### 3. Machine Learning Model

- **Framework:** TensorFlow Keras
- **Model:** MobileNetV2 (with transfer learning)
- **Output:** 4-class classification (`softmax`)
- **Accuracy:** Trained to ~72% validation accuracy

### 4. Data Pipeline

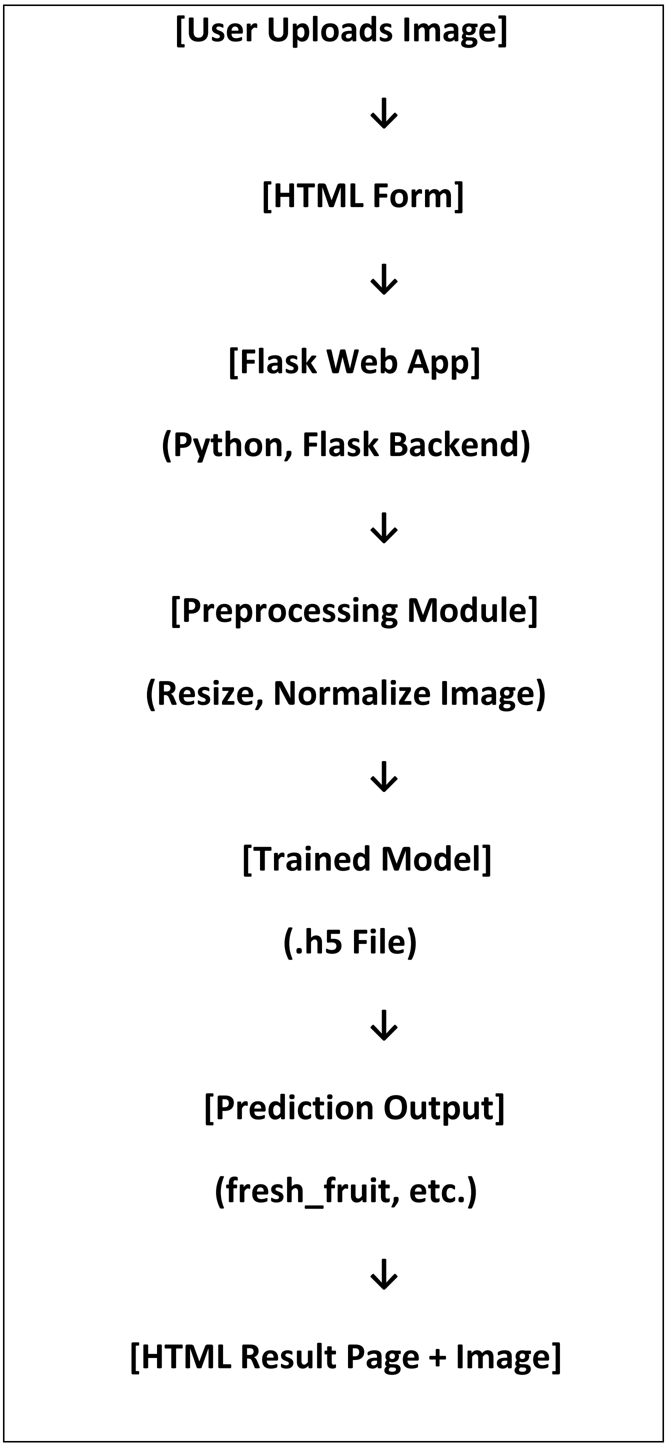
- **Dataset:** Kaggle dataset with 12 folders, mapped into 4 custom classes
- **Preprocessing:**
  - Resized to 224x224
  - Augmentation (rotation, zoom, flip)
  - Train/Validation split
- **Storage:** Google Drive for `.h5` model, `data_subset_4class` for training/testing

### 5. Deployment (Local / Cloud)

- **Option 1 (Local):**
  - Run Flask app locally on Anaconda / Python virtual environment

  - Open `http://127.0.0.1:5000/` in browser
- **Option 2 (Cloud):**
  - Host on platforms like:
    - **Render**
    - **Replit**
    - **Heroku** (with some modifications)
  - (Optional) Integrate with Flask-Ngrok for public URL during development

## Architecture Diagram:


[User Uploads Image]
↓
[HTML Form]
↓
[Flask Web App]
(Python, Flask Backend)
↓
[Preprocessing Module]
(Resize, Normalize Image)
↓
[Trained Model]
(.h5 File)
↓
[Prediction Output]
(fresh_fruit, etc.)
↓
[HTML Result Page + Image]