Project Documentation

GreenClassify – Deep Learning Based Vegetable Image Classification

1. Introduction

In today's world, image recognition plays an important role in many real-life applications. In agriculture and time-consuming. Different vegetables may look similar in color and shape, especially under different lighting conditions.

The main aim of thind retail sectors, identifying vegetables manually from images can sometimes be confusing as project is to build a system that can automatically classify vegetable images using Deep Learning techniques. The model is trained using Convolutional Neural Networks (CNN) and deployed using a Flask web application. Users can upload an image and get the predicted vegetable name along with confidence score.

2. Objective of the Project

The objectives of this project are:

- To build a deep learning model that can classify vegetable images.
- To understand how CNN works for image classification.
- To deploy the trained model using Flask.
- To create a simple and user-friendly web interface for image upload and prediction.

3. Problem Statement

- Identifying vegetables manually from images is not always easy because:
- Some vegetables look similar.
- Lighting and background affect image quality.
- Manual classification takes time.
- So, there is a need for an automated system that can identify vegetables accurately using image processing and deep learning techniques.

4. Tools and Technologies Used

Programming Language:

- Python

Libraries:

- TensorFlow
- Keras
- NumPy
- Pillow
- OpenCV
- Flask

Frontend:

- HTML
- CSS

Development Environment:

- VS Code

5. Dataset Description

The dataset used in this project contains images of different vegetables.

The dataset is divided into:

- Training folder
- Validation folder
- Each class has its own folder. Some of the vegetable classes are:

- Bean
- Bitter Gourd
- Bottle Gourd
- Brinjal
- Broccoli
- Cabbage

6. Data Preprocessing

Before training the model, the following preprocessing steps were applied:

Resizing all images to 128x128

Normalizing pixel values (scaling between 0 and 1)

Applying data augmentation such as:

Horizontal flip

Zoom

Shear

These steps help improve the performance and generalization of the model.

7. Model Architecture

A Convolutional Neural Network (CNN) was built for image classification. The model includes:

- Convolutional layers for feature extraction
- MaxPooling layers for reducing dimensionality
- Flatten layer
- Dense (Fully connected) layers
- Softmax activation function for multi-class classification

The model is compiled using:

Optimizer: Adam

Loss Function: Categorical Crossentropy

Metrics: Accuracy

8. Model Training

The model was trained using the training dataset and validated using the validation dataset.

Training Details:

Epochs: 3 to 10

Batch Size: 32

After training, the model achieved satisfactory accuracy and was saved as:

vegetable_model.h5

9. Web Application Development

After training the model, it was deployed using Flask.

The web application consists of three main pages:

index.html – Home page

prediction.html – Image upload page

logout.html – Result page

The user uploads an image through the web interface. The image is sent to the Flask backend, where it is processed and passed to the trained model. The predicted vegetable name and

confidence score are then displayed on the result page.

11. Project Folder Structure

- GreenClassify/
- app.py
- train.py
- requirements.txt
- templates/
- static/
- models/
- screenshots/

12. How to Run the Project

Step 1: Install required libraries

pip install -r requirements.txt

Step 2: Run the application

python app.py

Step 3: Open browser and go to

http://127.0.0.1:5000

Step 4: Upload image and check prediction.

13. Results

The system successfully predicts the vegetable class from the uploaded image. It also displays a confidence score to indicate how certain the model is about its prediction.

The project demonstrates how deep learning can be applied in real-world image classification tasks.

14. Conclusion

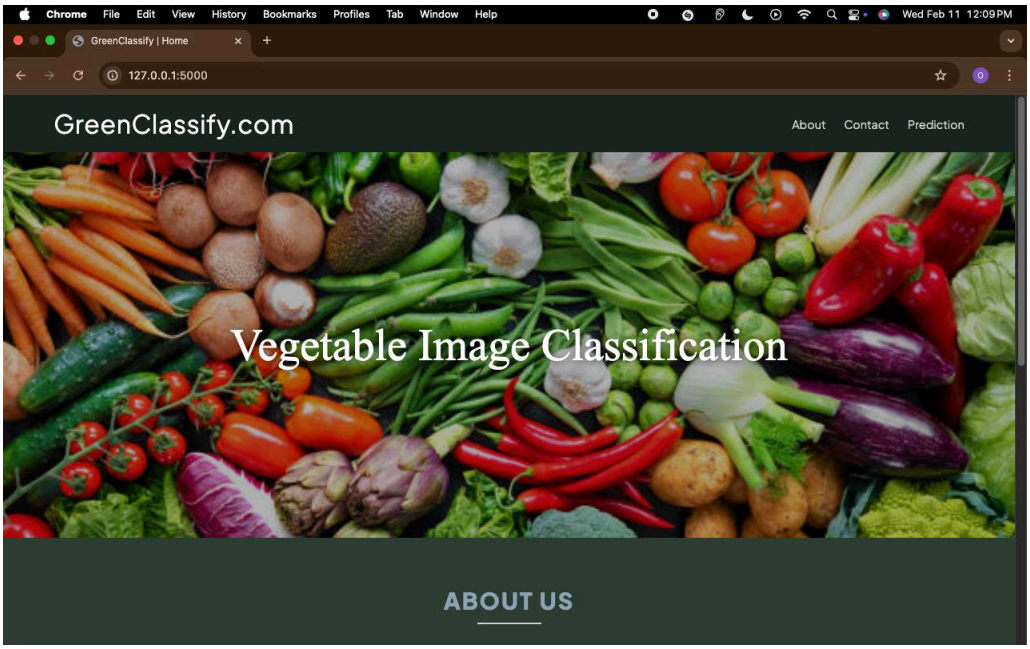
In this project, a vegetable image classification system was developed using Convolutional Neural Networks. The trained model was successfully integrated with a Flask web application. This project helped in understanding image preprocessing, CNN model building, training, and deployment.

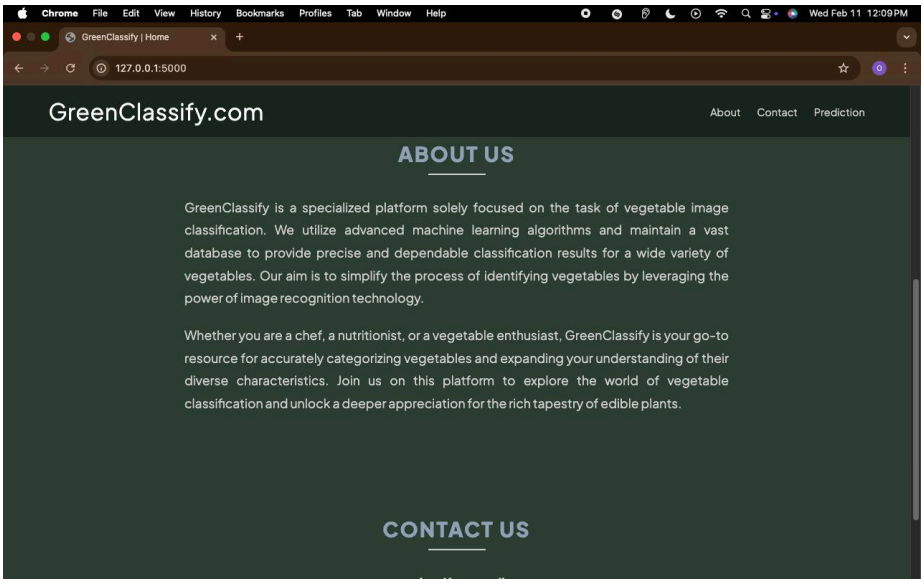
The system can be further improved by increasing dataset size and using advanced pre-trained models.

15. Project Output Screenshots

1. Home Page

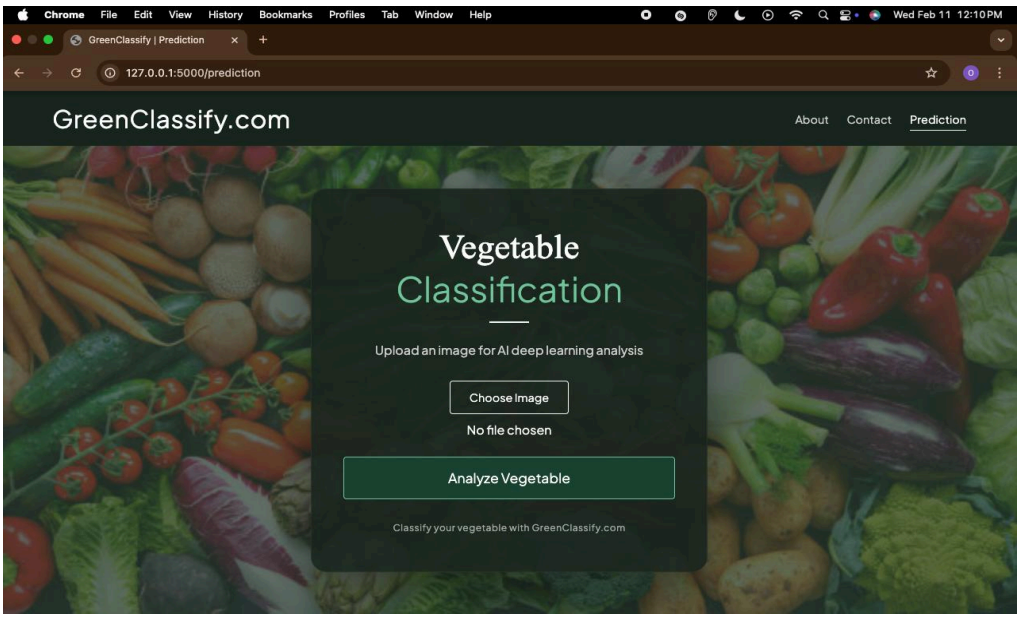
The home page displays the project title “GreenClassify – Vegetable Image Classification” along with navigation options. It provides a simple and user-friendly interface for users to start the classification process.





2. Upload / Prediction Page

This page allows the user to upload a vegetable image. The user selects an image file and clicks the predict button to classify the vegetable.



3. Result Page

After uploading the image, the system displays:

- The uploaded image
- The predicted vegetable name
- The confidence score

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