Department of Computer Science and Engineering

Plant Disease Detection using ML

Under the guidance of
Dr. Preeti Garg (Dept.t of CSE)
KIET Group of Institution,
Ghaziabad

By -

- Shreyash Verma (2100290100160)
- Sachin Singh (2100290100141)
- Shivam Chaurasia (2200290109015)

Members

- Shreyash Verma (2100290100160)
- Sachin Singh (2100290100141)
- Shivam Chaurasia (2200290109015)

PROBLEM STATEMENT

To create a Plant Disease Detection software using ML for improving plant health and crop failure.

Content

Plant Disease Detection using Machine Learning

Introduction

Plant diseases pose a significant threat to global agriculture, often resulting in substantial reductions in crop yield and quality. These illnesses are caused by a variety of pathogens and can spread swiftly under favorable environmental conditions. Beyond lowering productivity, plant diseases can cause severe financial losses for farmers, increase dependence on chemical pesticides, and disrupt the global food supply chain.

Timely and accurate detection of plant diseases plays a crucial role in protecting crops and ensuring food security over the long term. e to human error, particularly on large-scale farms. Moreover, visual assessments may fail to identify early symptoms, limiting the opportunity for prompt and effective treatment.

OBJECTIVE

The objective of this project is to develop a machine learning model capable of accurately detecting and classifying plant diseases from leaf images. This system aims to support farmers and agricultural professionals by enabling early diagnosis, reducing crop loss, and promoting efficient disease management through accessible and automated image-based detection techniques.

Methodology

The methodology involves building a Flask-based web application for crop recommendation, fertilizer suggestion, and plant disease detection. It integrates trained machine learning models: a Random Forest model for crop recommendation using soil and weather data, and a ResNet9 deep learning model for detecting plant diseases from leaf images. Weather data is fetched in real-time using API. User inputs are collected via HTML forms, predictions are generated using the models, and results are displayed through dynamically rendered HTML templates. This runs on a local server.

Requirements

- VS Code
- Python 3.x
- Flask
- Torch (PyTorch)
- Pandas
- NumPy
- PIL
- Pickle
- HTML/CSS
- pip for package management

Technologies & Libraries Used

Summary of Technologies & Libraries:

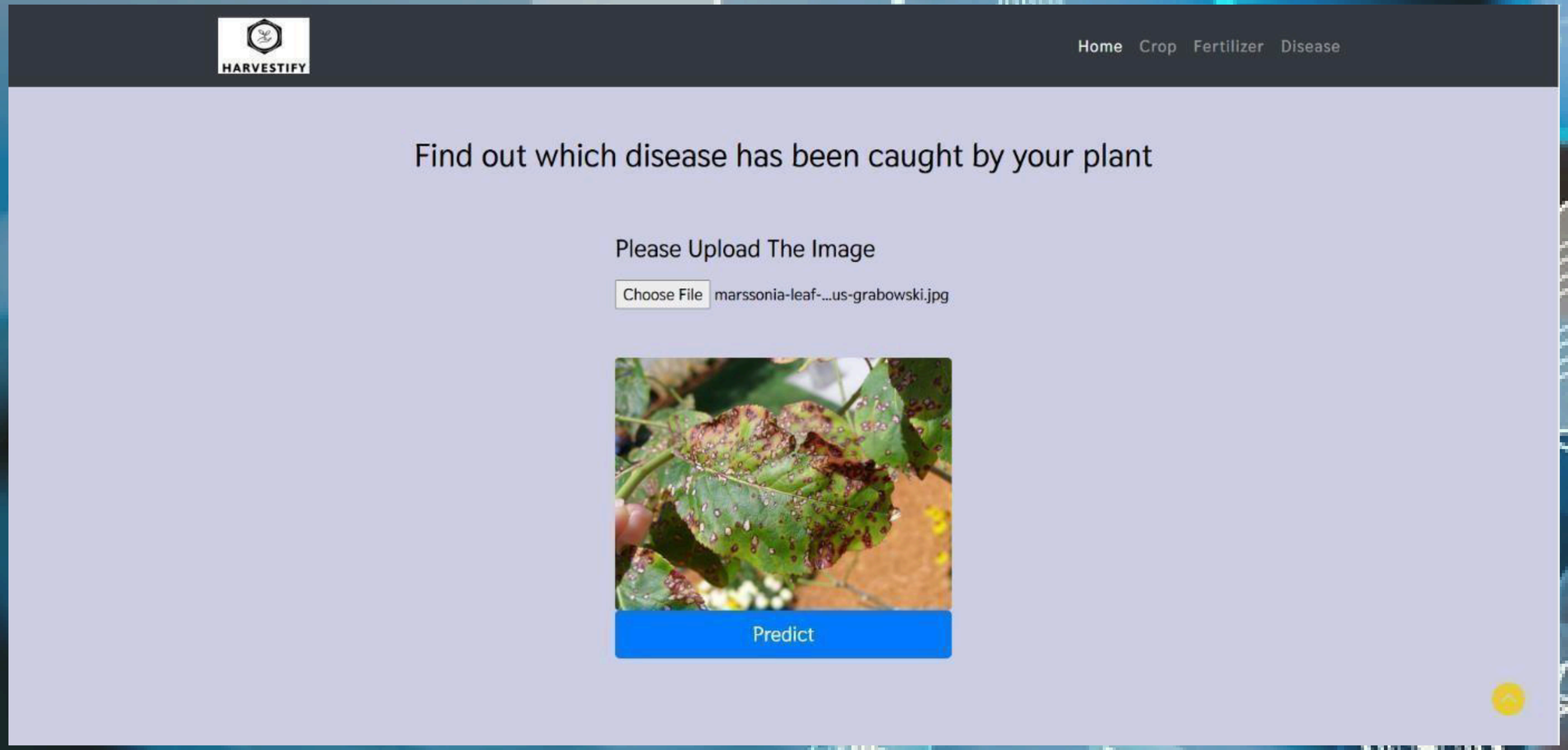
- **Web Development: Flask, Jinja2**
- **Machine Learning: PyTorch, scikit-learn (via RandomForest)**
- **Data Processing: NumPy, Pandas**
- **Image Processing: Pillow (PIL), TorchVision**
- **API Integration: Requests**
- **Model Deployment: Flask**
- **Frontend: HTML, CSS**

Dataset

Plant Disease Detection Dataset

- Source: Plant Village dataset
- Datatype: Image dataset (JPEG/PNG format)
- Data Size: ~20k+ images across 38 classes
- Content: Labeled leaf images for various crops and diseases

OUPTPUT SCREEN



OUPTPUT SAMPLE

Crop: Corn

Disease: Grey Leaf Spot

Cause of disease:

Gray leaf spot lesions on corn leaves hinder photosynthetic activity, reducing carbohydrates allocated towards grain fill. The extent to which gray leaf spot damages crop yields can be estimated based on the extent to which leaves are infected relative to grainfill. Damage can be more severe when developing lesions progress past the ear leaf around pollination time. Because a decrease in functioning leaf area limits photosynthates dedicated towards grainfill, the plant might mobilize more carbohydrates from the stalk to fill kernels.

How to prevent/cure the disease

1. In order to best prevent and manage corn grey leaf spot, the overall approach is to reduce the rate of disease growth and expansion.

CONCLUSION

The project successfully demonstrates the potential of machine learning in detecting plant diseases with high accuracy. By automating diagnosis through image analysis, it offers a practical solution for early intervention and improved crop management. This approach can enhance agricultural productivity, reduce losses, and support sustainable farming practices worldwide.

Future Scope

- **Mobile Applications for Farmers** – To provide instant disease diagnosis and treatment suggestions.

- **Agri-tech Startups** – For developing commercial solutions and smart farming tools.

- **Educational Institutions** – As a teaching tool in agricultural and data science programs.

References

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Thanks

For the Opportunity