MINOR PROJECT-2

SYNOPSIS

ON

Plant Disease Prediction System

Submitted By

Garvit Khurana	Tanya Malhotra	Vanshaj Goel
R177219080	R177219191	R177219196
500076532	500075815	500076419

Under the guidance of

Dr. Ravi Tomar

Associate Professor

Department of Informatics, School of Computer Science

UPES
UNIVERSITY OF THE FUTURE

Artificial Intelligence & Machine Learning

Department of Informatics

School of Computer Science

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

Dehradun-248007

Jan - May, 2022

Index

Link to Presentation

tinyurl.com/2up968nh

Introduction

Agriculture, with its associated sectors, is the chief source of livelihood in India. According to the Food and Agriculture Organization of The United Nations, 70 percent of India's rural households still depend primarily on agriculture for their living, with 82 percent of farmers being marginal. Some of the most popular crops and plants that are grown nationwide are Apples, corn, maize, etc. [1]

Plant and crop diseases are a significant yield and quality constraint for Indian farmers. The crop pathogens can be fungal, viral, or bacterial in nature and can damage the parts of the crops above or below the ground. Identifying those diseases is an ongoing challenge for Indian growers of crops like apple, potato, corn, pepper, etc. Not only farmers, but the people living in urban cities who prefer to grow fruits in their kitchen gardens also face the above-mentioned issue of their plants and trees getting diseased.

Manually identifying plant diseases is not only hectic but also has high chances of being inaccurate. Misdiagnosing a crop disease can lead to loss of money and severe harm to the consumers of the crop. Computer vision models increase the efficiency but the great variation in symptoms due to the age of infected tissues, genetic variations, and light conditions decreases the accuracy of detection.

Motivation

In the agricultural sector, misdiagnosis of diseases impacting agricultural crops can lead to misuse of chemicals leading to increased input costs with significant economic loss and harmful impact on the environment. Existing disease diagnosis based on human scouting is time-consuming and expensive.

During the time when Machine Learning and Deep Learning are so popular, it is necessary to understand that all this knowledge can be used in different areas to impact humanity in a useful manner.

Thus, the main motivation to pursue this project is to help people and farmers in observing the health of their plants easily.

Related Work

Plant diseases prediction is a very important research content in the field of machine vision. At present, machine vision-based plant disease prediction equipment have been initially applied in agriculture and has replaced the traditional naked eye identification to some extent. Some popular researches have been mentioned in the table below.

S.No.	Existing Researches	Working Phenomenon	Gist
1.	Using Deep Learning for Image-Based Plant Disease Detection[2]	CNN (AlexNet & GoogLeNet)	To demonstrate the technical feasibility using a deep learning approach utilizing 54,306 images of 14 crop species with 26 diseases (or healthy) made openly available through the project PlantVillage[2]
2.	Forecasting Plant and Crop Disease: An Explorative Study on Current Algorithms[3]	Forecasting based on weather & plant image data	To examine the specific approaches and methods adopted, pre-processing techniques and data used, performance metrics, and expected results, highlighting the issues encountered[3]
3.	ResTS: Residual Deep interpretable architecture for plant disease detection[4]	Model Training on ResTS Architecture	ResTS is trained to classify images into these 38 categories and to visualize signs of a specific disease[4]
4.	IoT Based Smart Agriculture and Plant Disease Prediction[5]	Remote Monitoring of sprinklers & sensors in field	An integrated application to control IoT system and Plant disease identification using Deep Neural Network model.[5]
5.	Real-Time Detection of Apple Leaf Diseases Based on INAR-SSD[6]	GoogLeNet Architecture	A novel real-time detection model that is based on the single-shot multi box detector (SSD) for apple leaf diseases is proposed.[6]
6.	Identification of Plant-Leaf Diseases[7]	Mixture Model (CNN & kNN)	The implemented deep-learning model has better predictive ability in terms of both accuracy and loss.[7]

Table – 1 Literature Review

Proposed Method

This section contains all the information regarding specifications for development of the application which can predict diseases in plants/crops.

Programming Language: Python, JAVA

Solving Technique: Convolutional Neural Networks

Frameworks: Tensorflow, FastAPI

Dataset: To be merged from different sources available on Kaggle

Environment Specifications (For Development) -

Operating System: Microsoft Windows 10/11 /Linux/MacOS

Memory: 8 GB DDR4

IDE: Jupyter Notebook, Android Studio, VS Code

Specifications for Final Application -

Operating System: Android

RAM: 4 GB

Parameters for Evaluation -

        a. Accuracy of Model

        b. Execution Time (To make final prediction)

Methodology

A dataset of different plants and crops will be collected consisting of healthy ones and the ones that have been infected. The collection of data would be done in two parts. One part of the data will be collected by on-field visits for capturing pictures of plants and another part of the data will be collected from online sources. After merging both parts of the data and pre-processing it, different architectures of the neural network like CNN's will be built and a comparison would be made for the best model.

An android mobile application will be developed with the help of which the user will be able to capture the image of the infected part of the plant and timely monitor its health. The AI model will be deployed on Heroku and connected with the mobile application through an API. The API will be developed using FastAPI framework. To predict the disease, the image will be sent to the AI model deployed on Heroku.

The mobile application will have the feature of constantly evaluating the health of plants. If a picture of the plant is found to have some disease, the application will send a notification to the user after a few days for capturing the photo of the plant again. So, the application will monitor if the intensity of disease is decreasing or not.

Gantt Chart

Date	Expected Work
1st Feb 2022 – 15th February 2022	Planning & Research
16th Feb 2022– 10th March 2022	Data Collection & Pre Processing
1st March 2022 – 15th April 2022	Mobile Application Development
10th March 2022 – 31st March 2022	Model Training & Comparison
1st April 2022 – 10th April 2022	Model Testing & Deployment
10th April 2022 – 15th April 2022	Final Project Report

Table – 2 - Plan of Work
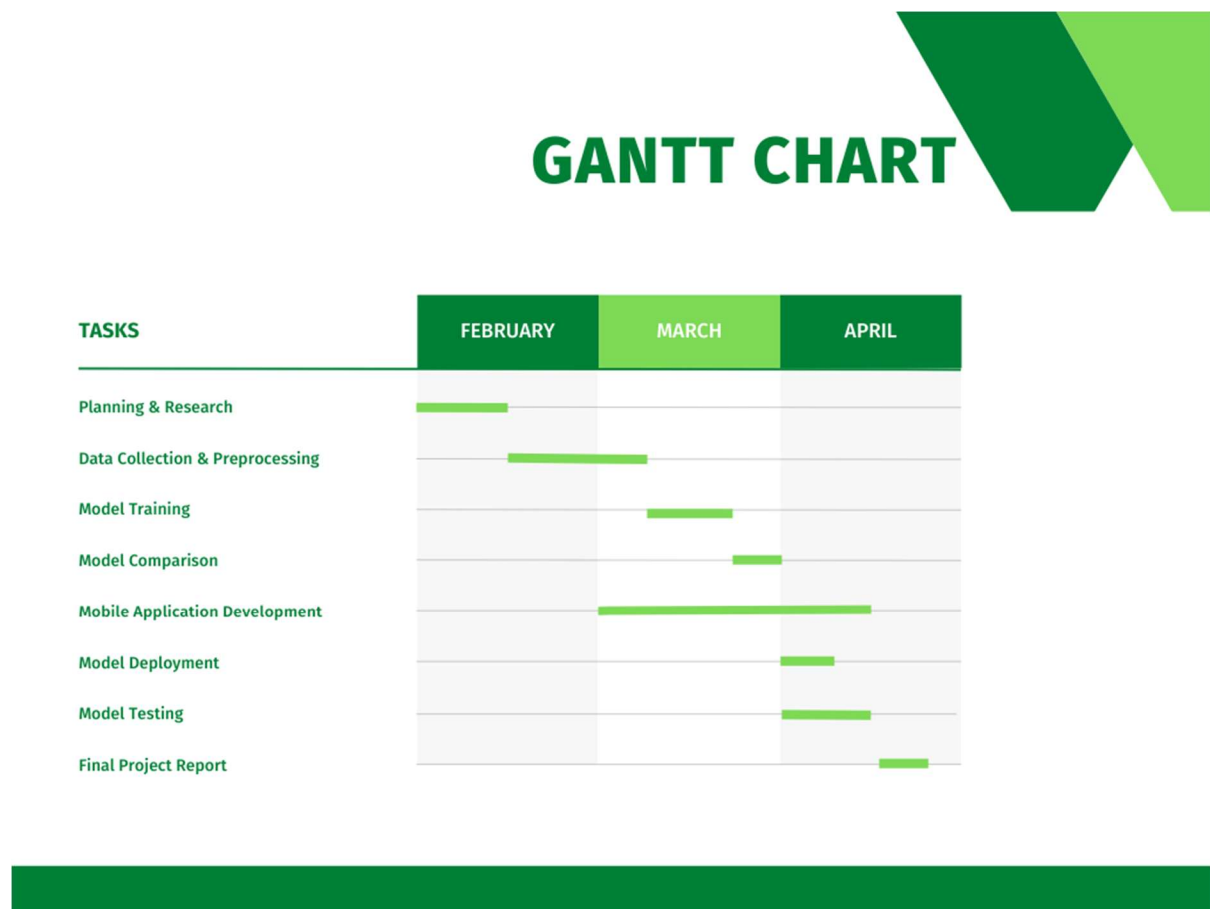

Figure 1 – Gantt chart

References

[1] "India at a Glance" – Food & Agriculture Organization of the United States

[2] Mohanty SP, Hughes DP and Salathé M (2016) Using Deep Learning for Image-Based Plant Disease Detection. Front. Plant Sci. 7:1419. doi: 10.3389/fpls.2016.01419

[3] G. Fenu and F. M. Malloci, "Forecasting Plant and Crop Disease: An Explorative Study on Current Algorithms," Big Data and Cognitive Computing, vol. 5, no. 1, p. 2, Jan. 2021, doi: 10.3390/bdcc5010002.

[4] Dhruvil Shah, Vishvesh Trivedi, Vinay Sheth, Aakash Shah, Uttam Chauhan. "ResTS: Residual Deep interpretable architecture for plant disease detection, Information Processing in Agriculture", 2021, ISSN 2214-3173, doi: 10.1016/j.inpa.2021.06.001.

[5] MS Bala Murugan et al 2021 J. Phys.: Conf. Ser. 2115 012017

[6] P. Jiang, Y. Chen, B. Liu, D. He and C. Liang, "Real-Time Detection of Apple Leaf Diseases Using Deep Learning Approach Based on Improved Convolutional Neural Networks," in IEEE Access, vol. 7, pp. 59069-59080, 2019, doi: 10.1109/ACCESS.2019.2914929.

[7] S. M. Hassan, A. K. Maji, M. Jasiński, Z. Leonowicz, and E. Jasińska, "Identification of Plant-Leaf Diseases Using CNN and Transfer-Learning Approach," *Electronics*, vol. 10, no. 12, p. 1388, Jun. 2021, doi: 10.3390/electronics10121388.