AI-Driven crop disease prediction and Management system

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Abstract: ***Agriculture is vital for feeding the growing population, serving as an energy source, and combating global warming. Plant diseases significantly impact crop yield and quality, necessitating early detection. Traditional detection relies on experts analyzing leaf color changes, a labor-intensive, costly, and inconsistent method, especially for large fields. Deep learning, particularly Convolutional Neural Networks (CNNs), offers an efficient alternative for disease detection through image classification and segmentation. This approach can reduce costs, improve accuracy, and enable remote monitoring. Additionally, integrating severity analysis and fertilizer recommendations can enhance disease management and support sustainable farming practice***

Keywords: Crop disease detection, deep learning, Convolutional Neural Networks (CNN), agricultural productivity, mobile application ,machine leaning, web application, early detection, real time monitoring

I. INTRODUCTION

This approach involves professionals who are skilled in spotting changes in crop leaf color. This approach is labor-intensive, time-consuming, and unsuitable for fields with a lot of space. The same sickness is frequently classified by several doctors as a separate condition. In order to stop the spread of a crop leaf disease, save the majority of the production, and do it at a cheap cost, farmers must monitor their crops and recognize the early signs. Professional agriculturists may be expensive to hire, particularly in rural, isolated locations. It incorporates picture classification using a Convolution Neural Network algorithm and image segmentation using the active contour method to forecast different sorts of illnesses. And further develop the strategy to suggest fertilizers based on measurements and severity analyses. Due to the need for ongoing expert supervision, this procedure is costly.

II.PRIOR WORK

The majority of crop leaf recognition research papers have investigated a machine learning algorithm designed for classifying whether the rice leaves are diseased or not. However, these algorithm incapable of dealing with the accuracy.

Random Forest: Random Forest is an ensemble learning method that uses multiple decision trees to make predictions. It is robust against overfitting, especially with high-dimensional data like images, and often provides good results in classification tasks. However, it may require substantial tuning and computational resources to handle the variability and complexity of disease symptoms in leaves

III.PROPOSED METHODOLOGY

FEED FORWARD NEURAL NETWORK

This type of neural network is the very basic neural network where the flow control occurs from the input layer and goes towards the output layer. These kinds of networks are only having single layers or only 1 hidden layer since the data moves only in 1 direction there is no back propagation technique in this network. In the feed-forward neural network, there are not any feedback loops or connections in the network.

RADIAL BASIS FUNCTION NEURAL NETWORK

This kind of neural network has generally more than 1 layer preferably two layers Radial basis networks are generally used in power restoration systems to restore the power in the shortest span of time to avoid blackouts. The popular type of feed-forward network is the radial basis function (RBF) network.

CONVOLUTION NEURAL NETWORK

CNN is one of the variations of the multilayer Perception. CNN can contain more than 1 convolution layer and since it contains a convolution layer the network is very deep with fewer parameters. CNN is very effective for image recognition and identifying different image patterns.

Before diving into the Convolution Neural Network, let us first revisit some concepts of Neural Network.

In a regular Neural Network there are three types of layers:
Input Layers: It's the layer in which we give input to our model. The number of neurons in this layer is equal to the total number of features in our data Hidden Layer: The input from the Input layer is then feed into the hidden layer. There can be many hidden layers depending upon our model and data size.

Output Layer: The output from the hidden layer is then fed into a logistic function like sigmoid or soft max which converts the output of each class into the probability score of each class

IV. MODULES CLASSIFIED

Classification- This preprocessing typically includes resizing the images to a uniform dimension, normalizing pixel values to standardize brightness and contrast, and applying noise reduction techniques to eliminate any irrelevant artifacts that could interfere with the classification process. The network utilizes activation functions to introduce non-linearity, enabling it to learn complex patterns associated with different crop leaf diseases

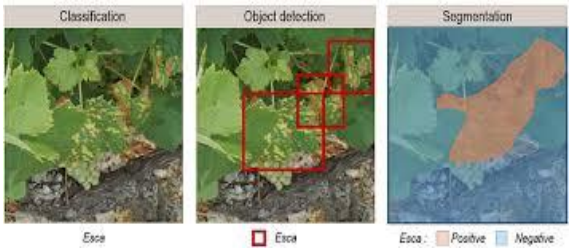
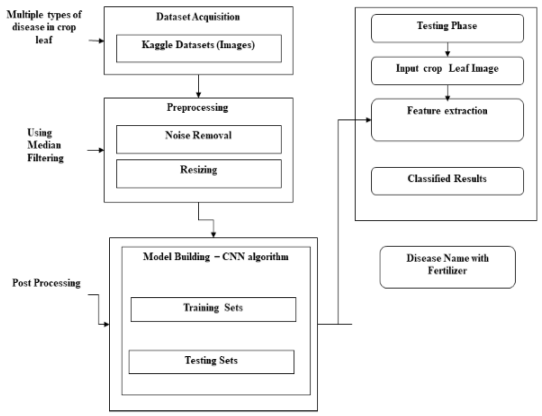


Image Acquistation-Crop leaves are structures specialized for photosynthesis and are arranged on the crop in such a way as to maximize their exposure to light without shading each other. The number of samples (crop leaves) of one species varies from 2 to 25; their total number in the database is 795

BLOCK DIAGRAM



V.SYSTEM SPECIFICATION

Frond End: Python

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales

Back End: My SQL

MySQL is the world's most used open source relational database management system (RDBMS) as of 2008 that run as a server providing multi-user access to a number of databases. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements.

VII. CONCLUSION

In this project, we will look at the many strategies and algorithms for segmentation and classification methods that have been offered to increase segmentation quality. However, the results demonstrate that, in comparison to the suggested graph cut model, segmentation techniques do not work well and are difficult to implement in big datasets. Finally, use a neural network classification technique to find crop leaf illnesses.

VIII.REFERENCES

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