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Plant Diseases Prediction Using Image Processing

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ABSTRACT: In India, the tomato plant is the most advanced crop. Farmers across the world are dealing with difficulties because of disruptions, illness, or inadequacies in their equipment. For the assurance of plant leaf contamination, they rely on the information they receive from the cultivating divisions. This engagement is complicated and lengthy. Here is a framework that will assist ranchers all around the world in accurately and quickly recognizing plant leaf diseases. The main purpose of this framework is to achieve more consistent execution in the detection of infections. In the middle of several plant diseases that affect leaves, such as Late scourge, bacterial, and viral infections, it has been chosen to separate contaminated leaves from healthy leaves, which includes Late scourge, bacterial, and viral infections. Using a large dataset, the proposed approach is designed to successfully discriminate specified illnesses that affect tomato plant leaves. We proposed using CNN techniques to predict tomato leaf disease.

Keywords: - Image Processing, Disease, Convolutional Neural Network

1. INTRODUCTION

Agriculture is, without a doubt, one of the most important jobs on the world. Food is a basic requirement for all living things on this earth, hence it plays a crucial role. As a result, improving the quality of farming products has become critical. It is critical to administer these crops in a legal manner right from the start. A plant's lifespan has a lot of different stages. It includes soil planning, cultivating, adding faeces and manures, water system measures, infection detection (if any), pesticide use, and produce harvesting. Plants have been infected with a variety of illnesses that have resulted in significant losses in the production of high-quality agricultural products. To address this problem, it is critical to do plant disease identification and prevention. In general, plant diagnostics are carried out by professionals through visual inspection and, if necessary, assessment of the concentration or potency of a virus or bacteria through its effect on living cells or tissues of plant leaves. Plant diseases have been identified using a variety of computer-based methods based on leaf pictures. Many techniques look at not just the spread of plant diseases, but also the location of their affected areas. Object detection and location have recently received a lot of attention in the deep learning and image processing domains, and numerous interesting algorithms have been suggested. The leaves of the plants are harmed by diseases and pests that must be discovered. These adverse consequences alter the physical look of the leaf, allowing the cause of the harm to be identified using photos captured by the cameras. In this scenario, a mobile computer and a typical RGB camera are required for disease diagnosis, and deep learning, a recent machine learning trend, produces excellent accuracy in classification jobs.

1.1 OBJECTIVES

- To improve the accuracy with which diseases can be identified.
- Recognize anomalies on plants in the greenhouse or in the natural environment.
- To use CNN Classifier to classify the disease

2. LITERATURE SURVEY

They employed the convolutional neural network (CNN) to classify plant leaf diseases into 15 categories, comprising 12 classes for diseases discovered in different plants, such as bacteria, fungi, and others, and three classes for healthy leaves. As a result, they achieved exceptional accuracy in training and testing, with a training accuracy of (98.29 percent) and testing accuracy of (98.029 percent) for all data sets used. [1] An overview of picture segmentation with K-means clustering and HSV-dependent classification for identifying infected parts of the leaf, as well as feature extraction with GLCM. When processed by a Random Forest classifier, the suggested methodology can successfully detect and categorize plant illnesses with an accuracy of 98 percent. [2]

To reduce production and economic losses in the agriculture industry, researchers proposed an integrated deep learning framework in which a pre-trained VGG-19 model is used for feature extraction and a stacking ensemble model is used to detect and categorize leaf diseases from photos. The system was tested using a dataset with two classes (Infected and Healthy) and a total of 3242 photos. Their work has been likened to that of other modern algorithms (kNN, SVM, RF and Tree). [3].

A CNN was proposed for automatic feature extraction and categorization. Plant leaf disease research makes extensive use of color information. Filters are applied to three channels based on RGB components in the model. For training the network, the output feature vector of the convolution component was input into the LVQ [4]. The major goal was to reduce pesticide use in order to produce a decent crop and boost production rate. Image processing can be used to detect plant disease. Pre-processing of the image, feature extraction, classification, and prediction of identified disease are some of the procedures involved in disease detection. As a result, developing a recognition system can aid in the evaluation of high-resolution images of the plant for proper therapy and prevention [5].

To diagnose diseases, deep learning approaches were applied. The implementation's most important difficulty was deciding on a deep learning architecture. As a result, two distinct deep learning network topologies, AlexNet and SqueezeNet, were tried. The Nvidia Jetson TX1 was used to train and validate both of these deep learning networks. The training was done with photos of tomato leaves from the Plant Village dataset. There are ten separate classes, all of which have healthy imagery. Images from the internet are also used to test trained networks. [6]

Faster R-CNN and Mask R-CNN are two separate models utilized in these methods in[7], with Faster R-CNN being used to identify the sorts of tomato illnesses and Mask R-CNN being used to detect and segment the locations and shapes of the infected areas. Four different deep convolutional neural networks are integrated to find the model that best matches the tomato disease detection problem. The dataset is divided into a training set, a validation set, and a test set used in the experiments, and the data is acquired from the Internet. The results of the experiments demonstrated that their proposed models can correctly and quickly detect the eleven tomato disease kinds, as well as segment the locations and forms of diseased areas. The main objective of this system is to accurately detect disorders in tomato plant using IoT, Machine Learning, Cloud Computing, and Image Processing [8].

3. IMPLEMENTATION DETAILS OF MODEL

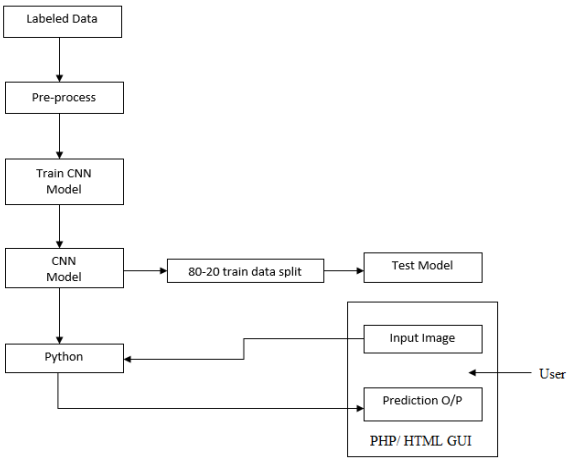

Fig: - System Architecture

The photos, or dataset, were gathered from Kaggle and include normal and several sorts of afflicted tomato leaf images. Applying pre-processing techniques such as RGB to greyscale conversion and enhancing them with a filtering algorithm to eliminate noise from the image is the first stage. The image is then segmented after edge detection algorithms are used to detect the image's edges. The following phase is segmentation, which is followed by feature extraction, which converts the image into a set of images. Certain visual features of interest are discovered and displayed here for further processing. The resulting representation can then be fed into a variety of pattern recognition and classification algorithms, which will categorize or recognize the image's semantic contents. The detection of leaf is noticed after feature extraction. All of this is accomplished in the classification block. All of these steps were completed using the convolutional neural network technique. Finally, the suggested system's performance and accuracy are assessed.

4. CONCLUSION

The deep feed-forward artificial neural network known as the convolution neural network is used to detect leaf disease. Because the adjacent leaves may have the same or a different disease, it will be difficult to detect precisely, we are considering one leaf per photograph. We undertake a series of stages in the suggested technique, such as data pre-processing to increase detection accuracy and other image processing methods to improve our result accuracy. If this strategy is fully applied, the disease will be recognized at an early stage, reducing the cost and time spent manually.

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