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Leaf Diseases Detection for Tomato Plant with Use of Neural Network

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Abstract-

The tomato plant is the most comprehensively developed produce in India. The serious issue that the ranchers all throughout the planet face is misfortunes, due to nuisances, sickness or a supplement insufficiency. They rely on the data that they get from the farming divisions for the determination of plant leaf infection. This process is lengthy and complicated. Here comes a system to help farmers everywhere in the world by automatically detecting plant leaf diseases accurately and within no time. The main objective of this system is to acquire more reliable performance in the identification of diseases. Amidst various plant diseases that affect leaf comprise of Late blight, bacterial and viral diseases have been chosen to differentiate infected leaves from that of the healthy leaves includes Late blight, bacterial and viral diseases. The proposed model is designed in such a way that it effectively identifies specific diseases that affect leaves of tomato plants through the use of a huge dataset. We have proposed tomato leaf Disease Prediction using CNN Techniques.

Keywords - *Image Processing, Disease, Convolutional Neural Network*

I. Introduction

Agriculture is quite possibly the main occupations all throughout the planet. It assumes a significant part since food is a fundamental requirement for each living being on this planet. Consequently, expanding the nature of farming items has gotten vital. Legitimate administration of these harvests directly from a beginning phase is significant. There are a great deal of stages in a plant lifecycle. It incorporates soil planning, cultivating, adding excrement and manures, water system measures, infection identification assuming any, utilization of pesticides and reaping of yields. Plants have been faced with many harmful diseases that cause noteworthy reductions in the production of qualitative farming products. It's crucial to perform identification and prevention of plant diseases to overcome this issue. In general, plant diagnostics are performed with visual inspection by the experts and, if appropriate, measurement of the concentration or potency of a virus or bacteria by its effect on living cells or tissues of plant leaves are a second choice. Many computer-based approaches have been used to identify plant diseases based on their leaf images. Many methodologies examine not only plant diseases, but also the localization of their impacted areas. In deep learning and image processing domain, object detection and location have recently gained a great deal of attention and many promising methods have been proposed. Diseases and pests that are to be detected, harms the leaves of the plants. These harmful effects change the physical appearance of the leaf so that the cause of the harm can be detected from the images taken from the cameras. In this case, there is a need for a mobile computer and a standard RGB camera for disease

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detection and Even Recent machine learning trend deep learning achieves high accuracy in classification tasks.

II. Literature Survey

In system, they used the convolutional neural network (CNN), through which plant leaf diseases are classified, 15 classes were classified, including 12 classes for diseases of different plants that were detected, such as bacteria, fungi, etc., and 3 classes for healthy leaves. As a result, they obtained excellent accuracy in training and testing, they have got an accuracy of (98.29%) for training, and (98.029%) for testing for all data set that were used. [1] An overview of image segmentation using K-means clustering and HSV dependent classification for recognizing infected part of the leaf and feature extraction using GLCM. The efficiency of the proposed methodology is able to detect and classify the plant diseases successfully with an accuracy of 98% when processed by Random Forest classifier. [2]

Proposed an integrated deep learning framework where a pre-trained VGG-19 model is used for feature extraction and stacking ensemble model is used to detect and classify leaf diseases from images so as to reduce production and economic loses in agriculture sector. A dataset consisting of two classes (Infected and Healthy) and a total of 3242 images was used to test the system. Their proposed work has been compared with other contemporary algorithms (kNN, SVM, RF and Tree)[3].

A CNN for automatic feature extraction and classification was proposed. Color information is actively used for plant leaf disease researches. In model, the filters are applied to three channels based on RGB components. The LVQ has been fed with the output feature vector of convolution part for training the network [4].

The main motive was to reduce the use of pesticides and thus yield a good crop and increase the production rate. Plant disease can be detected using image processing. Disease detection follows some steps like pre-processing of the image, feature extraction, classification, and prediction of classified disease. Thus creating a recognition system can help in evaluating high precision image of the plant for proper cure and further prevention [5].Deep learning methods were used to detect diseases. Deep learning architecture selection was the key issue for the implementation. So that, two different deep learning network architectures were tested first AlexNet and then SqueezeNet. For both of these deep learning networks training and validation were done on the Nvidia Jetson TX1. Tomato leaf images from the PlantVillage dataset has been used for the training. Ten different classes including healthy images are used. Trained networks are also tested on the images from the internet. [6]

Two different models in[7], Faster R-CNN and Mask R-CNN, are used in these methods, where Faster R-CNN is used to identify the types of tomato diseases and Mask R-CNN is used to detect and segment the locations and shapes of the infected areas. To select the model that best fits the tomato disease detection task, four different deep convolutional neural networks are combined with the two object detection models. Data are collected from the Internet and the dataset is divided into a training set, a validation set, and a test set used in the experiments. The experimental results showed that their proposed models can accurately and quickly identify the eleven tomato disease types and segment the locations and shapes of the infected areas. This system showcased a prototype that uses multimodal analysis through sensor data, computer vision. The main objective of this system is to accurately detect disorders in tomato plant using IoT, Machine Learning, Cloud Computing, and Image Processing [8].

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III. Implementation Details of Module

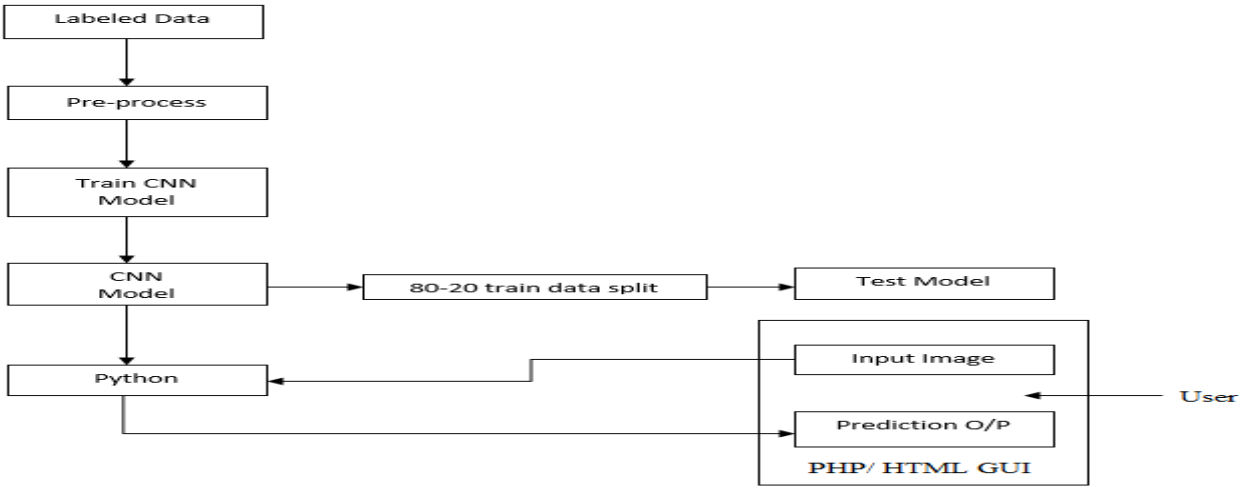

Fig. 1 System Architecture

The images dataset are obtained from Kaggle that contains normal as well as different types of affected leaves images of tomato leafs. In the first step, applying pre-processing technique such as RGB to grey scale conversion and enhance them by using filtering algorithm to remove the noise from the image. Then it detects the edges in the image using edge detection methods and segmented the image. Later on next step is segmentation, After segmentation, the image is converted into set of images by feature extraction. Here, certain features of interests within the image are detected and represented for further processing. The resulting representation can we subsequently used as an input to number of pattern recognition and classification techniques which will then classify or recognize semantic contents of the image. After feature extraction, the detection of leaf is observed. All this is done in classification block. For these entire steps have been done by using convolutional neural network technique. Finally, the performance and the accuracy of the proposed system is evaluated.

IV. Conclusion

The convolution neural network is the deep feed-forward artificial neural network which is applied for detecting the leaf disease. We are considering one leaf per image because the surrounding leaves may have the same or different disease and it will be difficult to detect accurately. In the proposed method, we are performing series of steps like data pre-processing for improving detection accuracy and other image processing methods to improve our result accuracy. If this method is fully implemented then the disease can be detected at early stage and this will reduce the cost and the time consumed manually.

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