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COTTON PLANT DISEASE DETECTION USING DEEP LEARNING

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ABSTRACT

Diseases found in Agricultural crops are a major threat that causes production and economic losses as well as reduction in both quality and quantity of agricultural products. In India, 70% of the population depends on agriculture which contributes about 17% of the total GDP of our country. Cotton is a very important cash crop in India. Farmers have difficulty switching from one disease control policy to another. It is difficult for the human eye to identify the exact type of leaf disease that occurs on the plant leaves, which also requires constant monitoring of experts, which can be prohibitively expensive on large farms. Expert naked eye observation is the main approach adopted and used in practice to detect plant diseases. With the help of the Deep CNN model, we can use images processing techniques to analyze dead leaf images and extract the features such as color, texture, and other characteristics. Automatic disease detection is easier as well as cheaper, which also supports machine vision, which provides image-based automated process control and inspection.

I. INTRODUCTION

India is one of the oldest countries still practicing agriculture. Traditional farming methods are still in existence and thus end up with minimal crop yields and fewer benefits to farmers. Various factors have affected the health of agriculture in India. Selecting a crop for planting is one of the biggest challenges that farmers face while growing crops. The emergence of a number of crop-related diseases also affects the productivity of the agriculture sector. One of the common problems is the destruction of most of the production due to diseases. A large part of the production process is hampered by the presence of diseases in the plants grown. This leads to a focus on effective ways of detecting diseases in plants. The presence of various diseases in plants is a major concern for farmers. minimal. Recent advances have been made in the identification of plant diseases. This paper examines the effectiveness of using CNN models and Image processing for the identification and classification of plant diseases.

II. AIM & OBJECTIVES

The main objective is to develop a user-friendly system that recognizes cotton crop diseases. In this, the user has to upload an image to the system. This image is used as an input for Image processing. The Image processing begins with the digitized color image of the diseased leaf. Finally, plant diseases can be predicted by applying CNN. The aim is to protect crop production from quantitative losses. To monitor large fields of crops and thus automatically detect the symptoms of diseases as soon as they appear on crop leaves and also to focus on enhancing productivity.

Objectives:

1. Developing a user-friendly web-based system for farmers.
2. Recognizing Cotton leaf diseases accurately from input images.

III. LITERATURE SURVEY

International Conference on Internet of Things and Intelligence System analysis [IEEE] [2018], this paper describes a modern method of TensorFlow framework by CNN model for identification of plant diseases. It identifies fungi-caused diseases in sugarcane by calculating only leaf area. However, this system requires high implementation and has computational complexity.

International Conference for Convergence in Technology [IEEE] [2018] presents Image processing techniques for plant disease detection. Images are captured and then they are realized to match the size of the image stored in the database. This approach can remarkably support disease detection. However, diseases are detected by calculating only leaf area which leads to less accurate results because of the lack of factors used for detecting the diseases. This system also recommended the use of pesticides which could harm the soil in the long run.

Plant Disease Analysis using Histogram Matching based on Bhattacharya's Distance Calculation [2016], uses Bhattacharya's Similarity Calculation method to detect rice plant diseases by comparing it with 100 healthy images and 100 samples of each disease 1 and disease 2. This method successfully identifies burning and blast diseases in plants. This method is not sufficient enough to detect diseases or classify them as the training data is not linearly separable.

Maturity and disease detection in tomatoes using computer vision [IEEE] [2016], uses the Thresholding algorithm and K-means clustering to detect diseases. The thresholding algorithm is used for image segmentation. This method is numerical, unsupervised, and iterative which makes it more accurate. However, thresholding is not a reliable method as this technique only distinguishes red tomatoes from other colors. It becomes difficult to tell the difference between ripe and unripe tomatoes. For this K-means clustering algorithm is used to overcome the disadvantages. K-means creates a certain number of non-hierarchical clusters. This method is a numerical approach that is unsupervised, non-deterministic and iterative.

Detecting Jute Plant Disease Using Image Processing and Machine Learning; presents the technique of detecting jute plant disease using image processing. The image is captured and then it is realized to match the size of the image to be stored in the database. Second, the image quality is enhanced and noise is removed. Hue-based segmentation is applied to the image using a customized thresholding expression. The image is then converted into HSV from RGB as it helps extract the region of interest. This proposed approach can greatly assist in detecting stem-oriented diseases in jute plants.

IV. EXISTING SYSTEM

In the existing work done, deep network models have many problems such as a large number of parameters, a long training time, high storage cost, computational cost and low recognition accuracy. High precision is necessary for classifying plant diseases as well as understanding how detection is accomplished and which symptoms are present in the plant. Therefore, in recent years, many researchers have committed themselves to studying visualization techniques such as the introduction of visual heat maps and salient maps to better understand.

Most of the frameworks proposed in the literature survey have good detection effects on their datasets, but the effects are not good on other datasets, that is the models are less robust. Therefore, more accurate models are needed to adapt to the diversified disease datasets. Although some studies are using hyperspectral images of diseased leaves, and some DL frameworks are used for the early detection of plant leaves diseases, there are still some problems that need to be resolved in order to make widespread use of HSI for the early detection of plant diseases. That is, it is difficult to obtain the labeled datasets for early plant disease detection and even mark where for early plant disease detection and even mark where the invisible disease symptoms are.

V. PROPOSED SYSTEM

In the proposed system, we use a real-time dataset containing images of various cotton diseases. These images are used for training and testing. We use Convolution Neural Network (CNN) for training our model. CNN has a methodology similar to traditional supervised learning methods, it receives input images, detects the features and then grades them. Our system is divided into two parts:

1. Training Model
2. Image Processing

The training model takes the leaf image as input and that image goes under four stages:

1. Convolution layer: This is the first layer where the features from the input images are extracted.
2. RELU Layer: After the convolution layer the image goes through the RELU layer, where non-linearity is introduced.
3. Pooling Layer: After the RELU unit, the image is sent to the pooling layer and the number of parameters is reduced if the images are too large
4. Fully Connected Layer: In this layer, we extract the features of the images with as much as high accuracy.

It is an essential layer of CNN.

After training our model we proceed to Image Processing, where three processes are to be followed:

1. Image Pre-Processing: In this phase, we require images with better resolution and with better quality. All the images are resized in a specific manner and resolution. Image pre-processing removes noise content and the images using data augmentation.
2. Feature extraction: In the feature extraction process, we find some important features of the defected leaf. It extracts structured data from unstructured data. These features are used to train our neural network.
3. Image Classification: Classification helps to analyze the measurements to identify the classes to which that image belongs.

VI. SYSTEM ARCHITECTURE

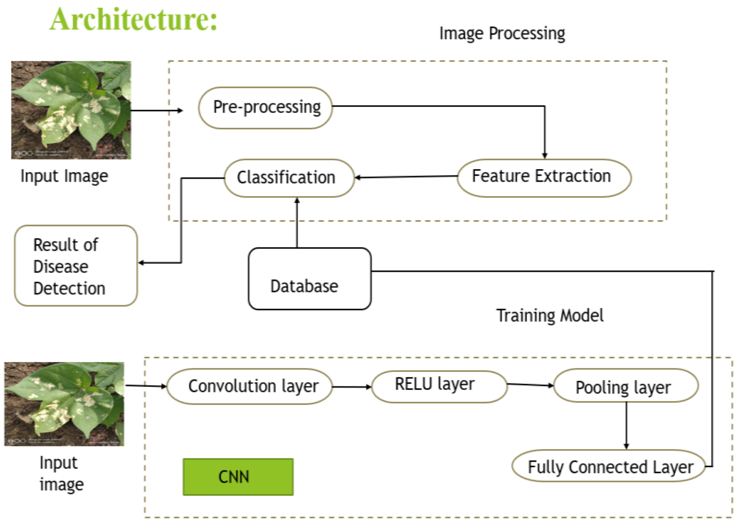

Fig 1: System Architecture

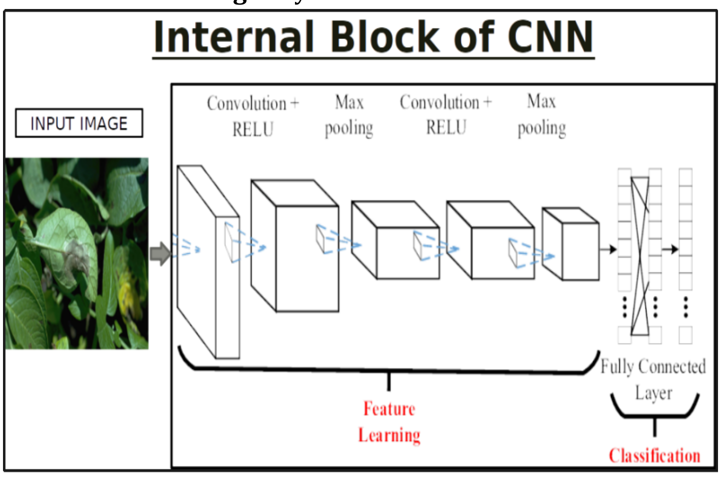

Fig 2: Internal block of CNN

VII. RESULT DISCUSSION

The purpose of this website is to create a system that recognizes crop diseases and provides the results to the user as a disease that has been detected.

Fig 3: Front Page

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The index page, as seen above, provides a user with an overview of the website.

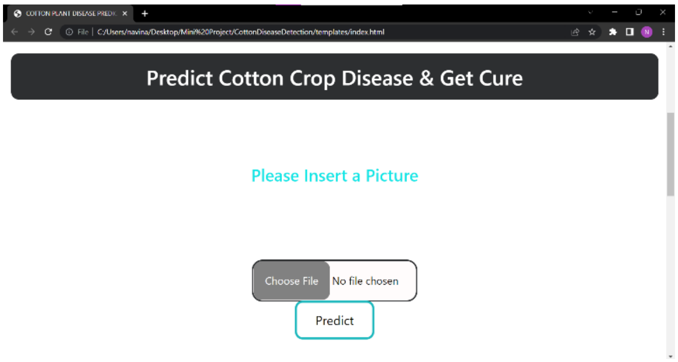

Fig 4: Taking Input from User

To predict the disease, the user has to upload a cotton leaf image. After the user has uploaded an image, Image Processing begins with a digitized colour image of the plant leaf. The Image Data Generator will read pictures and the images are resized with a target size of 150 × 150, which are chosen to be small and close to a fraction of the average image size. Finally, plant disease can be anticipated by using CNN. On different scales and resolutions of images, the system can anticipate diseases. The output result is unaffected by size, direction, or light intensity. On the other hand, in high-resolution image detection accuracy of the image detection will be high.

A total of 520 images make up the training dataset, while 217 images make up the testing dataset. The system's overall accuracy is found to be 89%.

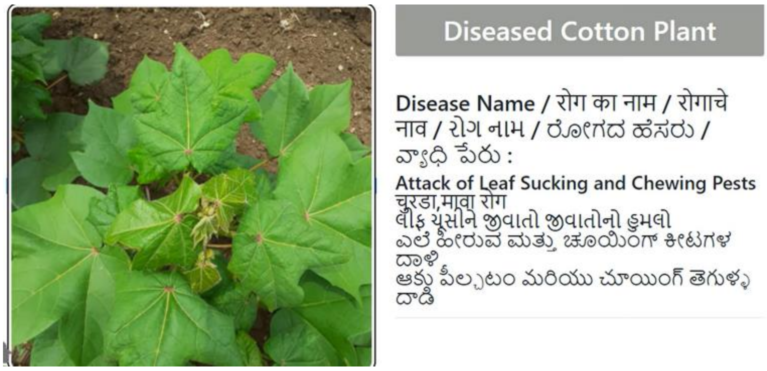

Fig 5: Detecting Disease of the Input Image

The above image shows the result obtained after the detection of the disease. The detection involves an image of the leaf along with the disease name in different languages. The most difficult component of constructing an object detection model based on machine learning was collecting a huge number of train photos of various forms, sizes, backgrounds, light intensity, orientation, and aspect ratio.

More research can be conducted to detect all forms of plant diseases, as well as to suggest disease cures. This system can also be combined with an IoT server to create a system that can be used in rural and remote areas.

VIII. CONCLUSION

A web-based system has been successfully implemented for crop disease detection for cotton leaves using a Convolutional Neural Network. The Convolutional neural network has been developed with three hidden layers to classify the cotton leaf disease images. The System successfully processes input from the user and provides output in the form of disease detected. Provided sufficient data is available for training, deep learning techniques are capable of recognizing plant leaf diseases with high accuracy. The importance of acquiring large datasets with high variability, data augmentation, transfer learning, and visualization of CNN activation maps in improving classification accuracy.

India is a country with a rich history of agriculture. Therefore, our work would help farmers to prevent plant diseases, increase productivity and profit. Our future work aims at an improved data set with a large number of attributes and also implementation of yield predictions, preventive actions, corrective actions, pesticides required and probable cost for proposed pesticides. This system can be extended to any other crop having the availability of enough large datasets for that crop. A number of other diseases can be included for detection. The System also can implement hardware using IoT for Image capturing in fields. The Web interface can also involve a forum for formers to have discussions regarding the current trends they are facing in different diseases.

IX. REFERENCES

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