Plant Leaf disease detection system using deep learning

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***Abstract*- Plant diseases have an effect on the expansion of their species, therefore early detection is extremely vital. We propose a deep learning approach for plant disease detection using an Android app. Our approach consists of two parts: (1) a deep learning model that is trained to detect plant diseases from images and video captured. (2) an Android app that uses the trained model to detect plant diseases from images and video captured by the user. The application also provides solutions based on detected disease. The developed mobileapplication is user-friendly and can be used by farmers without much technical knowledge.**

Keywords: **Deep learning, Preprocessing, Classifier.**

1. INTRODUCTION

According to the Food and Agriculture Organization of the United Nations, plant diseases are estimated to cause an annual global loss of 10-16% of total crop production, resulting in an estimated loss of US $220 billion to US $312 billion per year. The most prevalent and economically damaging plant diseases include bacterial blight, viral disease, fungal disease, and nematode infestations. Many of these diseases are spread through soil, water, insects, and other animals, while others are caused by environmental factors such as extreme weather. The World Health Organization (WHO) estimates that up to 40% of global food production is lost due to plant diseases. Climate change is expected to increase the occurrence and severity of plant diseases, further impacting global food security.

Plant disease detection techniques using in the world:

1. Microscopy: Microscopy is used to analyze the structure of plant tissues in order to detect plant diseases. This technique is used to identify pathogens, such as fungi, bacteria and viruses, that cause plant diseases.
2. Visual Symptoms Inspection: Visual symptoms inspection is the most common and simplest method used to detect plant diseases. Plant pathologists use this method to identify plant diseases by looking for typical symptoms such as spots, lesions,discoloration, wilting, etc.

A plant disease detection system using deep learning is a computer-based system that uses machine learning techniques, particularly deep learning, to automatically identify and diagnose plant diseases from images of the affected plants. The system can be trained using a dataset of labeled images ofdiseased and healthy plants to learn the patterns and featuresthat are characteristic of specific diseases. Once trained, the system can analyze new images of plants and make predictions about the presence of disease and the type of disease. This can help farmers and agricultural workers to quickly and accurately detect and diagnose plant diseases in the field, which can enablethem to take timely and effective action to prevent the spread of the disease and protect their crops.

2. LITERATURE SURVEY

Shima Ramesh; Ramachandra Hebbar; Niveditha M; Pooja R.; Prasad Bhar.Use of Random Forest in identifying between healthy and diseased leaf from the data sets created.Using machine learning to train the large data sets available publicly gives us a clear way to derect the disease present in plants in a colossal scale

SharadaP.Mohanty, David.P. Hughes and Marcel Salathc Training a deep convolutional neural network to identify cropspecies and diseases (or absence thereof). The approach oftraining deep learning publicly available image datasets presentsa clear pad1 toward smartphone-assisted crop disease diagnosison a massive global scale.

Konstantions P Ferentinos .Plant disease detection and diagnosis using simple leaves images of healthy and diseased plants, through deep learning methodologies.The significantly high success rate makes the model a very useful advisory or early warning tool, and an approach that could be further expanded to support an integrated plant disease identification system to operate in real cultivation conditions.

U.Shruthi; V.Nagaveni; B.K.Raghavendra.This paper presents the stages of general plant diseases detection systemand comparative study machine learning classification techniques for plant disease detection.In this survey it observed that Convolutional Neural Network gives high accuracy anddetects more number of diseases of multiple crops.

Ashwin Dhakal, Prof. Dr. Subarna Shakya.The detection of plant diseases, infected leaves and crops.Demonstrating the feasibility of this approach in the field of Plant Disease helps in the diagnosis and high crop yielding in future.

Amandeep Singh, Maninder Lal Singh& et al... [3] The most significant challenge faced during the work was capturing the quality images with maximum detail of the leaf color. It is very typical task to get the image with all the details within a procesable memory. Such images are formed a through high resolution and thus are of 6-10MB of size. This was handled by using a Nikon made D5200 camera which served the task very well. Second challenge faced was to get rid of illuminationconditions as from the start to the end of paddy crop season, illumination varies a lot even when the image acquiring time is fixed. However the solution to this is variable user definedthresholding and making necessary adjustments to the shades of LCC

Y.Sanjana, AshwathSivasamy& et al… In this it describes theuploaded pictures captured by the mobile phones are processed in the remote server and presented to anexpert group for their opinion. Computer vision techniques are used for detection of affected spots from theimage and their classification. A simple color difference based approach is followed for segmentation of thedisease affected lesions. The system allows the expert to evaluate the analysis results and provide feedbacks tothe famers through a notification to their mobile phones. The goal of this research is to develop an imagerecognition system that can recognize crop diseases. Image processing starts with the digitized color image of diseaseleaf. A method of mathematics morphology is used to segment these images. Then texture, shape and colorfeatures of color image of disease spot on leaf were extracted, and a classification method of membership functionwas used to discriminate between the three types
of diseases.

3. PROPOSED SYSTEM

The proposed system is a plant disease detection system using deep learning with an android application. This system consists of two parts. The first part consists of a deep learning model thatis trained on a dataset of images of diseased plants. The model will be able to detect a variety of diseases in different plants.The second part of the system is an android application that will allow users to take photos of their plants and submit the photos to the deep learning model.

The model will then classify the photos and provide the user with information about the disease and its potential treatments.The application will also provide tips on how to prevent the disease in the future. This system will enable users to quickly and accurately detect plant diseases, allowing for better crop management and improved crop yields.

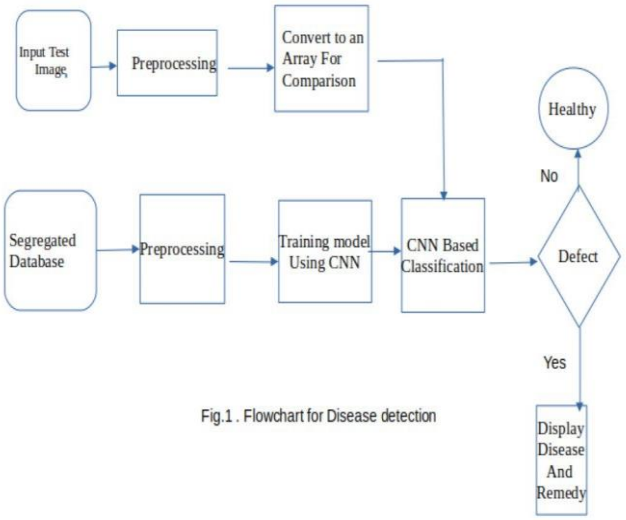


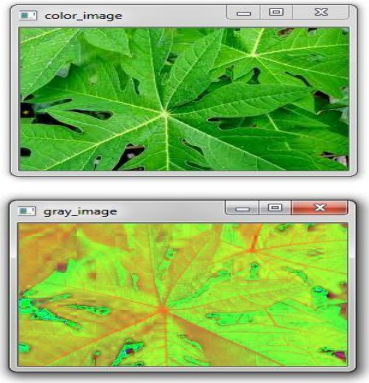
Fig.1 . Flowchart for Disease detection

Image Pre-processing:

The use of computer algorithms to perform imageprocessing on digital images is known as image pre-processing. We can detect the plant by analysing the image with a specific algorithm. Weuse a similar approach for image processing and detection with a specific algorithm. The image quality is critical in this process; we can't use the algorithm if the image isn't clear.

Image Segmentations:

The method of segmenting a digital image into multiple segments is known as image segmentation (sets of pixels, also known as imageobjects). Image segmentation is used to make image identification and analysis simpler by dividing the image into several segments and analysing each segment individually. Color, texture, and intensity are all common characteristics among the various segments.



The algorithm here is implemented using random forests classifier. They are flexible in nature and can be used forboth classification and regression techniques. Compared to other machine learning techniques like SVM, GaussianNaïve bayes, logistic regression, linear discriminant analysis, Random forests gave more accuracy with less number of image data set. The following figure shows thearchitecture of our proposed algorithm.

4. CONCLUSION

This project presents the survey on different diseases classification techniques used for plant leaf disease detection and an algorithm for image segmentation technique that can be used for automatic detection as well as classification of plant- leaf diseases later. Grape, corn, tomato, pepper, apple, and blueberry are some of those species on which proposed algorithm is trained and tested. Therefore, related diseases for these plants were taken for identification. With very less computational efforts the optimum results were obtained, whichalso shows the efficiency of proposed algorithm in recognition and classification of the leaf diseases. Another advantage of using this method is that the plant diseases can be identified at early stage or the initial stage.

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