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PLANT SPECIES IDENTIFICATION AND DISEASE DETECTION USING DEEP LEARNING

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Abstract

Plant diseases affect the growth of the species and their respective crops, early identification of the plant disease prevents the losses in the yield and improves the quality and quantity of the agriculture products. Many machine learning models are used to detect the disease inthe plant but, after the advancements of deep learning models, this area of research appears to have a great potential in terms of increasing accuracy.The proposed system identifies the plant species and disease of the leaf. The dataset we got from internet Kaggle is segregated and the different plant species are identified and are renamed to form a proper database then obtain test-database which consists of various plant diseases that are used for checking the accuracy of the project. Then using training data, we will train our classifier and then output will be predicted with better accuracy, we used google Net model to train the data, which consists of different layers which are used for predicting the disease.The existing system the farmers are using for the detection of diseases in the plants is that- they could be identified through the naked eye and their knowledge about plant disease. For doing so, on large number of plants is time consuming, difficult and accuracy is not good, Consulting experts is of great cost. In such kindof conditions to improve the accuracy rate and make it more beneficial suggested techniques are implemented for the detection of the diseases that makes the process cheaper and easier This review provides a comprehensive explanation of deep learning models used to visualize various plant diseases. In addition, some research gaps are identified from which toobtain greater transparency for detecting diseases in plants, even before their symptoms appear clearly.

1. INTRODUCTION

An automated plant species identification and disease diagnosis system could help botanists and layman in identifying plant species rapidly. Deep learning is robust for feature extraction as it is superior in pro- viding deeper information of images. In this research, the leaf images were pre-processed and the features were extracted by using Convolutional Neural Network (CNN). This paper proposes a mathematical model of plant disease detection and recognition based on deep learning, which improves accuracy, generality, and training efficiency. The segmented leaves are input into the transfer learning model and trained by the dataset of diseased leaves under simple background.

2. OBJECTIVE

Aim of this project is to develop a system which identifies the species and disease of a plant by using Google Net architecture of CNN algorithm, project is to develop a system which can perform early prediction of disease in plants with a higher accuracy Image processing is also used to represent the output in the forms of images and charts.The image processing could be used in the field of agriculture for several applications. It includes detection of diseased leaf, stem or fruit, to measure the affected area by disease, to determine the color of the affected area. Tomato cultivation is one of the most remunerative farming enterprises in India. The naked eye observation by the experts is approach usually taken in identification and detection of plants. This approach is time consuming in huge farms or land areas. The use of image processing

3. EXISTING SYSTEM

The existing method for plant disease detection is simply naked eye observation by experts through which identification and detection of plant diseases is done. For doing so, a large team of experts as well as continuous monitoring of plant is required, which costs very high when we do with large farms.

4. PROPOSED SYSTEM

Proposed system opted to develop an Android application that detects plant diseases. It has the algorithms and models to recognize species and diseases in the crop leaves by using Convolutional Neural Net- work. Proposed system uses Collab to edit source code. A dataset of 54,305 images of diseased and healthy plant leaves collected under controlled conditions Plant Village dataset. The images cover 14 species of plants, including: apple, grape, orange, pepper, potato, brinjal, lady's finger, and tomato.

It contains images of 17 basic diseases, 4 bacterial diseases, 2 diseases caused by mold (oomycete), 2 viral diseases and 1 disease caused by a mite. 12 crop species also have healthy leaf images that are not visibly affected by disease. Our dataset contains solutions for several plant textures such as,

5. EXPERIMENTAL STUDY

Techniques in detection and identification of tomato plant diseases in the earlier stages and thereby the quality of the product could be increased. These systems monitor the plant such as leaves

and stem and any variation observed from its characteristic features, variation will be automatically identified and also will be informed to the user.

6. LITERATURE SURVEY

Paper [1] presents classification and detectiontechniques that can be used for plant leaf disease classification. Here preprocess is done before feature extraction. RGB images are converted into white and then converted into grey level image to extract the image of vein from each leaf. Then basic Morphological functions are applied on the image. Then the image is converted into binary image. After thatif binary pixel value is 0 its converted to corresponding RGB image value. Finally, by using Pearson correlation and Dominatingfeature set and Naive Bayesian classifierdisease is detected.

In paper [2] there are four steps. Out of them thefirst one is gathering image from several part of the country for training and testing. Second part is applying Gaussian filter is used to remove all the noise and thresholding is done to get the all-green color component. K-means clustering is used for segmentation. All RGB images are converted into HSV for extracting feature.

The paper [3] presents the technique of detecting jute plant disease using image processing. Image is captured and then it is realized to match the size of the image to be stored in the database. Then the image is enhanced in quality and noises are removed. Hue based segmentation is applied on the imagewith customized thresholding formula.

- EASABILITY STUDY

In this review, we present a comprehensive andcritical survey on image-based plant leafdisease prediction techniques. Diseases inplants cause major production and economic losses in agricultural industry worldwide. Monitoring of health and detection of diseases in plants and trees is critical for sustainable agriculture. To the best of our knowledge, there is no sensor commercially available for real- time assessment of health conditions in trees. Currently, scouting is most widely used mechanism for monitoring stress in trees, whichis an expensive, labor-intensive, and time- consuming process. Molecular techniques such as polymerase chain reaction are used for the identification of plant diseases that require detailed sampling and processing procedure. Early information on crop health and disease detection can facilitate the control of diseases through proper management strategies such as vector control through pesticide applications, fungicide applications, and disease-specificchemical applications; and can improveproductivity. The aim of this research is topropose and evaluate a framework for detectionof plant leaf diseases. Studies show that re- lying on pure naked-eye observation of experts to detect such diseases can be prohibitively expensive, especially in developing countries.

- **Economic Feasibility**

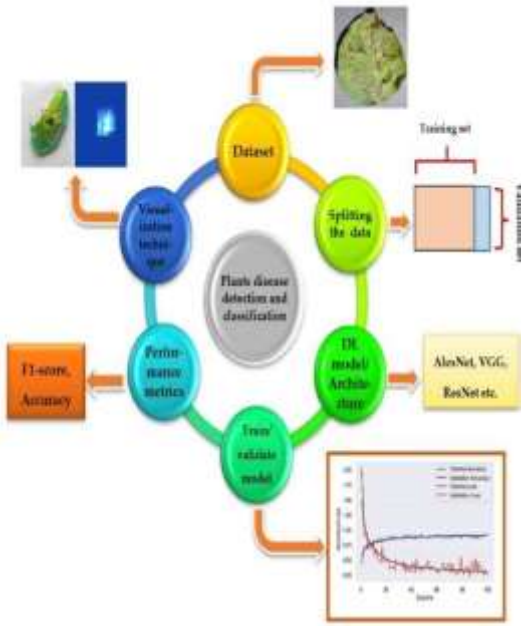
Agricultural productivity is something on which economy highly depends. This is the oneof the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area, then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected. For instance, a diseasenamed little leaf disease is a hazardous disease found in pine trees in United States. Detection of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in big farms of crops, and at very early stage itself it detects the symptomsof diseases i.e., when they appear on plant

leaves. This paper presents an algorithm for image segmentation technique which is used forautomatic detection and classification of plant leaf diseases. It also covers survey on different diseases classification techniques that can be used for plant leaf disease detection. Imagesegmentation, which is an important aspect for disease detection in plant leaf disease, is done by using genetic algorithm.

- **Technical Feasibility**

The focus is on enhancing productivity, without considering the eco- logical impacts that has resulted in environmental degradation. As dis- ease of the plants is inevitable, detecting diseaseplays a major role in the field of agriculture. Plant pathogens consist of fungi, organism, bacteria, viruses, phytoplasmas, viroid's etc. Three components are absolutely necessary for diseases to occur in any plant system and which may infect all types of plant tissues including leaves, shoots, stems, crowns, roots, tuber, fruits, seeds and vascular tissues. Therefore, detection and classification of diseases is an important and urgent task. The necked eye observation of experts is the main approach adopted in practice for detection and identification of plant diseases. How- ever, this requires continuous monitoring of expertswhich might be prohibitively expensive in largefarms. We can analyze the image of disease leaves by using computer image processing technology and ex- tract the features of disease spot according to color, texture and other characteristics from a quantitative point of view.

6.2 ARCHITECTURE



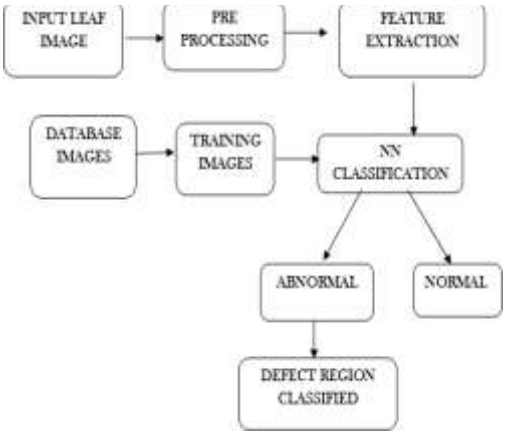
6.3 METHODOLOGY

To get a sense of how our approaches will perform on new unseen data, and also to keep a track of if any of our approaches are overfit- ting, we run all our experiments across a whole range of train-test set splits , namely 80–20 , thePlant Village dataset has multiple images of thesame leaf (taken from different orientations), and we have the mappings of such cases for 41,112 images out of the 54,306 images; and during all these test-train splits, we make sure all the images of the same leaf goes either in the training set or the testing set. Further, for every experiment, we compute the mean precision, mean recall, mean F1 score, along with the overall accuracy over the whole period of training at regular intervals (at the end of every epoch). We use the final mean F1 score for the

comparison of results across all of the different experimental configurations. We evaluate the applicability of deep convolutional neuralnetworks for the classification problem described above. We focus on popular CNN architecture Google Net. The Google Net architecture on the other hand is a much deeper and wider architecture with 22 layers, while still having considerably lower number of parameters (5 million parameters) in the network than Alex Net (60 million parameters).

6.4 DESCRIPTION Data flow diagram:

The testing and training dataset are used inCNN model to predict the leaf disease the last level comprises of both CNN and denseCNN model. It is used to gain more accuracy.



6.5 Results

The plant disease recognition model based on deep learning has the characteristics of unsupervised, high accuracy, good universality, and high training efficiency. However, there are many challenges in accuracy practicability of plant disease detection in the complex environment. In order to solve these problems and optimize the identification method, this paper proposes a recognition model integrating RPN algorithm, CV algorithm, and TL algorithm, which can effectively solve the problem of plant disease identification in the complex environment. The model not only adapts to complex environments, but also increases the accuracy of identification. Compared with the traditional model, the model proposed in this paper not only guarantees the robustness of the convolutional neural network, but also reduces the number and quality requirements of the convolutional neural network on the data set and obtains better results. Therefore, the model could help agricultural production personnel to prevent and cure the plant disease quickly.

6.7 CONCLUSION

In conclusion, this research is about plant species identification and disease detection by using deep learning via framework TensorFlow. It has three (3) objectives that have achieved throughout this research. The objectives are linked directly with conclusions because it can determine whether all objectives are successfully achieved or not. It can be concluded that all results that have been obtained, showed quite impressive outcomes. Implementation of deep learning by using framework TensorFlow also gave good results as it is able to simulate, train and classified with up to 90% percent of accuracy towards different plants that have become a trained model. Lastly, Python have been used as the programming language throughout this research since it comes together with framework TensorFlow which leads to designing of the system involved Python from start until it ends

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