

## IDENTIFICATION OF PLANT DISEASES USING CONVOLUTIONAL NEURAL NETWORKS

# DEEP CONVOLUTIONAL NEURAL NETWORK BASED IDENTIFICATION SYSTEM FOR REAL-TIME PLANT DISEASE RECOGNITION

D. SHIVADATHA REDDY

<sup>1</sup> M.TECH, DEPT OF ECE,

UNDER GUIDANCE OF

<sup>2</sup>ASSOCIATE PROF. DR. JAHANGIR BADASHAH [Ph.D.],

ASSISTANT PROF. DR. VIKRAM PALODIYA [Ph.D.] ,

DEPARTMENT OF ECE, SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY, HYDERABAD, TS, INDIA.

**ABSTRACT:** Green plants are very much important to the human environment; they form the basis for the sustainability and long term health of environmental systems. Thus it is very important to grow healthy plants. The plant disease could be cured if it is known in the earlier stage. In this paper, we have proposed a system using raspberry pi to detect healthy and unhealthy plants & alerts the farmer by sending email. We have used tensor flow tool for numerical computation. It can be used in an controlled environment farms such that it detects the signs of disease whenever they appear on the leaves of the plant.

### 1. INTRODUCTION

India is cultivated country and about 70% of the population depends on agriculture. Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural product. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of health and disease on plant plays an important role in successful

cultivation of crops in the farm. In early days the monitoring and analysis of plant diseases were done manually by the expertise person in the field. This requires tremendous amount of work and also requires excessive processing time. The system uses raspberry pi to detect healthy and unhealthy leaves by training images and finding accuracy.

### 2. LITERATURE SURVEY

Plant diseases have turned into larger problems as it causes significant reduction in both quality and quantity of agricultural

products. Spinach Leaf pests and diseases affect food crops, causing significant losses to farmers and threatening food security. The spread of leaf diseases has increased dramatically in the recent years due to environmental pollution and many other causes. Following the discovery of the causes of plant diseases in the early nineteenth century, growing understanding of the interactions of the pathogen and host has enabled us to develop a wide array of measures for the control of specific plant diseases.

From the advent machine learning techniques, many people have tried and classified plant disease. Kim et al. (2009) have classified the grape fruit peel diseases using color texture features analysis. The texture features are calculated from the spatial gray-level dependence **Matrices** (SGDM) and the classification is done using squared distance techniques. Grape fruit peel might be infected by several diseases like canker, copper, burn, greasy spot, melanose and windscar. Helly et al. (2003) developed a new method in which Hue saturation intensity transformation is applied to the input image, then it is segmented using Fuzzy c-mean algorithm. Feature extraction stage deals with the color, size and shape of the spot and finally classification is done using neural networks.

The common diseases are fungal, Damping-off and root rot, Downy mildew, Fusarium wilt, White rust. They are being caused due to fungi. Disease emergence is favoured by very wet weather, spores are spread by splashing water. Symptomatic plants are often found in low-lying areas of the field or garden where water accumulate, disease symptoms are similar to symptoms caused by over watering plants. The symptoms in white rust are due to yellow spots on upper side of leaves, clusters of white, blister-like pustules on underside of leaves which may spread to upper leaf surfaces in advanced stages of infection, infected plants show a loss of vigor and collapse if conditions are favourable to rapid disease development. The diseases that can be commonly affected in spinach are Downy mildew, Anthracnose, Cladosporium Leaf spot, Stemphylium leaf spot, Damping off and root rot. The favourable conditions for spinach to be maintained are high humidity, high soil moisture, cloudiness and low temperatures below 24 degree Celsius for few days are ideal.

### **3. EXISTING SYSTEM:**

In existing system, we can identify the disease of the plant by using our own eye that is with help of human. This process is not accurate because many diseased leaves have same features and applying wrong remedy leads to the loss of the entire plant.

We can also take picture of leaf and apply the K means algorithm and then check whether the leaf is diseased or not by using SVM but that is not accurate because it can achieve only less accuracy for a good dataset. so we have to improve the model or use the different algorithm so we use the CNN algorithm.

#### 4. PROPOSED SYSTEM

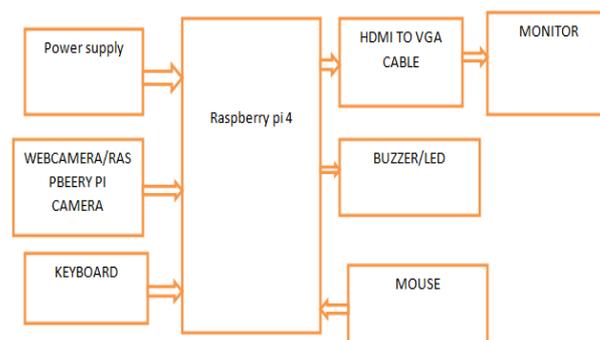
In this project author using convolution neural network as artificial intelligence to train all plant diseases images and then upon uploading new images CNN will predict plant disease available in uploaded images. For storing CNN train model and images author is using cloud services. so, using AI author predicting plant disease and cloud is used to store data.

In this Project author using smart phone to upload image but designing android application will take extra cost and time so we build it as python web application. Using this web application CNN model will get trained and user can upload images and then application will apply cnn model on uploaded images to predict diseases. If this web application deployed on real web server then it will extract users location from request object and can display those location in map.

Accurately identify diseases and get solutions with a mobile app by photographing affected plant parts

#### 5. ARCHITECTURE

The block diagram of the proposed the system is shown. Our proposed system will be able to detect the disease and classify it. It requires power supply, raspberry pi3, Internet, E-mail, Raspberry pi camera. In this process, we have to send command to the camera. It is directly connected to the raspberry pi. Using the USB connection, the power supply is being provided. Using tensor flow, the image is being processed and detected by the raspberry pi.



#### 6. WORKING & RESULTS

We have trained the Convolution Neural Network application with more than 1000 healthy leaves and disease infected leaves. Training the tensor flow takes time about 45 minutes depending on the number of dataset that we provide. The accuracy of identifying the disease is proportional to the number of datasets. After training, the command for capturing the real-time leaf is executed through the terminal window. The raspberry pi camera after capturing the

leaf compares the image with the dataset that we have provided and gives the result. The result is based on the dataset provided, which signifies the percentage of leaf affected by disease and which are not. We can improve the accuracy by increasing the dataset. After all the training steps are complete, the script runs a final test accuracy evaluation. The test evaluation provides the best estimate of how the trained model will perform on the classification task.

## **7. BLOCK DIAGRAM EXPLANATION.**

### **1. Power Supply for pi**

We use 5V and 1A power supply for this project because it is used for the charging purpose of the raspberry pi

### **2. Camera module**

Camera is used to capture a picture; it is connected to raspberry. There are two ways to connect the camera to the raspberry pi. The first method is to connect the camera through USB cable and the second method is 15 pin headers for the interface of raspberry pi.

### **3. Raspberry PI**

Raspberry Pi is like a mini CPU. The camera will capture the picture and send it to the Raspberry Pi. It identifies a plant leaf disease using the Open CV and the CNN algorithms for identification. It is a microprocessor. It is very small in size, it is

in size of credit card. We can carry it easily anywhere.

### **4. Screen as presentation**

In the screen we will see the name of the disease that plant has been infected and its confidence.

### **5. CNN and Open CV**

CNN means convolutional neural network and Open CV means open computer vision. Open CV is used to read the leaf using the camera and used to process the image. CNN is used to train the sample dataset leaves and is used to train the model and used to predict whether the leaf is diseased or not and to show the type of the disease.

## **8. FUTURE WORK**

In this Project, we have proposed a system using raspberry pi which can detect disease infected leaf. The project has many verticality leaf detection. So far we have achieved in detecting the disease affected leaf. In future we will segregate the disease whether it is affected by bacteria, fungi or viral and specify the solution to the farmer in the field.

## **9. CONCLUSION**

The project deals with identifying the disease affected leaf. This is achieved through the Convolutional Neural Network Algorithm. If the leaf is affected by disease then the information is shared through the mail. This helps the farmer to find

asolution without coming towards the field.

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