CROP DETECTION ANALYSIS USING CNN ALGORITHM WITHAMAZON WEB SERVICES

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Abstract— The most provident thing is to develop the smarter platform to find out best productive and efficient plant disease detection to meet the demand. The aim of this paper is to increase the production of the crop by diagnosing the plant because most of the plants are affected by a different fungal and bacterial diseases, leads threat to food security, giving the appropriate fertilizers in right time is important. Here we mainly deal with the plants of fruits and vegetable and for easy interface we are employing web user interface. Every plant has different diseases in different season sometimes we have to recognize early stage of the diseases, as we dealing with fruit and vegetable plants, collecting the data of fertilizers to the appropriate disease for both plants of fruits and vegetables. The recent revolution in smart phone penetration and computer vision models has created an opportunity for image classification in agriculture. Convolutional Neural Networks (CNNs) are best in image recognition and offer the ability to provide a prompt and definite diagnosis of a plant disease detection. An automated system is introduced to identify fruit and vegetable plant diseases by checking the symptoms appearon the leaves of a plant.

Keywords—Artificial Neural Network, Convolutional Neural Network, Flask, Crop Detection

1.INTRODUCTION

Agriculture is the backbone of the livelihood security system of nearly 700 million people in the country and we need to build our food security on the foundation of home-grown food. In recent years, artificial intelligence and the disease detection first we apply the convolution to the images which use image data generator is used to load the images like zoom, flip [1]. By striding and relu function used to consider images as which positive pooling is applied to the processed images max., average and global pooling is taken to the image. Convolution will apply based in the programmed interest to get the accurate result pixel layer or fully connected layer which is the input to the values are taken accordingly striding to the right and the bottom side will be considered whenever it requires with depends on the size of the convolution layer size which defines [3]. Over the pooling layer vector will be applied it will be flattened Neural Network the which is havingthe dense layer the weights will be added randomly to the layers to extract the accuracy. The proposed model we take raspberry pi 4b as processor to implement the paper and OpenCV for camara and flask files to develop web page and AWS cloud is very useful for students on free of cost for primary hours, which is very helpful especial for those who uses for cloud-based techniques. The objective of the Plant disease detection is to diagnose the plant condition to maintain the crop healthy and productive. This paper is dealing with fruits and vegetable, whereas fruits are Apple, Corn and Peach, vegetables are Pepper, Tomato, Potato.

Plant disease is an impairment of the normal state of a plant that interrupts or modifies its vital functions. All species of plants, wild and cultivated alike, are subject to disease. Although each species is susceptible to characteristic diseases, these are, in each case, relatively few in number. The occurrence and prevalence of plant diseases vary from season to season, depending on the presence of the pathogen, environmental conditions, and the crops and varieties grown. Some plant varieties are particularly subject to outbreaks of diseases while others are more resistant to them.

Plant diseases are a normal part of nature and one of many ecological factors that help keep the hundreds of thousands of living plants and animals in balance with one another. Plant cells contain special signaling pathways that enhance their defenses against insects, animals, and pathogens. One such example involves a plant hormone called jasmonate (jasmonic acid). In the absence of harmful stimuli, jasmonate binds to special proteins, called JAZ proteins, to regulate plant growth, pollen production, and other processes. In the presence of harmful stimuli, however, jasmonate switches it signaling pathways, shifting instead to directing processes involved in boosting plant defense. Genes that produce jasmonate and JAZ proteins represent potential targets for genetic engineering to produce plant varieties with increased resistance to disease. Sporogenesis is the part of the pathogen's life cycle when it is not in vital association with living host tissue and either continues to grow in dead host tissue or becomes dormant. During this stage, some fungi produce their sexual fruiting bodies; the apple scab (Venturia inaequalis), for example, produces perithecia, flask-shaped spore-producing structures, in fallen apple leaves.

2.PROPOSED APPROACH

Most control measures are directed against inoculum of the pathogen and involve the principles of exclusion and avoidance, eradication, protection, host resistance and selection, and therapy. Potash and nitrogen, and the balance between the two, may affect the incidence ofcertain bacterial, fungal, and viral diseases of corn, cotton, tobacco, and sugar beet. A number of micro elements, including boron, iron, zinc, manganese, magnesium, copper, sulfur, and molybdenum, may cause noninfectious diseases of many

crop and ornamental plants. Adjusting the soil pH, adding chelated (bound or enclosed in large organic molecules) or soluble salts to the soil, or spraying the foliage withthese or similar salts is a corrective measure.

A variety of chemicals are available that have been designed to control plant diseases by inhibiting the growth of or by killing the disease-causingpathogens. Chemicals used to control bacteria (bactericides), fungi (fungicides), and nematodes (nematicides) may be applied to seeds, foliage, flowers, fruit, or soil. They prevent or reduce infections by utilizing various principlesof disease control. Eradicates are designed to kill a pathogen that may be present inthe soil, on the seeds, or on vegetative propagative organs, such as bulbs, corms, and tubers. Protectants place a chemical barrier between the plant and the pathogen.Therapeutic chemicals are applied to combat an infection in progress. This plant disease detection system is dealing with total six types of plant of fruit and vegetable, here is details of ideal conditions and disease type which aredealing in this paper. The Ideal condition for healthy plant are the following

1.Apple plant, the soil pH is 6.0 to 7.0 for healthy growth. Avoid planting apples ina low spot where cold air or frost can settle.
2.Corn plant, maintain the soil consistently moist, but not soggy and only need fertilizer every 6 months. It prefers temperatures of 75 to 80 degrees F.
3.Peach plant, should have deep sandy soil that ranges from a loam to a clay loam for healthy growth. Poor drainage in the soil will kill the root system of growing peach trees, so make sure the soil is well drained. Growing peach trees prefer a soilpH of around 6.5.
4.Pepper plant, take the necessary precautions like, putting the plant where it gets at least 10 hours of direct sunlight. Keep soil evenly moist for good growth. Peppersneed well-draining soil that is rich and loamy, but avoid too much nitrogen in the soil. Too much nitrogen can cause plenty of leaves and little to no peppers. Your soil should have a pH between 6.0 and 6.5.
5.Potato plant, where they will receive full sun (6-8 hours per day) planted in an acidic, well-drained soil. Plant Potatoes in Early Spring: Potatoes prefer cooler weather. They can be planted as soon as the ground can be worked in the early spring, once the soil temperature reaches 45˚F.
6.Tomato plants will grow well in well-drained sites that receive full sun for most of the day. The soil pH should be slightly acidic (6.2 to 6.8). Excess nitrogen can result in plants with lush, vigorous foliage but little fruit production.

The diseases of plant are described and how it can be controlled also explained in detailed manner. In Apple Black Rots is a fungal infection. To control black rot, remove the cankers by pruning at least 15 inches below the end and burn or bury them. Treating the sites with the antibiotic streptomycin or a copper-based fungicide will be helpful. Corn Northern Leaf Blight, the primary management strategy to reduce the incidence and severity of NCLB is planting resistant products. Using fungicides is also helpful. Peach Bacterial Spots, this is a difficult disease to control when environmental conditions favor pathogen spread. Compounds for the treatment include copper, oxytetracycline (Mycoshield and generic equivalents), and syllit+captan; however, repeated applications are typically necessary for even minimal disease control.
Pepper Bacterial Leaf Spot, the disease cycle can be stopped by using the Sango formula for disinfectants. Bleach treatment and hot water treatment is also helpful. Potato Early Blight, avoid irrigation in cool cloudy weather and time irrigation to allow plants time to dry before nightfall. Protectant fungicides (e.g., maneb, mancozeb, chlorothalonil, and triphenyl tin hydroxide) are effective.

But in Potato plant is Late Blight and the late blight can be effectively managed with prophylactic spray of mancozeb, cymoxanil and mancozeb or dimethomorph+mancozeb. For Tomato Bacterial spots, to protect the uninfected plants, remove the infected leaves and bury or burn them s there is no cure for this infection. To prevent future infections plant pathogen-free seeds or transplants to prevent the introduction of bacterial spot pathogens on contaminated seed or seedlings. Tomato Late blight, early treatment for this disease is needed. Fungicides like e Daconil fungicides from Garden Tech brand prevent, stop, and control late blight. and more than 65 types of fungal disease. Planting resistant cultivars and watering the plants early in the mornings help to prevent this infection. Tomato Leaf spot, removing the infected leaves immediately will curb the spread of infection. Organic and chemical fungicides with chlorothalonil are effective in treatment.

3.DETECTION OF PLANT DISEASES USING AMAZON WEB SERVICES

The plant disease detection system consists Raspberry pi, USB camera and a monitor to web UI and AWS used as to give access to the user to detect the plant disease. Here raspberry pi acts as controller to input and out output modules. The camera capture the frames will be collected by raspberry pi which is having saved model of the disease detection. using flask which is a web frameworkhaving saved templates HTML, CSS and JS and app.py which is having all the functions like saved model files of fruit and vegetable plant disease, URL, render template and app run. AWS is having console management DynamoDB, lambdadb and API gateway to which 3 are having user data and to access, DynamoDB stores the user credentials and lambdadb is to push and get data API gate way to interface with user. The plant disease detection system is shown in Figure 1. The plant detection system involves raspberry pi 4b which connected with USB camera, AWS and a monitor. The camera is used to collect data and AWS is provided access to the web page to detect plant disease . The architecture of plant disease detection system is shown in Figure 2

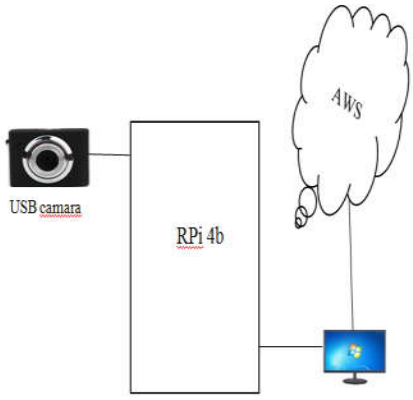

Figure 1 Plant Disease Detection System

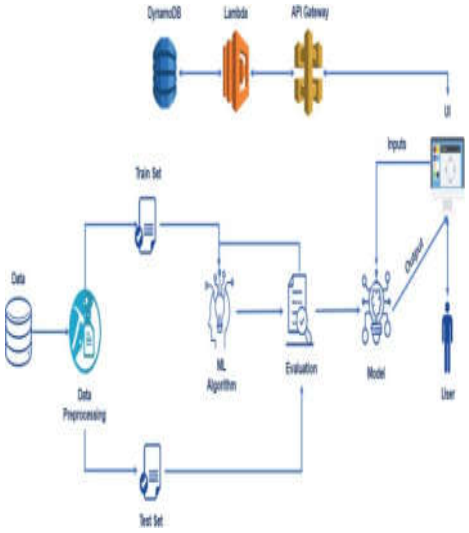

Figure 2 Architecture of Plant disease detection System

The user login's or register in to the Plant disease detection with the credentials, after successful login live streaming will be started by initializing stopor stop camera else using drop in image can select a file from the local storage to predict direct disease, whereas camera is in live streaming have to capture the Leaf of required plant and get the image which has shown in Figure .3, then select weather plant is fruit or vegetable also for the file which is selected from local storage, the process goes further after submission and predict, if the model recognizes the disease gives result with the suggestive techniques or else predicts that the plant is healthy.

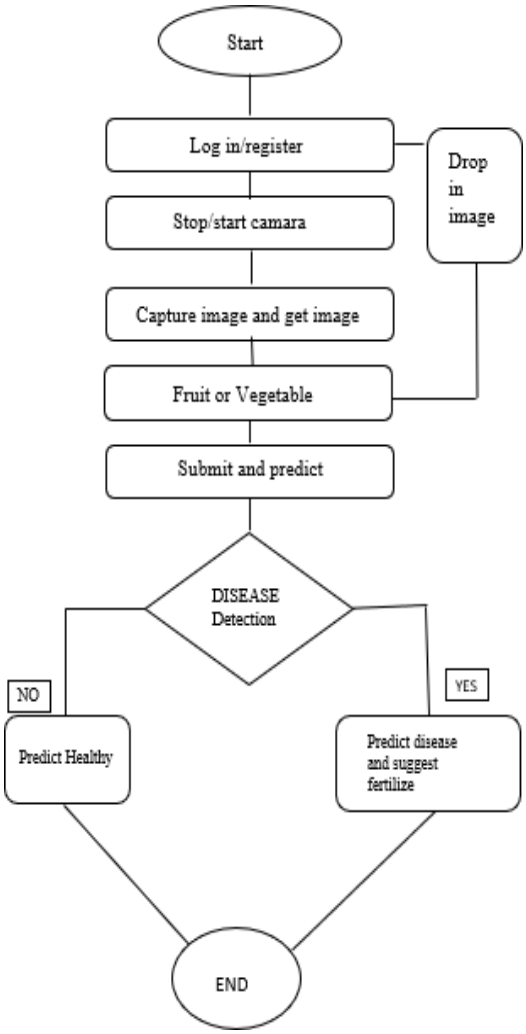

Figure 3 Flow Chart

4. IMPLEMENTATION RESULT

The dataset folder contains two folders for fruit and vegetable dataset which includes a test and train folder, each of them having images of different diseases. Flask folder has all the files necessary to build the flask application. A home page will be opened which has the 3 tabs like register, login and home will appear, the user who opens for the first time has to register with his details to login.

Log in page consist of tab mail id, password and log in bar which has shownin Figure 4. Testing log in page is accurate which has taken the username and password correctly, if user id is entered for the first time it indicates please registerthe stored files. Specify the credential as shown in Figure 5 name, email, phone number and password then click on the register. If the user is already registered, able logindirectly. Else registration has to be done. After the registration the person has to log in with mail id and password. Testing Registration is success, it successfully taken the value name email id andthe mobile number. The user is not registered or enters wrong password or wrong mail id, it willdisplay "log in unsuccessful you have entered wrong password" shown in Figure. 6. The successful login redirects to the page which is having the Camera live streaming…! And Drop in the image

to get prediction. Click on the camera live streaming tab on the web page which guides to page having the tab start/stop camera, capture and get image as shown in Figure 7 ,And it's been successfully captured the picture. Prediction of the plant diseases detection for apple plant and the tomato plant is success. It predicts Apple plant has Black Rots and suggested what action should be done along with fertilizers to be used, which has done by dropping imageas shown in Figure 8 and for Tomato plant it predicts Late blight and suggested required actions which has done on real time as shown in Figure.9. Finally, by clicking on logout the session will end as show in Figure..10, for more have to login again is shown in Figure.11, Logout also tested successful and accurate. In this approach, as shown in Figure 12 the main aim is to diagnose the plant leaf to find out the disease using CNN method, Raspberry pi4b and AWS. Hence, successive and accurate identification of plant diseases are essential to ensure high quantity and best quality. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases. Deep learning is very much helpful now days Machine learning.

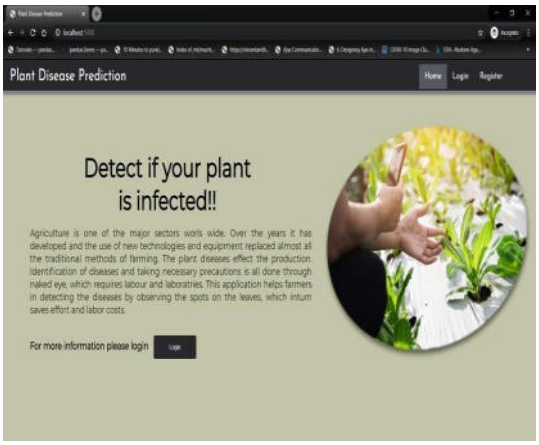

Figure 4: Home page of the Plant Diseases Prediction

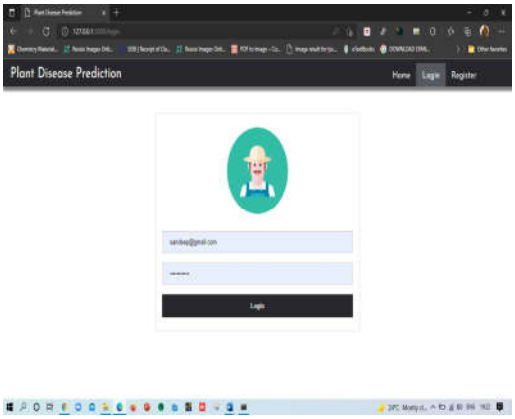

Figure 5: Log in page

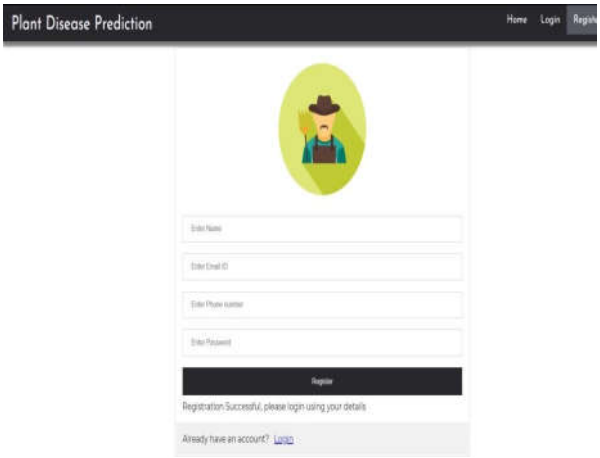

Figure 6: Registration Page

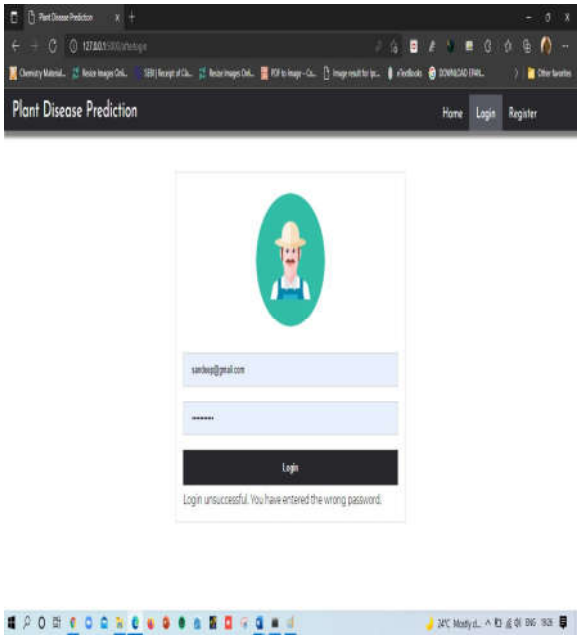

Figure 7: Log in failed

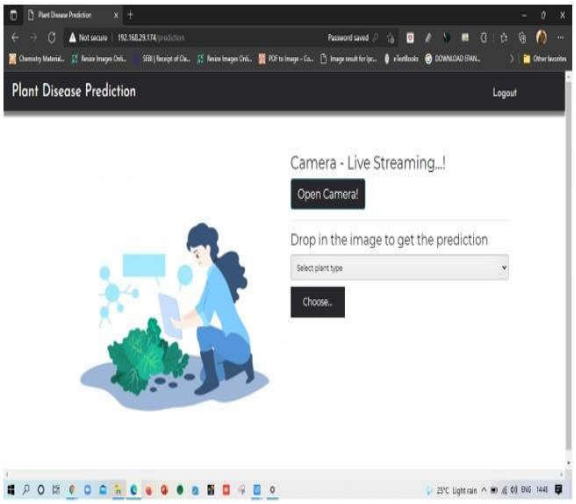

Figure 8 : Camera and drop image

Figure 9: Capture and acquire image

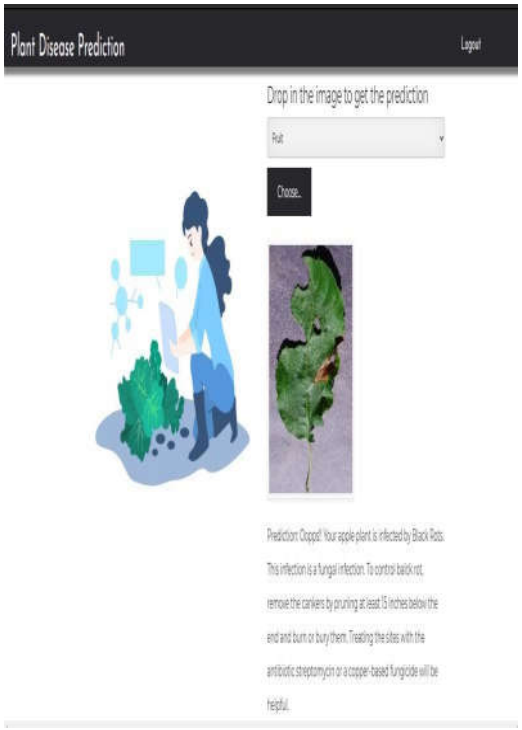

Figure 10: Prediction result of fruit plant

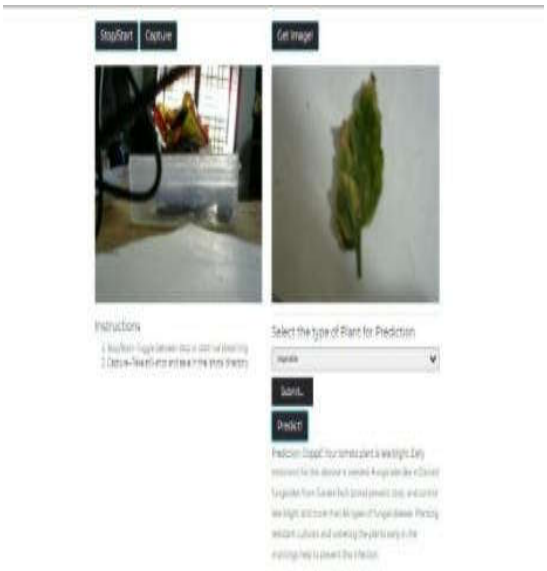

Figure 11: Prediction result of vegetable plant

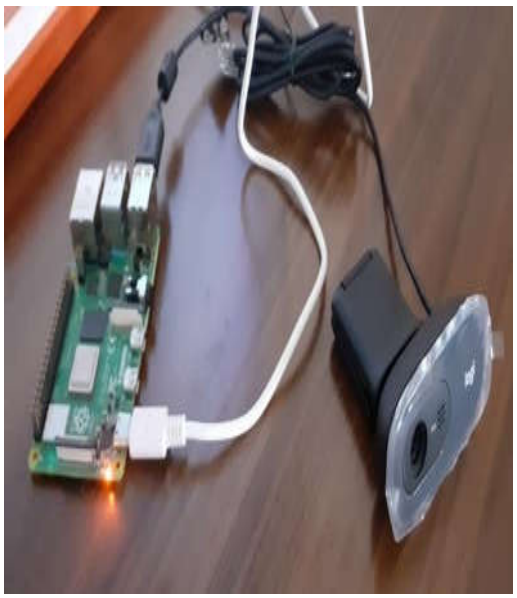

Figure 12: Plant disease detection system

The paper shows the importance of plant disease detection related to measurement of accuracy and loss.In this work convolution neural network sequential model is constructed for both fruit and vegetable plants. The batch size given for fruit is 32 and 5 was the number of epochs, for vegetable batch size is 64 and 20 was number of epochs 25% of images from the dataset were used for testing accuracy of these models, and 25% of imagesare randomly selected for testing. The testing dataset gives more than 95% accuracy in both cases. The accuracy and the loss for both training and validation graphs generated by the model of fruit and vegetable are shown in Figure 13 and 14 respectively.

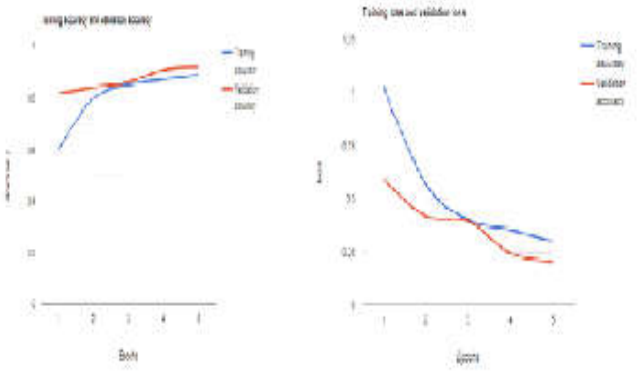

Figure 13: Fruit model accuracy and loss graph

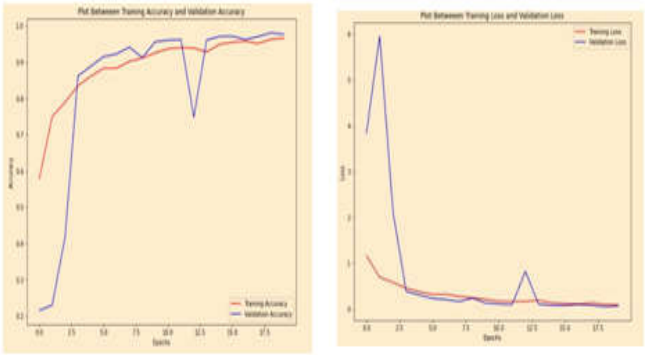

Figure 14: Vegetable Model accuracy and loss Graph

The diseases related to plant detection of vegetable and fruits plants are shown in Figure 15.

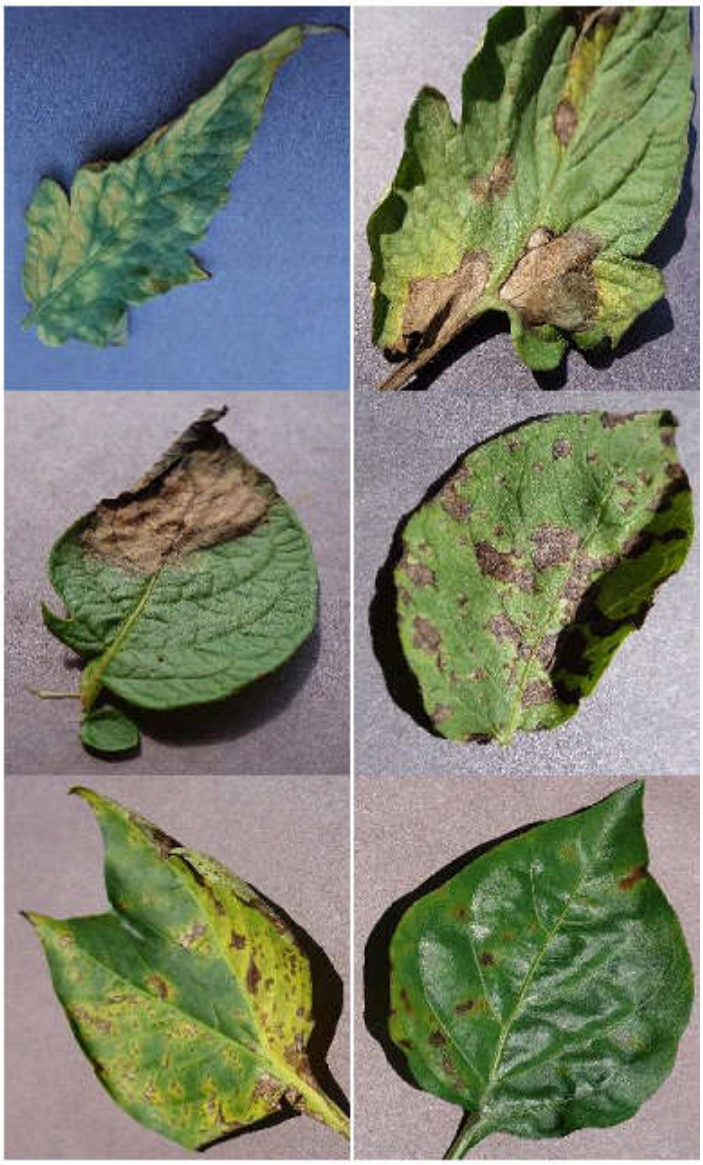

Figure 15 Datas Apple, Corn, Pepper, Tomato and Peak

5. CONCULSION

The Plant disease detection has been tested perfect and successful results are achieved of fruit and vegetable plant diseases, the Convolution Neural Network is accurate and recognized maximum trained data. The trained and tested data is nearly 19,000 images, which is a huge data and Raspberry pi 4b is also very accurate to run these model files of fruit and vegetable, these are large files taken more time to deploy in Raspberry pi and coming to real time it still needs to improve. Whereas effect of Global warming on environment with different type like fungus, bacteria and insects leads to damage of the crop. The former should aware of the all those diseases and fertilization and better forming techniques to get better production and food security. The AWS is helps Plant disease detection to connect globally. It can be more efficient on mobile application platform using variant methods in ML and AI.also, instead of Raspberry pi can use the Jetson board for fast computing, which helps unreached network areas like hill stationed formers.

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