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Image Based Plant Disease Detection by Using Deep Learning

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***Abstract:** We living being are mostly dependent on plant and animals as well. We don't have much food that can even sustain for even some years for we are not the only consumers on this earth. 29% of the land where the whole living eco-system exists is not apt. to feed such a huge population. Had we no plants eaters' bacteria's or locust, then we might have enough resource that would last for year. My project that is IMAGE BASED PLANT DISEASE DETECTION BY USING DEEP LEARNING is all about that. This system will enable us to recognize the type of disease the plants are suffering from and how to diagnose and treat them as well. This system depicts us an appropriate outcome.*

It will enable us to five a fill depiction of the kind of disease the plant are suffering from. We can even recognize the kind of medication that will be effective in totally eradication of the disease. Plant diseases are one of the foremost important reasons that destroy plants and trees.

Detecting those disease at early stages enable us to beat and treat them appropriately. It is quite more important to find the kind of disease first the to treat then unknowingly. The outcomes were 92% accurate and thus we can work on the plant right way to help our plants live even longer.

After multiple test, we have come forward with such and initiative that will be a boon for the humankind. Farmers are the backbone of any nation. We cannot survive until they do not get the right price for their yields and our system will play a significant role in that.

***Keywords:** Plant Disease Detection, Kind of disease, kind of medication, Backbone of nation,Food safety*

ACKNOWLEDGEMENTS

Any assignment puts to litmus, test of individual's knowledge, credibility or experience and thus sole efforts of an individual are not sufficient to accomplish the desired task. Words shall never be able to describe neither the spirit with which we worked together nor shall they ever be able to express the feeling we felt towards our guides. Successful completion of a project involves interests and efforts of many people so it becomes obligatory on our part to extend our thanks to them.

I take this opportunity to thanks Prof. Manoj Lipton Guide, and Prof. Chetan Agrawal HOD CSE, RITS for accepting me to work under their valuable guidance, closely supervising this work over the past few months and offering many innovative ideas and helpful suggestions as and when required. His valuable advice and support, was an inspiration and driving force for me. He has constantly enriched my raw ideas with his experience and knowledge. Indeed it was a matter of great felicity to have worked under his aegis.

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Last but not least I'd like to thank "The Almighty God", my Parents, my family and my friends who directly or indirectly helped me in this endeavor.

I. PLANT DISEASE DETECTION SYSTEM BY USING DEEP LEARNING

As we know Agriculture is the oldest human being work that has been practiced from ancient time. And Plants are important part of our live.As 51% population of INDIAN directly or indirectly dependent on agriculture. But due to various developmental activities, pollution, climate changes etc. cause different type of problem in plant. Just like animals. plants also suffer from varieties of disease. The biological agent the cause diseases to plant are known as pathogens.

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A. Some Of The Common Pathogens In Plants Are

1) *Virus:* Virus is a unicellular microorganism that is a link between a living and a nonliving thing. They are dead outside then only replicate when they are inside the body

2) *Bacteria:* Bacteria are the microscopic creatures which come underprokaryotic organism. They can be found everywhere causing disease and spreading among the massesbacteria are the among the first to come on this earth

3) *Fungi:* Fungus belongs to eukaryotic member that includes microorganism such as yeast and molds. They are responsible for the decomposition of dead plants and animals on Earth. Some are edible such as Mushroom.

4) *Nematodes:* Nematodes or roundworms belong to the phylum kingdom and they are many in numbers on this Earth. They can be seen commonly in the wet ground when dug to some depth. they are referred to as Farmer's friends.

A plant disease is usually defined as abnormal growth and dysfunction of plant are the result of some disturbance in the normal life process of the plant. Diseases may be the result of living and nonliving causes.

Table1.1 Causes of Plant diseases

Biotic Factors	Abiotic factors
1) Fungi	1) Nutritional abnormalities
1) Bacteria	2) Pesticides Exposure
2) Virus	3) Environmental pollutants
3 Nematodes	4) Extreme weather conditions
4 Protozoa and Algae	5) High/low soil moisture
5 Parasitic plants	6) High/los intensity

B. Common name of Plant Disease

Table 1.2.1Some of the Disease caused by Bacteria in plant are

Bacterial Disease	Name of Plant
1) Ring Rot, Brown Rot	1) Potato
2) Canker	2) Tomato
3) Black Aram	3) Cotton
4) Blight	4) Beaus, Rice

Table 1.2.2 Disease caused by Fungi in plants

Fungal Disease	Name of Plant
1) Red Rot	1) Sugarcane
2) Ergot, Green Ear, Smut	2) bajra (Pearl millet)
3) Wilt	3) Pigeon pea, cotton
4) Tikka	4) Ground nut
5) Blast	5) Rice
6) Downy	6) Grapes, Cabbage, Cauliflower, Bajra

Table 1.2.3 Disease caused by virus in Plants

Viral Disease	Name of the Plants
1) Leaf Roll	1) Potato
2) Bunchy Tap	2) Banana
3) Leaf Curl	3) Papaya
4) Mosaic	4) Tabaco
5) Red Leaf	5) Carrot

Table 1.2.4 Disease caused by Nematodes

Disease	Affected Plant
1) Hairy Root	1) Sugar Beats, Potatoes, Soybeans
2) Root knot	2) Tomatoes, Peanuts.

C. Theory

1) Humankind will exist in this world until the plant and animals survive. They are not because of us but we are still alive because of them. Ecological impacts have degraded their productivity. Unknown and Strange disease have started to eat them off. It is therefore the need of the hour to detect and diagnose and treat them with our latest designed system.
2) Plants Disease Detection and Recognition will analyses theimage of disease from the plants and can give an outline or feature of disease spots in line with colors texture, and other characteristics from a quantitative point of view.
3) Farmers, being unaware of the kind of disease, often use wrong pesticides or insecticides to cure their plants that have a negative impact on them. They cannot look for an expert as for this they will have to cover miles of distance in lack of communication and transportation as well.
4) Plant diseases have been a nightmare as they cause a big reduction in both quality and quantity of agricultural products thus negatively influence the countries that primarily depend upon agriculture for their economy. Consequently, detection of plant diseases is an important research topic because it may prove useful in monitoring large fields of crops and thus automatically detect the symptoms of diseases as soon as they leave their bad impact on plant leaves.
5) Computer- based image processing technology will help those farmers who in spite of growing food for us end in loss.
6) The proposed approach is image-processing-based and consists of 4 main phases; within the first phase, we create a color transformation structure for the RGB leaf image, and then, we apply device-independent color space transformation for the color transformation structure. Next, within the second phase, the pictures at hand are segmented using the K-Means clustering technique. within the third phase, we calculate the feel features for the segmented infected objects. Finally, within the fourth phase, the extracted features are capable of a pre-trained neural network. We test our program on five diseases that affect the plants; they're Early scorch, Cottony mold, Ashen mold, late scorch, and tiny whiteness. Using the proposed framework, we could successfully detect and classify the examined diseases with a precision of around 93% on average. The minimum precision value was 80%.
7) This experiment will also enable vegetables to stay fresh for longer. We have been working continuously on this project for a long time. Its accuracy and efficiency will be the reward, I think, we deserve.
8) Early detection of the disease not only help in diagnosing them but also enable us to give our plants a healthy ecosystem.

D. Thesis outline

1) Chapter 2: -Recognition
2) Chapter 3: - Method and materials
3) Chapter 4: - Literature review
4) Chapter 5: - Proposed scheme This chapter discusses method of the research. It also provide the algorithms and tools used for the dissertation work, this chapter details the solution of the problem plant disease detection
5) Chapter 6: - Conclusion and future work

Finally, a summary of the overall work done in this research work is given in this chapter. The future scope for the research has also been disused. Further, what areas of this research work can be improvised which may bring interesting results.

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II. RECOGNITION

A. *Introduction*

In this chapter, The Plant disease recognition one of the most important aspects of the plant Pathologist's train. With the help of proper recognition of the disease and the disease-causing Bactria fungi, we and control the waste of time and money and lead to further plant losses. Without proper recognition of the plant disease it may be the infected plant spread the virus to healthy plant we can also cure our healthy plant before the virus spread, how they feed on the plants we have the desired result that will help in proper cure. The proposed system goes through multiple steps to its recognition.

Identify the kind of plants species.

Detect the kind of disease that the plant is suffering from.

Present multiple treatment options and provides an accurate understanding

B. *Recognition of Plant Disease*

As we have discussed above plants are mainly affected by various pathogens but Most plant disease around 85% are cause by fungal or fungal-like organism.

If plant disease is suspected careful attention to plant appearance can give a good clue regarding the type of pathogen involved here are few

C. *Example Of Common Sign And Symptoms Of Fungal, Bacterial Are Viral Plant Disease*

1) *Bacterial Diseases Signs And Symptoms:* It includes Bacterial ooze, Water-Soaked lesions, Bacterial Streaming in water form a cut stem, leaf spot with yellow halo, fruit spot, Shepperd's crook stem ends on woody plant
2) *Fungal Disease Signs And Symptoms:* It includes leaf rust, stem rust powdery mildew Bird eye spot on berries, Damping off of seedling, Leaf spot
3) *Viral Disease Symptoms And Sign:* It is very difficult to detect symptom of disease cause by virus but some symptoms can be seen as Mosaic leaf Patten, crinkled leaves, plant stunting, yellow leaves.
4) *Nematode Diseased Symptom And Sign:* It includes greatly reduce root system with short stubby roots having dark, shrunken, lesions, particularly at the tips, severe stunting, wilting, yellowing and sometime death

D. *Plant Disease Detection*

Plant disease can be detected through various means. Some of them can be detect easily through visual ways and some through methods, techniques and processes

E. *Aim Of Research*

1) To identify the disease in the plant-based on training and classification
2) To identify the type of disease and pesticide to that disease.
3) To notify the farmers so that early action can be taken.
4) By the employment of neural networks, we are visiting to identify the disease-attacked area in groundnut plant leaves.

F. *Problem Statement*

1) Agriculture plays a critical role in providing a food supply for the growing population of the planet. Annual global food supply loss because of plant diseases is 40% on average.
2) In developing countries, like INDIA smallholder farmers generates quite 80% of the agricultural production. For them, the loss of crops has devastating consequences.
3) Sometimes, farmers can lose almost 100% of their crop thanks to plant diseases. This makes crop diseases a significant threat to food security around the world.
4) Disease identification may well be challenging thanks to the shortage of the required lab infrastructure.
5) The project presents plant characteristics analysis using image processing techniques for automated vision systems employed in the agricultural field.
6) The system utilizes image content characterization and a supervised classifier sort of neural network.

Plant leaves diseases, its detection and diagnostic method could be a methodology. Digital image processing could be a technique that's used and implemented within the detection of diseases within the plant. The image pre-processing is employed to urge clear, noiseless enhanced leaf images. These enhanced images are accustomed to leaves diseased detection and its analysis. Various sorts of images are utilized in image pre-processing. Generally, plant leaves image color and texture could be a unique feature, which is employed to detect and analyze diseases.

III. LITERATURE REVIEW

In the previous chapter we read about the recognition of plant disease, the aim of the research and type of problem have to face. In this chapter we will discuss the progress and research work done in the field of Plant disease detection.

A. A comparative study of fine-tuning deep learning models for plant disease identification

Edna Chebet Tooa, Li Yujiana , Sam Njukia , Liu Yingchun

In the paper the accurate and quick image identification and demonstration of the image Deep Learning has been seen as a revolution in this field. Convolution neural network has proved to be efficient in the precise and correct evaluation of the plants disease causing organism. The architectures evaluated include VGG 16, Inception V4, ResNet with 50, 101 and 152 layers and DenseNets with 121 layers. The data used for the experiment is 38 different classes including diseased and healthy images of leaf's of 14 plants from plant Village. Out of 38 different plants species both healthy and diseased taken for evaluation of the image 14 plants were from plant village. An accurate and efficient outcome is desired for the quick eradication of the disease for a healthier life of the plants. Thus we can reduce the burden of food loss from the entire nation and food security can be achieved. With the growing number of epochs there has been noticed that DenseNets has been up to the mark in its proper evaluation. It moreover, requires less time and a quick result is always obtained. It has been found that the result is 99.75 % accurate which shows its efficiency. Keras with Theano backend was required fo the evaluation of training of the architecture.

B. Deep Convolutional Neural Network based Detection System for Real-time Corn Plant Disease Recognition

SumitaMishraa, Rishabh Sachana , Diksha Rajpala

Corn has been the native food of Indian people and the disease affecting them has been a matter of concern as it will have a tremendous effect on our Indian economy and a threat to food security. Smart use of technology can be a revolution in the proper eradication of such disease so that they can be treated in time and a food security can be achieved as well. This paper presents a real time manner which is primarily based on deep convolution neural network. With the proper adjustment of hyper-parameters and pulling combination on a system with GPU the performance of Deep neural network can be improved. The parameters used in this device is optimized to get a desired result within stipulated time. The pre-trained Deep CNN model was stationed into raspberry pi 3 using Intel Movidius Neural Compute stick consisting dedicated CNN hardware blocks. An accuracy of 88.46% has been achieved in demonstration of the corn leaf disease. It shows the compatibility of this system. This presented model can be used in smart devices like raspberry-pi or smartphones and drones as well for its convenience.

C. Deep learning models for plant disease detection and diagnosis

Konstantinos P. Ferentinos

In this paper, convolutional neural network models Application but it can be used for detection and diagnosis of plant disease by comparison of leaves images of healthy and diseased through deep learning methods

Experiment was performed with the use of 87,848 images, containing 25 different plant combination with disease and healthy plants. Many experiments were done with the best one was accuracy reaching 99.535 success for detection the disease of the plant if any. We can say that this experiment shown the significant success of this model which can be used and early ad possible for detecting disease in plants, It will definitely work as a pre harvesting warning tool in the field of agriculture so that the farmers crop produce high yield production.

D. Using deep transfer learning for image-based plant disease identification

JundeChena ,Jinxiu Chena , DefuZhanga, , YuandongSunb , Y.A. Nanehkarana

In this paper, The author says that the agriculture is an important sector of GDP of India and ensure food security but due to various reasons like population, climate changes, global warming, several plant are harmed by disease impacted not only agriculture producton, but also its quality and quantity. Thusdiseases of plants can by identify and detect through various methods in this methods, Deep learning is one of them.

In this work, we study transfer learning of the deep CNN for detection of plant leaf disease and consider massive datasets, and then transfer to the specific task, trained by own data. Two approaches are selected one is VGGNet Pre-trianed and ImageNet and another is Inception module

Instead of starting the training form scratch y randomly initializing the weights, we initialize the weights using the pre-trained network on the large labeled dataset, ImageNet. The above approaches have more accurate performance than the state of the art methods.

Recorded validation Accuracy approx. 91.83%. sometimes it even reaches 92.00% for the prediction of rice plant images.

E. *Le VNT et al (2020) A novel method for detecting morphologically similar crops and weeds based on the combination of contour masks and filtered Local Binary Pattern operators. GigaScience 9(3):giaa017*

In this paper, the k-FLBPCM method combining LBP feature extraction with contour masks has been proposed for reducing noise and improving plant classification accuracy. Results have shown that various factors can reduce weed identification accuracy, including outdoor scene complexity and morphological variability of plants. On the basis of the experimental results, the k-FLBPCM method had the best performance of 98.63% accuracy in identifiying morphologically similar plants. This method is particularly useful to discriminate between 2 classes with highly similar morphologies while tolerating morphological variability within each class. Furthermore, results have shown that the execution time of the proposed method is faster than that of the combined LBP method in the previous published article. As a result, the proposed method helps to improve classification of plants with similar morphological features. Furthermore, the fast processing time of this method enhances the ability to implement plant detection in real time.

F. *Ahmad W, Shah S, Irtaza A (2020) Plants disease phenotyping using quinary patterns as texture descriptor. KSII Trans Internet Inf Syst 14(8):3312–3327*

This study proposed an automatic approach for image-based phenotyping of plant disease using Directional Local Quinary Patterns (DLQP) as feature descriptor and Support Vector Machine (SVM) as a classifier. The proposed DLQP based system is specifically used for agricultural applications. Six tomato leaf diseases, three potato, and three apple leaf diseases are taken for experimentation. For each disease we performed a classification process and compared the individual performance of DLQP, LTP and LBP as feature descriptors. It is found that proposed DLQP texture feature descriptor improves the performance for plant disease phenotyping. The maximum detection efficiencies of 97.8% for apple, 95.6% for tomato, and 96.2% for potato are achieved using DLQP and Medium Gaussian kernel for SVM. Also, a comprehensive comparison shows that the proposed method performs significantly well as compared to existing methods. The proposed system provides promising results for plant disease phenotyping but there is a scope for improvement by using combination of other shape and color-based feature descriptors with DLQP.

The above experiment demonstrate that this method of deep learning is efficient for the plant disease detection.

IV. MATERIAL AND METHODS

A. *CNN (Convolutional neural network)*

CNN is a category of neural network that is use commonly to analyze image and video recognition. It has been proved to be quite efficient then traditional method. It shows simple pattern through optimize learning and algorithm.

A typical CNN architecture mainly consists of three layers

1) *Convolution Layer:* The convolutional layer is that the crucial component of CNN, which extracts the specific features of the image by the different sizes of the convolution kernel. A set of feature maps of input images can be extracted after applying the convolutional layers several times
2) *Poling Layer:* The pooling layer is placed after the convolution layer to aggregate the statistics of feature map. Fundamental pooling process involves down sampling of feature map resulting in reduced trainable parameters.
3) *Full Connection Layer:* Last few layers of a CNN fully connected layers. Each neuron receives input from each of the previous layer elements. The entire previous layer is the receptive field. The receptive area is smaller in a convolutional layer than the entire previous layer.

B. Deep Learning

Deep learning is a subset of machine learning which was a hierarchical level of artificial neural network to execute the process of machine learning. In artificial neural network it is built like the neural brain. While traditional programmed build analysis with data in a linear way. The hierarchical function of deep learning system makes machine able to process data with a non-linear view.

C. Machnine Learning

Machine Learning (ML) is a subset of man-made brainpower which spotlights for the most part on AI from their experience and making forecasts depending on thisexperience.ML is the scientific study of algorithms and statistical models used forthe computer systems to perform a particular task without using specific directions,relying instead on patterns and inferences. It is seen as an artificial intelligencesubset. ML algorithms create a sample based mathematical model. Identified astraining data to create predictions or decisions without specific programming toachieve the task. AI calculation is prepared utilizing a preparation informationalcollection to make a model.ML starts with reading and observingthe training data, to discover useful insight and patterns to make a model thatpredicts the right outcome. The efficiency of the model is than assessed using thetest information set. This method is carried out up until; the machine learns andmaps the input to the correct output automatically without any action by humans.

D. Neural Network

Neural networks are often seen like machines that are designed to model the way in which the brain performs a specific task or function of interest. Neural Network resembles the brain that knowledge is acquired by the network through a learning process. Inter neuron connections strengths known as synaptic weights are used to store the knowledge. The function of which is to switch the synaptic weights of the network in an orderly manner so on attain a designed design objective

E. Transfer Learning

Transfer learning is a machine learning approach in which CNNstrained for a task is reused because the start line for a model on a second

task rather than starting the training fromscratch by randomly initializing the weights we can initialize theweights using a pre-trained network on large labeled datasets, such aspublic image datasets, etc. In this paper, we consider using the pretrained models learned from the massive typical dataset ImageNet, and then transfer to the specific task trained by the objective dataset.

F. Dataset

Deep learning models were evaluated and trained on images of plant leaves to classify and identify disease on images that the model has not seen before. Openly and freely dataset from Plant Disease Dataset were used for this study. Plant Disease Dataset has 54,306 images, with 26 diseases for 14 crop plants. the pictures are originally colored images of assorted sizes. the photographs are first resized to 224×224 for VGG net, ResNet, and DenseNets architectures. On the opposite hand, for the Inception V4 architecture, the photographs are resized to 299×299 pixels. Normalization of knowledge is completed by dividing all pixel values by 255 to create them compatible with the network’s initial values. Furthermore, one-hot encoding of the target variable or categorical variable is finished to be employed in the models studied. the information is first split into two. First is that the training data then test data with a percentage ratio of 80% and 20% respectively. The tested detaset is employed for the prediction and evaluation of the models. The training data is further split into two; training and validation data with the ratio of 80% and 20% respectively to see if the model is overfitting. The training set was 34,727 samples, the validation set was 8702 samples, and also the testing set of 10,876 samples.

G. Activation Function

Every activation function takes a single number and performs a certain fixed mathematical operation on it. There are a number of common activation functions in use with neural networks. Sigmoid activation function. It generally takes a real-valued number and squashes it into the range between 0 and 1. Here, large negative numbers become 0 and large positive numbers become 1. Historically, it has been used frequent, as it shows nice interpretation on firing rate of a neuron from not firing at all (0) to fully-saturated firing at an assumed maximum frequency (1).

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H. VGGNET

1) The input to the convolution neural network is a fixed-size 224 × 224 RGB image. The only preprocessing it does is subtracting the mean RGB values, which are computed on the training dataset, from each pixel.
2) Then the image is running through a stack of convolutional (Conv.) layers, where there are filters with a very small receptive field that is 3 × 3, which is the smallest size to capture the notion of left/right, up/down, and center part.
3) Architecture Summary:
4) Input to the model is a fixed size 224×224224×224 RGB image
5) Pre-processing is subtracting the training set RGB value mean from each pixel

6) Convolutional layers 17

– Stride fixed to 1 pixel
– padding is 1 pixel for 3×33×3

7) Spatial pooling layers

– This layer doesn't count to the depth of the network by convention
– Spatial pooling is done using max-pooling layers
– window size is 2×22×2
– Stride fixed to 2
– Convnets used 5 max-pooling layers

8) Fully-connected layers:

1st: 4096 (ReLU).
2nd: 4096 (ReLU).
3rd: 1000 (Softmax).

V. PROPOSED SCHEME

In the previous chapter, we discussed all the work which were done in the Plant Disease Detection and Recognition by using deep learning. In the Chapter I have proposed and idea which and help in solving that existing problem using some method. I have given a improve model of Plant Disease detection and Recognition

A. Introduction

In this figure, Firstly I mount the My drive to the google colab and alse Import the necessary packages

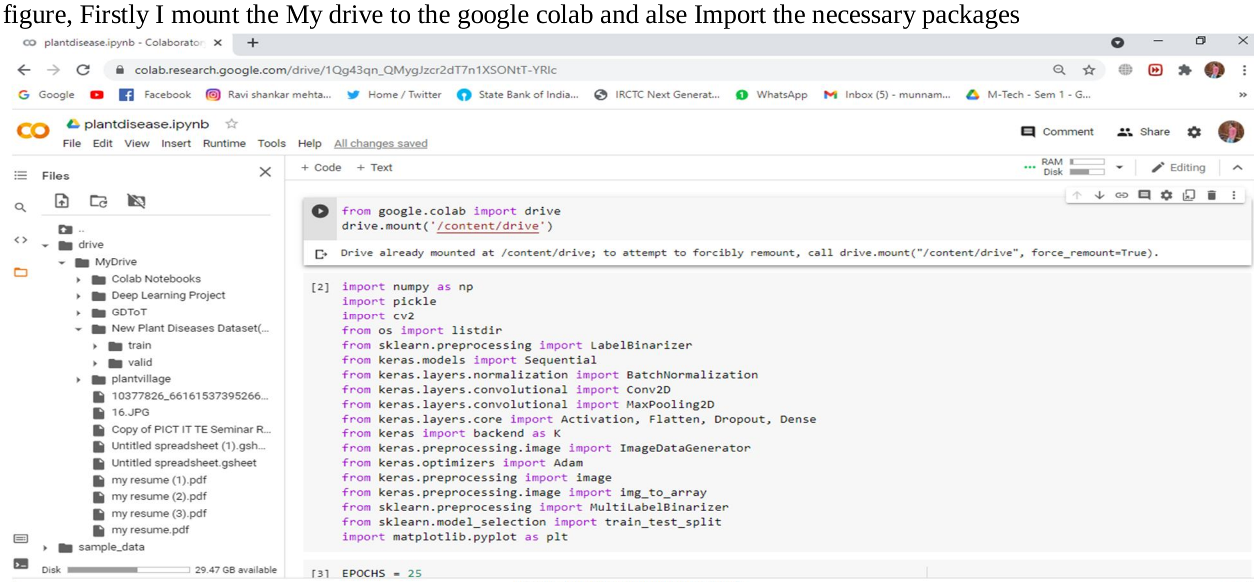

Fig 5.1

B. loading our Image Data Set

In this fig shows that the processing all the images form the dataset to load all the images to the google colab

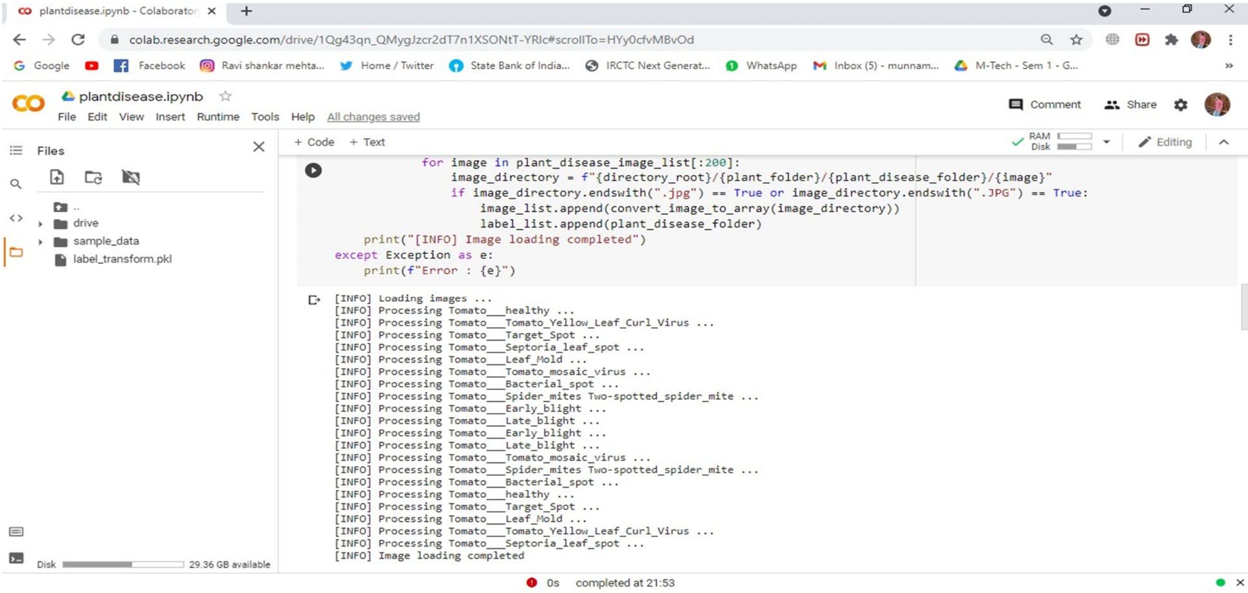

Fig 5.2

C. The Finding The Disease Of The Plant

This fig shows that the finding of the plant disease

```
['Pepper__bell___Bacterial_spot' 'Pepper__bell___healthy'
 'Potato___Early_blight' 'Potato___Late_blight' 'Potato___healthy'
 'Tomato_Bacterial_spot' 'Tomato_Early_blight' 'Tomato_Late_blight'
 'Tomato_Leaf_Mold' 'Tomato_Septoria_leaf_spot'
 'Tomato_Spider_mites_Two_spotted_spider_mite' 'Tomato__Target_Spot'
 'Tomato__Tomato_YellowLeaf__Curl_Virus' 'Tomato__Tomato_mosaic_virus'
 'Tomato_healthy']
```

Fig 5.3

D. The Model Summary

In this figure the model summary function run and get the data of all the params trained or non-trained param

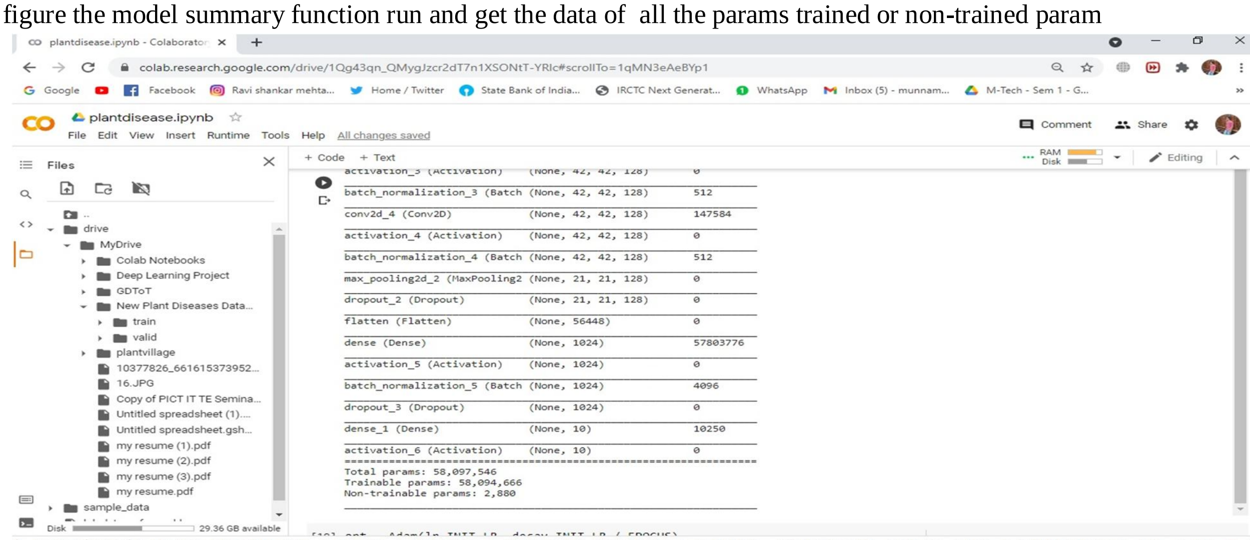

Fig 5.4

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E. The Number of Epoch

One Epoch is completed when a complete dataset is cycled forward and backward through the neural network or you can say your neural network has watched the entire dataset for once

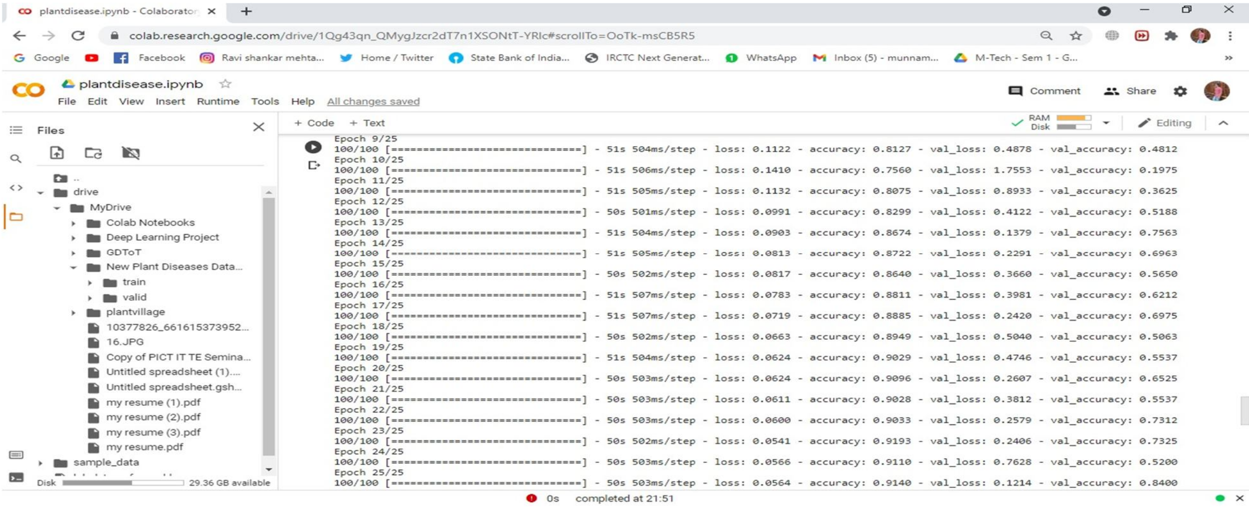
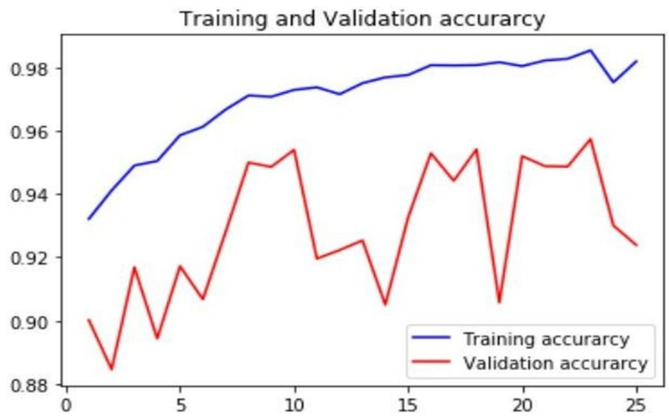


Fig 5.5

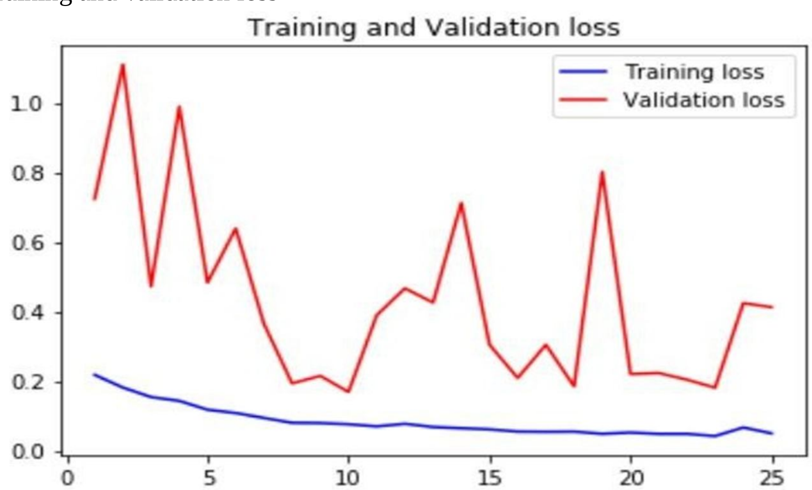
F. Training and the Validation Accuracy

This figure show that the training and validation accuracy



G. Training and the Validation Loss

This figure shows that the training and validation loss



H. Here our Model Gives the Accuracy

```
[INFO] Calculating model accuracy
591/591 [==============================] - 1s 2ms/step
Test Accuracy: 96.44670223221561
```

I. System used

1) O.S:Windows 10
2) O.S type: 64-bit 41
3) RAM: 6GB
4) Processor: 2.2 GHz Dual-Core Intel Core i7

J. Development Tools

The development of the program includes different tools in the process of development and deployment. These tools are as follows:
1) Google colab
2) Anaconda IDE

Anaconda is a distribution of the Python and R programming languages for scientific computing, that aims to simplify package management and deployment. The distribution includes data-science packages suitable for Windows, Linux, and macOS.

Colab is basically a free Jupyter notebook environment running wholly in the cloud. Most importantly, Colab does not require a setup, plus the notebooks that you will create can be simultaneously edited by your team members – in a similar manner you edit documents in Google Docs.

K. Conclusion

This chapter provided detailed idea for the implementation which may help in finding the performance of algorithms. This chapter also includes the step involved in developing and deploying.

VI. CONCLUSION

All the aforementioned experiments has successfully proved the efficacy of our software. The proposed approach is image-processing-based and is very supported by the Means clustering technique and Artificial Neural Network (ANN). The approach consists of 4 main phases; after the preprocessing phase, thephotographs at hand are segmented using the K-means technique, then some texture features are extracted within which they're tried and true a pre-trained neural network.

This futuristic approach, when directed accordingly, will bring a revolution in the field of agriculture. Some computational usage will present us a quite accurate figure that will help in quick treatment.

After testing the land and the soil where Bactria shelter and how they feed on the plants we have the desired result that will help in proper cure. The proposed system goes through multiple steps to its recognition.
1) Identify the kind of plants species.
2) Detect the kind of disease that the plant is suffering from.
3) Present multiple treatment options and provides an accurate understanding

VII. FUTURE WORK

For future research, they need been some directions, like developing better segmentation technique; selecting better feature extraction, and culling classification algorithms.

the survey on different disease classification techniques which will be used for plant disease detection and an algorithm for image segmentation technique used for automatic detection furthermore as classification of plant leaf diseases has been described later. Jute, Grape, Paddy, okra are a number of those species on which the algorithms and methods were tested. Therefore, related diseases for these plants were taken for identification. Another advantage of using these methods is that plant diseases will be identified at an early stage or the initial stage.

Object detection with a convolution neural network is widely utilized in today's era.

Timely and proper identification of a disease when it first appears could be a critical step for efficient disease management.

An app is developed that the previous can wear their smartphone with the subsequent capabilities.

1) Identify the kind of plant
2) Identify if the plant has the disease
3) Just in case the leaves are littered with the disease, classify the disease
4) Provide treatment options(get the knowledge from the database with links to online sources)
5) The app is installed on a drone to scan the complete field to enhance efficiency and save time for the farmer by dramatically increasing coverage of the inspected area.

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