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PLANT DISEASE DETECTION USING VGG AND DJANGO

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Abstract - *Agriculture is the backbone of Indian government. Every human being has a requirement of a lot of production of crops to fulfill the needs of Indian government. Because of some diseases that we observe in this day to day life, a large amount of crop production is being decreased. There are various types of diseases on plant leaves and as well as for the crop, that causes problems in development of crops. Human eyes don't have the capacity to identify so strongly with our naked eye. It is too difficult to identify the plant diseases on leaves. The automatic disease detection system is used to automatically detect and identify the diseased part of the leaf images and it classifies plant leaf disease using image processing techniques. By gathering some of the leaves and training those leaves. We use this training data to train our data and then output will be predicted with optimum accuracy. For this we use the Django framework. We upload the image into the website we have developed. Now the patterns of the uploaded image are compared with patterns available in the dataset, which is almost accurate, resulting in identification of the plant disease. At the starting stage, the disease can be easily identified. Proposed model helps to reduce efforts or hard work of farmers for monitoring big farms and related diseases to farms and crops.*

Key Words: **VGG16, VGG19, Django, Image Processing, Data Augmentation, Tensorflow, Keras.**

1. INTRODUCTION

In India, Farmers have a great diversity of crops. Various pathogens are present in the environment which severely affect the crops and the soil in which the plant is planted, thereby affecting the production of crops .Various diseases are observed on the plants and crops the main identification of the affected plant or crop are its leaves. The various coloured spots and patterns on the leaf are very useful in detecting the disease.

The past situation for plant leaf disease detection taken direct eye observation, recall the particular set of disease as per the climate, season etc. India is a cultivated country and about 80% of the population depends upon agriculture. Plant leaf disease leads to the reduction in both the quality and quantity of agricultural products. The diseased plant leaf refers to the studies of visually observable patterns on the plants. Health of plant leaf and disease on plant leaf plays an important role in successful cultivation of crops in the farm. In early days, analysis of plant leaf diseases were done manually by the proficiency person in that field only. This requires a huge amount of work and also requires excessive processing time. Diseases on the plant leaf have turned into a significant problem as it can cause serious reduction and losses in both quality and quantity of agricultural products. A vast majority of the growing national population depends on agriculture yields. But the cultivation of these crops for optimum yield and quality product is highly technical & challenging.

1.1 Advantages

1. Supporting an accurate, automatic detection and also recognizes the disease.
2. The high level of accuracy in the diagnosis and prognosis and reduction of cost.
3. Support accurate and automatic detection of leave disease.

2. LITERATURE SURVEY

2.1 Paper 1

BhumikaS.Prajapati, Vipul K.Dabhi In this detection and classification of cotton leaf disease using image processing and machine learning techniques was carried out. Also the survey on background removal and segmentation techniques was discussed. Through this survey, we concluded that for background removal color space conversion from RGB to HSV is useful. We also found that thresholding technique gives good results compared to other background removal techniques. We performed color segmentation by masking green pixels in the background removed image and then applying thresholding on the obtained masked image to get a binary image. This is useful to extract accurate features of disease. We found that SVM gives good results, in terms of accuracy, for classification of diseases. There are five major steps in our proposed work, out of which three steps have been implemented: Image Acquisition, Image pre-processing, and Image segmentation.

Advantages:

1. Good generalization capability.
2. Sparseness of the solution and the capacity control obtained by optimizing the margin.
3. SVMs can be robust, even when the training sample has some bias.

Disadvantages:

1. Slow training.
2. Difficult to understand the structure of Algorithms.

2.2 Paper 2

Sachin D. Khirade Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. It requires a tremendous amount of work, expertise in plant diseases, and also requires excessive processing time. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaves and the classification of plant diseases. The use of ANN methods for classification of disease in plants such as self- organizing feature maps, back propagation algorithms, SVMs etc. can be efficiently used. From these methods, we can accurately identify and classify various plant diseases using image processing techniques.

Advantages:

1. Requesting less formal statistical Training.
2. Ability to implicitly detect complex non linear.
3. Relationship between dependent and independent variables.

Disadvantages:

1. Greater computational burden.
2. Proneness to over fitting.

2.3 Paper 3

Prof. N. Karthika and Dr. A. GraceFulvara They presented the classification of grape leaf diseases proposed along with the leaf identification. The grapes images are classified then the histogram of H and a color channel are generated and the pixel values are observed to distinguish the healthy and diseased tissues. Then, features are extracted and classified by using the KNN classification algorithm in order to find the leaf diseases. This was found to be more effective.

Advantages:

1. Simplest.
2. Robust with regard to search space.
3. No training is required, confidence level can be Obtained.

Disadvantages:

1. Expensive testing of each instance.
2. Sensitiveness to noisy or irrelevant inputs.
3. Lazy Learning.

3. PROPOSED SYSTEM

Here we developed a website using the Django framework where a user can upload the leaf image that he wants to know the disease that is affected and this uploaded image is sent to the server and image is processed by the designed model(cnn) ,predicted disease name is sent as a result back to the user.

3.1 Block Diagram design:

1. The model is trained with vgg16 architecture with 16 layers.
2. First the image is uploaded.
3. The website is created using django. So the uploaded image is sent to the server using the post method.
4. The sent image is then given input to the pretrained model.
5. After the prediction, it gives back to the user as a result.

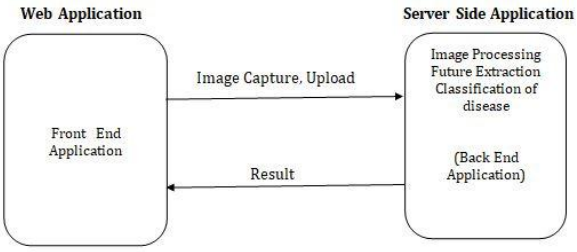

Fig -1: Structure of Proposed System

This proposed system is able to detect upto 10 diseases (Bacterial spot, early blight healthy, Late blight, Leaf Mold, Septoria leaf spot, Spider mites, Target Spot, Tomato mosaic virus, Yellow Leaf Curl Virus).

Fig -2: Healthy leaf

Fig -3: Bacterial Spot

Fig -4: Late Blight

Fig -5: Yellow curl virus

4. PROCESS FLOW DIAGRAM

The input test image is acquired and preprocessed in the next stage and then it is converted into array form for comparison. The selected database is properly segregated and preprocessed and then renamed into proper folders (classified according to their disease names).The model is properly trained using CNN (VGG16 architecture) and then classification takes place. The comparison of the test image and the trained model take place followed by the display of the result. If the leaf is healthy or not. If it is not healthy then the software displays the disease. This all process is shown in the following figure

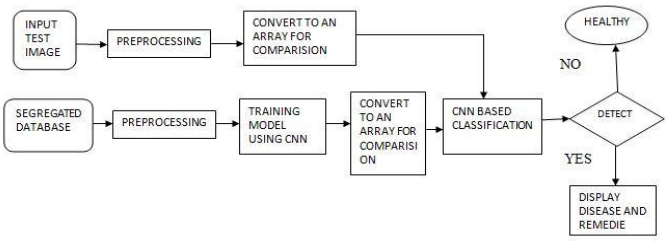

Fig -6: Flow chart for disease detection

5. METHODOLOGY

The CNN model is developed using vgg16 which have 11 hidden layers and three fully connected layers. This model is designed by convolution layers of 3x3 filter with a stride 1 and always used the same padding and maxpool layer of 2x2 filter of stride 2.It follows this arrangement of convolution layer and max pool layer consistently throughout the whole architecture. In the end it has 2 fully connected layers followed by a dense layer with 10 units and a softmax for output. This model is designed with 16 layers that have weights. This network is a pretty large network and it has about 14,965,578 parameters (250,890 trainable and 14,714,688 non rainables parameters).

6. IMPLEMENTATION

This can be implemented by the following steps:

1. Data-preprocessing: The images in the data set are resized to 224 X 224.
2. Data set is divided into 80 % for training and remaining 20% for testing purposes.
3. Now the Data Augmentation process is applied to avoid overfitting.
4. The convolution layers of the model extracts the features in order to classify the images.
5. Now with those training set features the model is trained.
6. The trained model is validated/tested using the testing data set.
7. If tuning is necessary then we can perform tuning by changing the number of epochs or by changing activations functions or by changing batch size accordingly.
8. This model is saved so that it can be used for new data ie. For uploaded image.
9. Using Django a web interface is created where the user can upload the image and this image is passed to the server.
10. The server contains the trained model and by using this model it predicts whether it is healthy or not. If it is not healthy then it gives the disease name as output.
11. This result is sent as a response back to the user.

7. RESULT ANALYSIS

In chart 1 and 2 the graphs show how training accuracy varies with validation accuracy when they are trained by VGG 16 and VGG19 models with 7 epochs and 32 batch sizes.

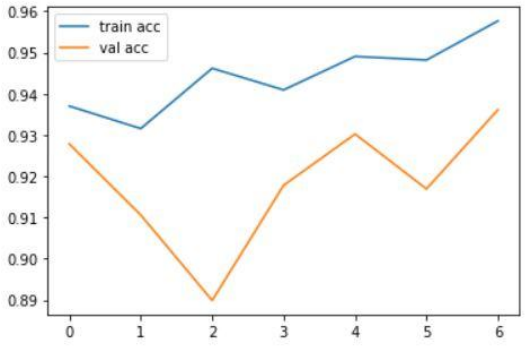

Chart -1: comparison between training and validation accuracy of VGG16 model

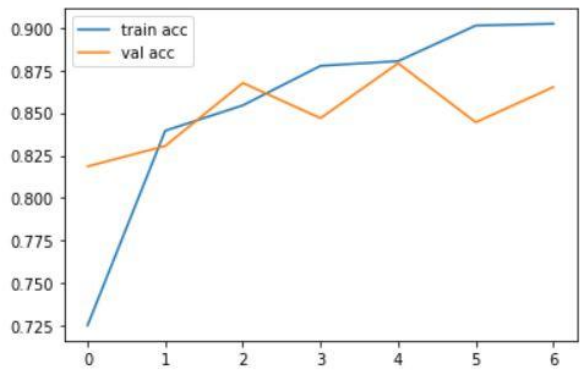

Chart -2: comparison between training and validation accuracy of VGG19 model

Table -1: Result analysis between VGG16 and VGG19

Model name	No of epochs	Batch size	Training accuracy	Validation accuracy
VGG16	7	32	0.9576	0.9361
VGG19	7	32	0.9024	0.8652

8. CONCLUSION

There are many methods in automated or computer vision plant disease detection and classification processes, but still, this research field is lacking. In addition, there are still no commercial solutions on the market, except those dealing with plant species recognition based on the leaves images.

Here a new approach of using deep learning methods was explored in order to automatically classify and detect plant diseases from leaf images.

9. FUTURE ENHANCEMENT

The developed model was able to detect leaves between healthy leaves and different diseases, which can be visually diagnosed. The model is able to detect only a few diseases. In future we will extend to this model to detect more number of diseases. As this is a small a website containing a server with trained model and frontend for the users. In future we will extend this with APIs and in further we can use drones which will captures the leaves and send those images to the server where it predicts where they are healthy or not and will maintain a record of statistical data (percentage of healthy leaves and defected leaves at a particular location).

This application will serve as an aid to farmers (regardless of the level of experience), enabling fast and efficient recognition of plant diseases and facilitating the decision-making process when it comes to the use of chemical pesticides.

10. ACKNOWLEDGEMENT

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