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Classification Of Plant Leaf Disease Using MachineLearning & Pre-Processing Techniques

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Abstract- *Agriculture has a high impact on the life and economic status of human beings.Improper management leads to a loss in the quality of agriculture products.Farmers lacks the knowlgde of diseases and hence affect their crops causing less production.Kisan call centers are available but do not offer service 24*7 and sometimes properly on call,there arises a need to analyze the image of the affected area of the disease.Though images and videos of crops provide a better view and agro-scientists can provide a better solution to be to resolve the issues related to healthy crops, the farmers are not yet aware of this. It is to be noted that if the productivity of the crop is not healthy, it poses a high risk to providing good and healthy nutrition. Recognizing illness can prompt faster treatment to lessen the negative impacts on the harvest.*

Step 1 : Start

II. SYSTEM ARCHITECTURE

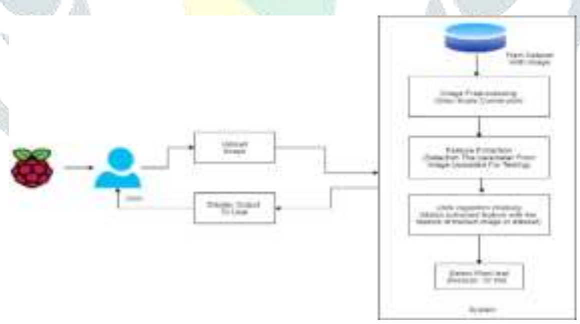

Fig: System Architecture

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Keywords- Plant Leaf Diseases Detection, Classification, Image Pre-processing, Segmentation, K Means clustering

I. INTRODUCTION

The deep convolutional network model used in this project uses a variety of plant leaf disease photos to provide quick and accurate automated detection. Symptoms of plant leaf diseases might vary. Inexperienced farmers may have a harder time spotting infections than trained plant pathologists. An autonomous system that is created to recognize agricultural illnesses by the appearance of the crop and visual symptoms could be a huge assistance to farmers as a verification system in disease identification We can identify plant leaf disease using neural networks and digital image processing approaches. The last few years have seen enormous progress in deep learning. Currently, it can extract practical feature representations.

Step 2 : Prepare Database (Healthy/Unhealthy)
Step 3 : Preprocessing NormalizationStep 4 : Train CNN
Step 5 : Real image from PCStep 6 : Pre-processing
Step 7 : Test Network
Step 8 : if probability of healthy > probability of unhealthyDisplay Healthy Image Otherwise
Display Unhealthy imageStep 9 : End

III. IMPLIMENTATION

The block diagram of plant disease detection processis given in the figure below.

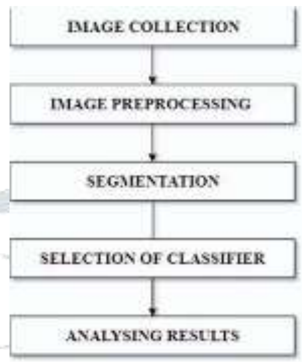


Fig: Block diagram of plant disease detection

3.1 Image preprocessing:

In this step images are resized to smaller pixel size in order to speed up the computations. The acquired images contain some noise. This noise is removed using some filtering techniques like Gaussian Blur. After that images are present in RGB format which is not appropriate for further work as RGB format is unable to separate image intensity. Hence it is converted to another color space that is Greyscale image.

Fig.1 Sample Images from Dataset

Fig.2 Images after Preprocessing

3.2Segmentation:

In this step, segmentation of images is done in order to separate the leaves from the background. Segmentation is performed using K-means clustering with 2 cluster centers, one for background and one for foreground. K-means clustering is unsupervised learning technique that is used to segregate the datapoints in the predefined number (k) of clusters or groups on the basis of their similarities.

K –Means algorithm works as follows: -

Set of inputs: - number of clusters(k), set of datapoints

1.Put k centroids in random location in space.

2.Repeat the following steps until none of cluster locationchanges: -

a) For every data point x□ -
i. Find nearest centroid c□ by argmax D (x□, c□) where D
= ¥ (™(x□-y□))
ii.Assign x□ to the cluster with nearest centroid
b)For every cluster, new centroid is assigned by taking meanof all datapoints assigned to that cluster

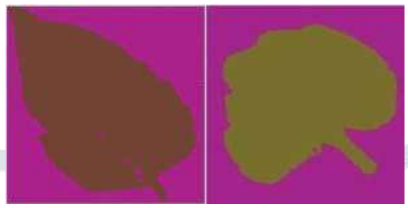


Fig 3: Images after K-means clustering

After finding the two clusters, one with background and other one with leaf part, the clustered image is used to change the pixel value of the background of the leaf to black. By doing so the useless information from the image is eliminated which in turn increases accuracy.

Fig 4: Images after removal of background

3.3Selection of Classifier:

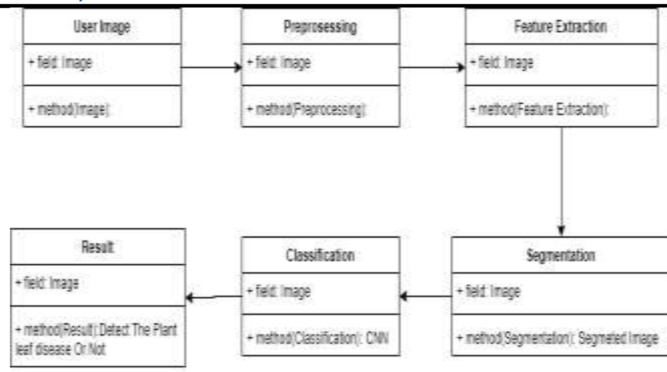
This is the classification problem as we have to classify the type of disease on the leaf of the plant. So, we have plenty of machine learning as well as deep learning algorithms that we can apply to this dataset.

We have decided to start with low-complex algorithms and increase the complexity level to increase the accuracy of the model.

IV.UML DIAGRAMS

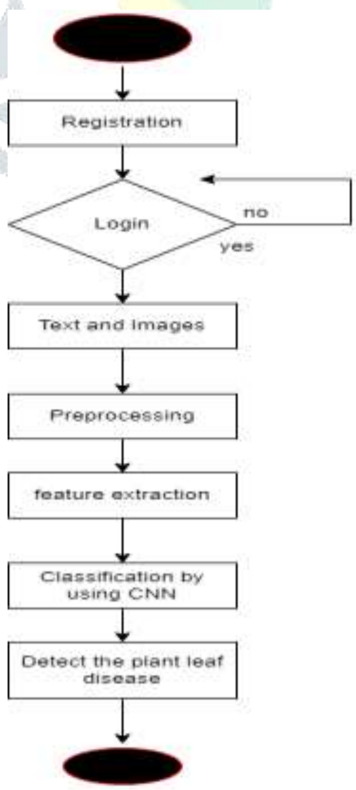
Unified Modelling Language is a standard language for writing software blueprints. The UML may be used to visualize, specify, construct, and document the artifacts of a software-intensive system and is process independent, although optimally it should be used in the process that is use case driven, architecture-centric, iterative, and incremental.
The Number of UML diagrams are available.

1) Class Diagram.
2) Use a case Diagram.
3) Activity Diagram.
4) Sequence Diagram.

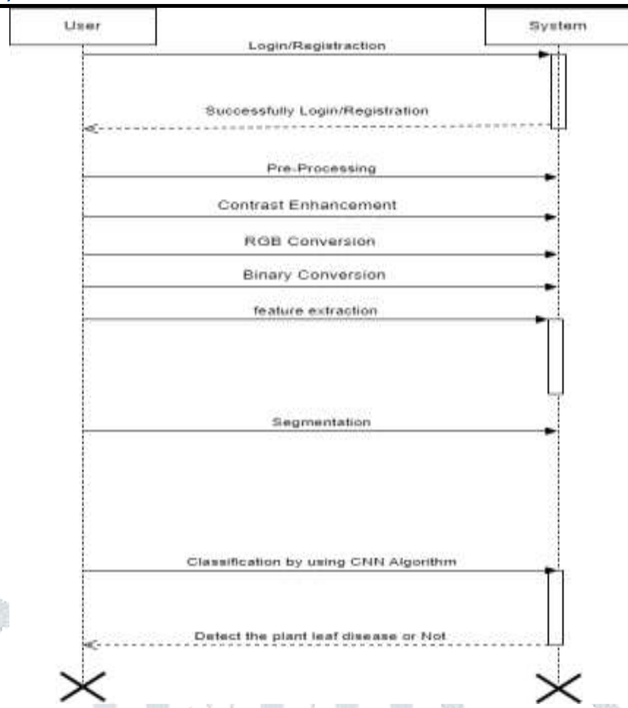


(1): Class Diagram

(2): Use case Diagram



(3): Activity Diagram



(4): Sequence Diagram

SCREENSHOTS OF SOME OUTPUTS

CONCLUSION

People around the world rely on the agricultural sector as one of the most important sectors where crops are the basic need for food. Early recognition and detection of these diseases are crucial to the agricultural industry. This paper has achieved its goal to detect and recognize different plant varieties and plant diseases using a convolutional neural network. The trained model can be used to test real-time images to detect and recognize plant diseases. For future work, additional plant varieties and different types of plant diseases may be included in the existing dataset to increase the trained models. Other CNN architectures may also use different learning rates and optimizers for experimenting with the performance and accuracy of the model.The achieved accuracy of the proposed model can assist farmers to detect and recognize plant diseases.

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