

# Tree Leaves And Fruits Disease Detection Using Convolutional Neural Networks

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## Abstract:

The purpose of Agriculture is growing the plants and feed the people. But it's an essential source of energy and a solution to solve the difficulty of global warming. Plant diseases are extremely full size, as that may adversely affect both best and quantity of vegetation in agriculture manufacturing. Plant sickness prognosis may be very critical in earlier degree as a way to cure and manipulate them. Tree leaves and fruit diseases can increase the cost of agricultural production and may extend to total economic calamity of a producer if not cured appropriately at beginning stage. It includes image segmentation and image classification approach to predict various types of diseases using Otsu thresholding method and Convolutional neural network.

**Keywords** —Apple, grape, pomegranate fruits and leaves images with disease, Feature extraction, Classification, Convolutional Neural Network, Disease detection

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## I. INTRODUCTION

Image preprocessing is to improve the image in behavior that increases or decreases the number of datasets. An image is a matrix of square pixels arranged in columns and rows. In a grayscale image each picture element has an assigned intensity that ranges from 0 to 255. A gray scale image is normally a black and white image, but the name emphasizes that such an image will also include various shades of gray. Some of the most common file formats are: GIF is an 8-bit (256 color), non-destructively compressed bitmap format. JPEG is a very efficient destructively compressed 24 bit bitmap format. Particularly for Internet and web are Widely used. TIFF is the standard 24 bit publication bitmap format. With Compress nondestructively for instance, Lempel-Ziv-

Welch(LZW)compression. PS(Postscript) is a standard vector format.

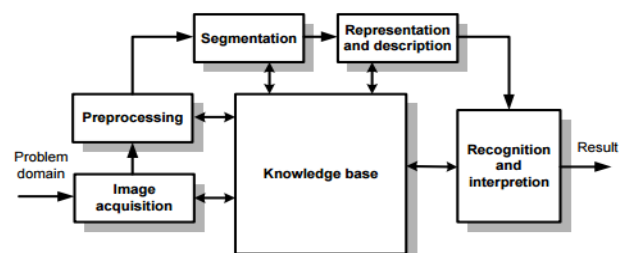


Fig1.Framework for Image processing Steps

## II. RELATED WORKS

Nitesh Agrawal ,Jyoti Singhai, Dheeraj K. Agarwal [1] have discussed about Detect the grape disease and classifies using multiclass support vector machine. In this paper having the proposed method, the input image is give to Preprocessing and they occur in segmented

process. The Image Databases are collected. Both images are classified using multiclass SVM.

Sachin D.Khirade, A.B.Patil [2] has discussed about Plant disease detection using image processing. The plant diseases are detected using some basic image processing steps. There are preprocessing, Image Acquisition, Image preprocessing, image segmentation, feature extraction, classification. The RGB image is converted into the HIS model for segmentation. For the image segmentation process, we use K-means clustering. The classification process is occurring in Artificial neural network and Back propagation network.

Rashmi Pawar, Ambaji Jadhav [3] have proposed Pomogranate Disease Detection and Classification. In this paper, the image Acquisition process is occurring, there are image is in RGB form. Then the image is resized and noise is removed in preprocessing. In the image segmentation process, the K-means clustering is applied. In Otsu Threshold Algorithm, the Thresholding creates binary images from grey-level images by setting all pixels. The Color, texture, morphology, edges are obtained in feature extraction. For classification, K-propagation is a training method used for a multi layer neural network.

Transfer Learning for Leaf Classification with Convolutional Neural Networks done by Hassan Esmaili and Thanathorn Phoka. Convolutional Neural Network (CNN) is taking a big role in image classification. This paper will focus on transfer learning, a technique that takes a pre-trained model e.g. Inception or MobileNets models then retrains the model from the existing weights for a new classification problem. This paper considers the problem of leaf image classification that the existing approaches take much effort to choose various types of image features for classification [4]

Plant Disease Detection Using CNNs and GANs as an Augmentative Approach by Rutu Gandhi, Shubham Nimbalkar, Nandita Yelamanchili and Surabhi Ponkshe. This paper presents an image-based classification system for identification of plant diseases. The classification

is done by a Convolutional Neural Network (CNN) model deployed in a smart phone app[5]

### III. PROPOSED METHODOLOGY

#### A. Dataset

In this project, we used the datasets are apple, grapes and pomegranate disease images and healthy fruits images. There are 80 images are classified into 16 classes. Resized the all images into 256×256 pixels. For each class, we randomly divided images into 5 equal subsets.

#### B. Algorithm

The proposed method for this project is Convolutional neural network. A neural network is a structure of interconnected neurons that exchange messages between each other. During the training process, the connections have numeric weights that are tuned.

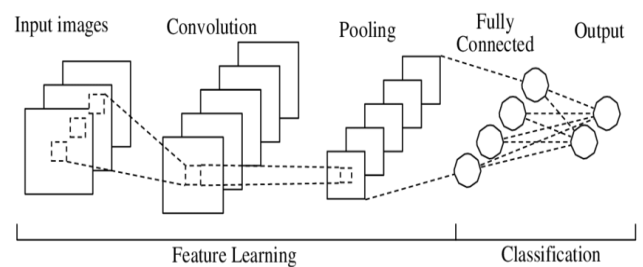


Fig2. Framework for Convolutional neural network

The Convolutional Neural Network has the three types of layers. There are Input layers, Output layers and Hidden layers.

Input layers are trains the data.

The hidden layers are classified into 3 processes of layers. There are Convolutional layers, pooling layers and fully connected layers.

In Convolutional layers, first we obtain the 4x4 pixel of images. And multiply with the convolution filters. There are

1	0
0	1

0	1
1	0

Finally, the 4x4 pixel image has been converted into a 3x3 pixel image.

The pooling layers are classified by two types. There are max pooling and mean pooling layers.

The large value of each 2x2 pixel is known as Max pooling.

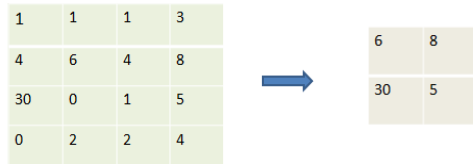


Fig3.Example of max pooling algorithm

The average value of each 2x2 pixel is known as Mean pooling.

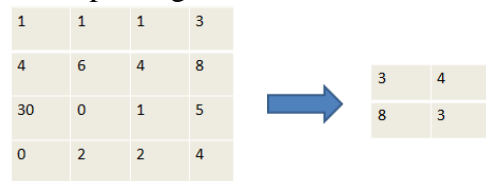


Fig4. Example of mean pooling algorithm

In these two pooling layers, we use only one pooling layer. There is only use max pooling or mean pooling layer.

Fully connected layers are final layers of Convolutional Neural Network. There are connecting the each neuron with each other. These are called Fully connected network. They estimate the all values and derive the output.

Output layers are deriving the results of output.

The input layer, Convolutional layer and pooling layers are called, “feature extraction layer”.

The fully connected layer and output layers are called, “feature map layer.”

Feature extraction layer is the input of each neuron is connected to the local receptive fields of the previous layer and extracts the local feature.

Feature map layer is each computing layer of the network is composed of a plurality of feature map. The input features and already constructed features are matched in feature map.

### C. Block diagram

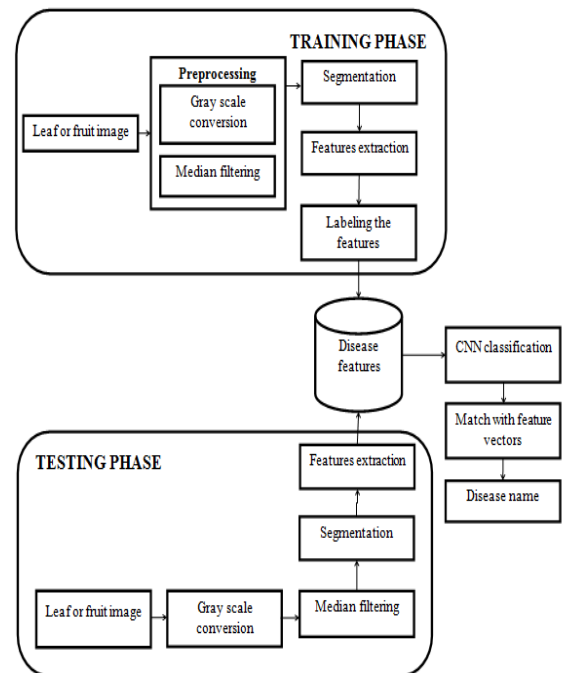


Fig5.Block diagram of proposed method

In this block diagram, we can implement the training phase and testing phase. In training phase, we can train the fruit or tree leaf images. After that, implement the preprocessing steps to convert the resized image into gray scale images. Then remove the noises from images for applying the filters. Then using segmentation algorithm to segment the pixels and extract features. Finally label the features and stored in database. In Testing phase, the input leaf or fruit images are perform preprocessing steps to eliminate the noises. Then using segmentation process to segment the pixels. And then classify the images using CNN (Convolutional Neural Network) algorithm to predict the disease name.

## IV. RESULTS



Fig.6



Fig.7

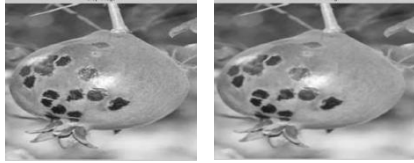


Fig.8

Fig.9



Fig.10

Fig.11

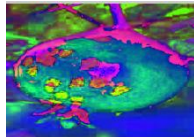


Fig.12

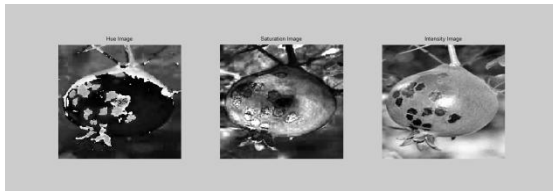


Fig.13

Fig.6, Fig.7, Fig.8, Fig.9, Fig.10, Fig.11, Fig.12, Fig.13 are Input image, Resized image, Gray image, Noise removal Image, Contrast enhanced, Otsu segmentation, Combination of HIS image and hue saturation intensity images respectively.

First we obtain the preprocessing steps. In the preprocessing steps, the input test images are resized and convert the gray images. Then apply the median filter for eliminating the noise. This is

noise removal image. Next got the contrast enhanced image. Then segmentation process is applied. Finally classify the images using Convolutional neural network (CNN) and then detect the disease in fruit and tree leaves.

## V. CONCLUSION

The perfect detection of tree leaves and fruit disease is very essential for the successful agriculture. This paper discussed different approach to detect the disease in tree leaves and fruits disease. There are preprocessing, feature extraction, image segmentation and classification. CNN method is using for classification. CNN is the advanced method in neural network algorithms.

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