Classification Technique Of Plant Leaf Disease Prediction And Detection Using CNN

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ABSTRACT

High accuracy in detection and classification of plant diseases are the important factors in plant production and therefore the reduction of losses in crop yield. This paper proposes an approach for plant disease detection and classification on plants using image processing. The algorithm presented has four basic steps: Image Pre- processing, Segmentation, Feature Extraction and Classification of plant disease. The plant disease diagnosis is restricted by person's visual capabilities because it is microscopic in nature. thanks to optical nature of plant monitoring task, computer visualization methods are adopted in plant disease recognition. The aim is to detect the symptoms of the disease affected in leaves in an accurate way. Once the captured image is preprocessed, the various properties of the plant leaf such as contrast, correlation, energy and homogeneity are extracted and sent to Conventional Neural Network algorithm for classification. The experimental results obtained using leaf images have shown that the highest classification accuracy

Keywords: Pre-processing, Segmentation, Feature Extraction, Classification, Convolutional Neural Network(CNN)

1 INTRODUCTION

Image processing is also a method of signal processing that input could be a picture, video frame or photograph. The image processing output could even be an image or characteristics of the pictures. an image is an array, or matrix, of square pixels arranged in columns and rows. The image processing techniques are often utilized within the pomegranate plant disease detection. this paper shown during this paper refers to the image processing technique used for disease detection. The methodology of the proposed work contains the five stages, which are shown within the diagram of proposed work. within the strategy proposed, the pictures collected from the dataset leaf Image Database Consortium. This dataset contains two sets of images like the disease affected leaf images and the healthy leaf images. Enhancement technique enhances the contrast of images. The contrast enhancement are often helpful to remove the noise, which is present within the image. Networks that esteem this constraint are called feed forward networks; their as- sociation pattern shapes a coordinated non-cyclic graph. Once a network has been organized for a specific application, that network is adapted to be trained. At that point, the training, or learning, starts. Supervised and unsupervised are the two training for trained sets. It physically or by giving the craved outputs the inputs, Supervised training includes a system of furnishing the network with the fancied output.

Unsupervised training is the place the network needs to make brains of the inputs without outside help or obstruction. The unlimited heft of networks use supervised training. Unsupervised training is utilized to play out some underlying portrayal on inputs. Its fame originates from three key properties. In the first place, it is the optimal (regarding mean squared error) linear plan for compressing an arrangement of high dimensional vectors into an arrangement of lower dimensional vectors and afterward reproducing. Second, the model parameters can be figured specifically from the information. Third, pressure and decompression are straight forward operations to complete given the model parameters they require just matrix increases.

Radial premise functions are food forward networks comprising of A shrouded layer of radial kernels and An output layer of linear neurons. The subsequent concealed space is regularly of higher dimensionality than the input space. The output layer performs linear regression to anticipate the sought targets. These are genuine esteemed capacity whose worth depends just on the separation from the cause. Sums of radial premise functions are ordinarily used to rough given functions. RBFs are additionally utilized as a part of bolster vector classification. "Image processing is a form of signal processing for which input is an image, video frame or photograph". The image processing output may be an image or characteristics of the images. "An image is an array, or matrix, of square pixels arranged in columns and rows". The image processing techniques can be used in the pomegranate plant disease detection. In most of the cases disease symptoms are seen on the leaves, stem and fruit. The plant leaf for the detection of disease is considered which shows the disease symptoms. This paper gives the introduction to image processing technique used for plant disease detection.

Aim of the paper

The aim of this paper is to detect the leaf image diseases and to classify them based on convolutional neural network algorithm to the upper effect.

Scope of the Paper

The images must be accessible in digitized structure is that the foremost necessities . For the process of digitization, most priorly the given Image is tested on a discrete grid and every segment or pixel is quantized using a limited number of bits. The digitized image is handled by a PC. For the digital image, within the start it's changed over into the analog signal, that is scanned into a presentation. Back propagation gives an approach. Indeed, the network does not must be sorted enter layers - any pattern of availability that allows a halfway requesting of the hubs from input to output is permitted.

Methodology

Image Acquisition

The images collected during this particular system are from the leaf Image Database Consortium. These images collected here are of two types, affected and not affected leaves with diseases.

Enhancement & Segmentation

Enhancement technique enhances the contrast of images. The contrast enhancement can be helpful to induce eliminate the noise, which is present within the image. Segmentation within the sense it divides the image into smaller desirable areas. The proposed method uses the most effective and accurate K-Means clustering algorithm for the segmentation. The K-Means clustering is utilized for classification of object supported a group of features into C number of classes.

Feature extraction & Classification

Feature extraction could be a necessary step to induce the areas of desire. In our proposed method the essential features are mean, variance, entropy, IDM, RMS, variance, smoothness, skewness, kurtosis, contrast, correlation, energy and homogeneity are calculated and considered feature values. Now a vector is created for these feature values. The segmented method shows different values for images. Convolutional Neural Network (CNN) is an IP paradigm that is inspired by the way biological nervous systems, just like the brain, process information. It is com- posed of an oversized number of highly interconnected processing elements working in unison to unravel specific problems. CNNs, like people, learn by example. An CNN is configured for a application, like pattern recognition or data classification, through a learning process. Learning in biological the systems includes adjustments to the synaptic connections which exist among the neurons.

2. LITERATURE REVIEW

In [1] authors described technique the following diseases are explained: Brown Spot, Downy mildew, Sugarcane Mosaic, Downy Fungal, Red stripe and Red rot. Pre-processing involved conversion of RGB image to gray scale and unwanted parts are removed. Linear, Nonlinear and Multiclass SVM are applied for disease detection.

In [2] authors introduced technique of Groundnut disease detection and diseases are: The Late leaf spot and The Early leaf spot disease. In preprocessing involved the conversion from the RGB image to the HSV image also used co-occurrence matrices to collect the color features and statistical approach for texture feature extraction to analyze texture images. Back propagation algorithm is applied for disease recognition and classification.

In [3] authors explained a technique which has the pre-processing a mathematical equation and removing objects and noise in image. Boundary spot detection algorithms are configured in segmentation to find leaf infected part. After that HB components and color co-occurrence methods are used to extract various features.

In [4] authors described technique of Tomato leaves diseases detection and dis- eases are: Powdery mildew Early . Gabor wavelet transformation is ap- plied feature extraction for feature vectors also in classification. Cauchy Kernel, Laplacian Kernel and Invmult Kernel are applied in SVM for output decision training for disease identification.

In [5] authors introduced technique of Citrus plant disease detection and dis- eases are: Anthracnose, Citrus canker, Overwatering and Citrus greening. The Pre- processing of the image during this system by applying YCbCr color system L*a*b* color space also color enhancement of the image by using discrete cosine transform. Gray-Level Co-Occurrence Matrix is employed for feature extraction to determine various statistics like energy, contrast, homogeneity, and entropy. Lastly SVMRBF and SVMPOLY are used for citrus leaf diseases detection.

3. PAPER DESCRIPTION

Proposed System

The diseases of pomegranate leaf features are described as, Alternaria: Small sepia circular spots appear on the leaves. Anthracnose: Appears as regular or irregular dull violet or black leaf spots with yellowish halos. Leaves turn yellow and fall out. Bacterial blight: appearance of 1 to many small waters soaked, dark colored irregular spots on leaves. Methodology: The methodology of the proposed work contains the five stages, which are shown within the diagram of proposed work.

Algorithm :

Step 1. Read input image

Step 2. Input images are converted to gray scale image. Step 3. Apply enhancement.

Step 4. Resize the image.

Step 5. Apply K-Means clustering operation. Step 6. Find the centroid of the pixels.

Step 7. Divide the pixels into cluster. Step 8. Represent the clustered image. Step 9. Segmented output.

step 10.Features extraction. step 11.Classification.

Stop

4 MODULE DESCRIPTION

General Architecture

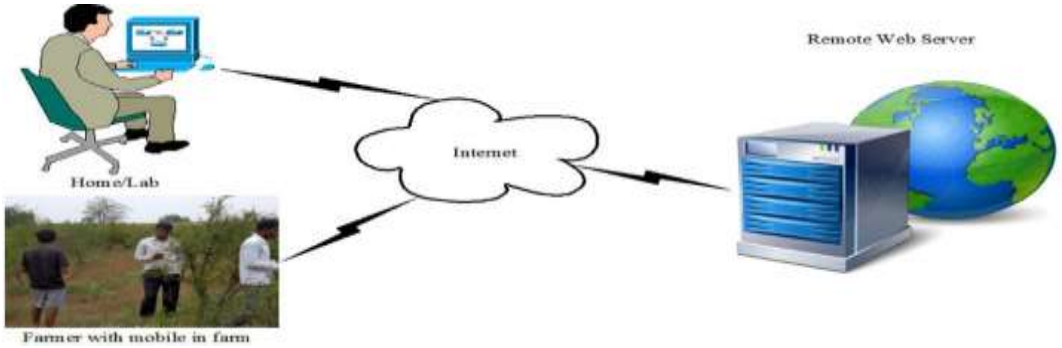

Figure 4.1: **Architecture Diagram**

The architecture diagram of the paper shows the relation between the home lab and the farmer with mobile in farm connected with internet. In home lab the machine is trained with all the data sets and is stored in the cloud. The farmer in the farm clicks a picture of the leaf and accesses the cloud and finds the disease and takes necessary steps.

Design Phase

Data Flow Diagram

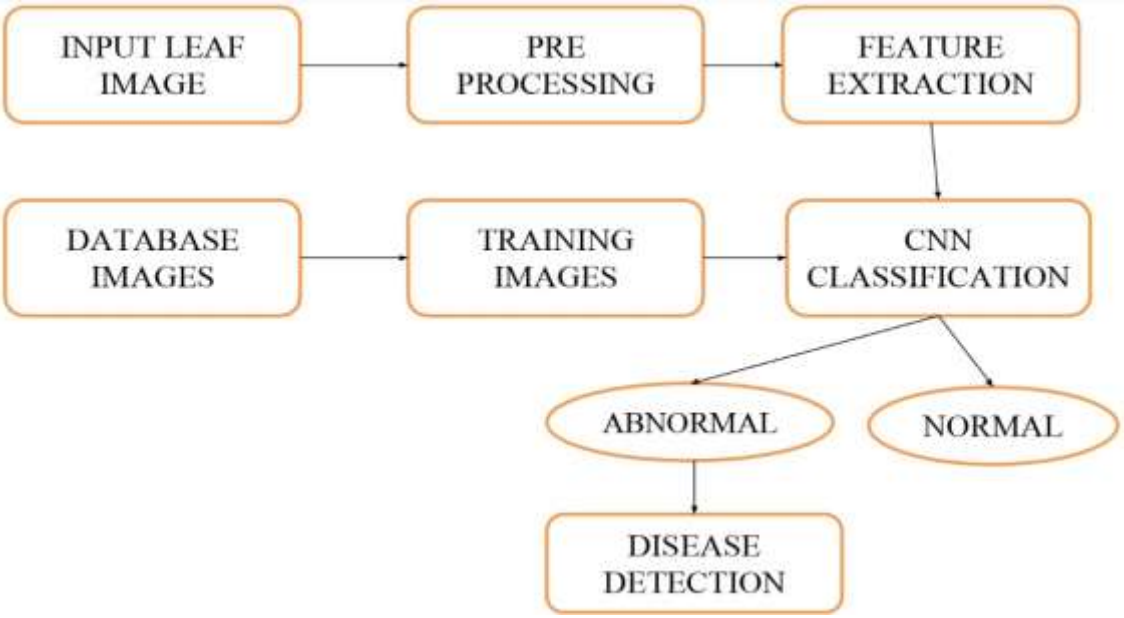

Figure 4.2: **Data Flow Diagram**

In the dataflow diagram, the sequential steps that are carried out in the process are listed. The proposed paper has the steps that are listed in the dataflow diagram.

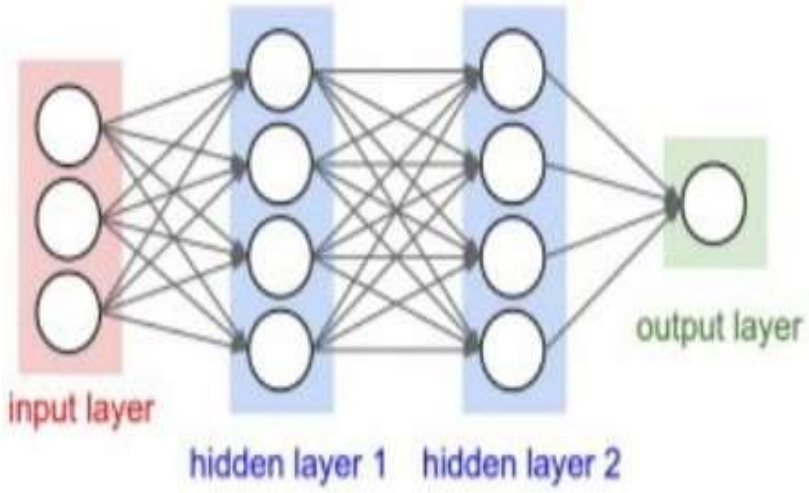

Figure 4.6: **Layers of CNN**

Convolution Neural Networks[7] or covnets are neural networks which usually share their parameters. Imagine you have got an image. it has always represented as a cuboid with its length, width (measures of the image) and height (as the image usually has red, green, and blue channels). Now imagine taking a little patch of this image and running a little neural net- work thereon , with say, k outputs and represent them vertically. Now slide that neural net- work across the full image, as a result, we'll get another image with different width, height, and depth. instead of just R, G and B channels now we've more channels but lesser width and height. his operation is called

Convolution. If patch size is same as that of the image it'll be a daily neural network. because of this small patch, we've fewer weights.

Types of layers:

We shall take an example by running a covets on of image of dimension 32 x 32 x 3. Input Layer: This layer has the input of image with width 32, height 32 and depth 3.

Convolution Layer: This layer calculates the output volume by calculating complex quantity of all filters and image patch. consider we use total 12 filters for this layer we'll get output volume of dimension 32 x 32 x 12.

Activation Function Layer: [6]This layer will apply element wise activation to the output of convolution layer. Some common activation the number remains unchanged hence output volume will have dimension 32 x 32 x 12.

Pool Layer: This layer is inserted within the convents and thus the most function is to cut back the size of volume which makes the computation fast reduces memory and also prevents from overfitting. Two common varieties of pooling layers are max pooling and average pooling. If we use a max pool with 2 x 2 filters and stride 2, the resultant volume are visiting be of dimension 16x16x12.

Fully Connected Layer: This layer is regular neural network layer which takes input from the previous layer and computes the category scores and outputs the 1-D array of scrutinize to the number of classes.

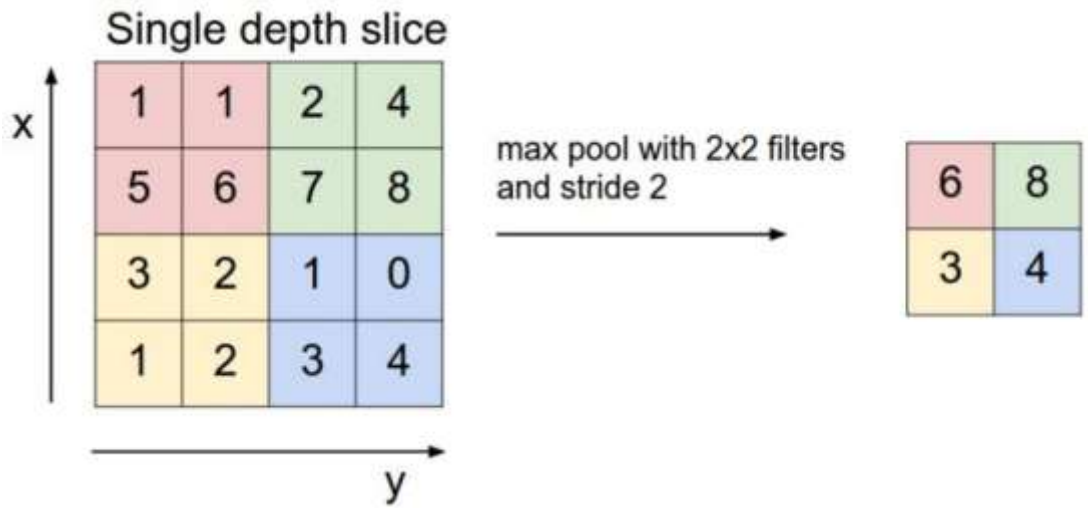

Figure 4.7: **Max Pooling**

5. IMPLEMENTATION

Input Design

The input design is finished in such the way that user finds it extremely easy to perform the operations that are per the particular paper. the appliance or the tool used to perform this operation is that the matlab. The system shows an option to select the image because the input for the user. The user selects an image of his choice to perform the on-going process. In such the way the input design is finished during this paper.

Output Design

The output design of the paper is being in quandary the upper viewing of the output from the angle of the user.

At the basketball shot the top the tactic is being completed; a message box appears showing the precise disease that the leaf is being affected with. Thus, the output design is finished making the user's work very easy not so complicated.

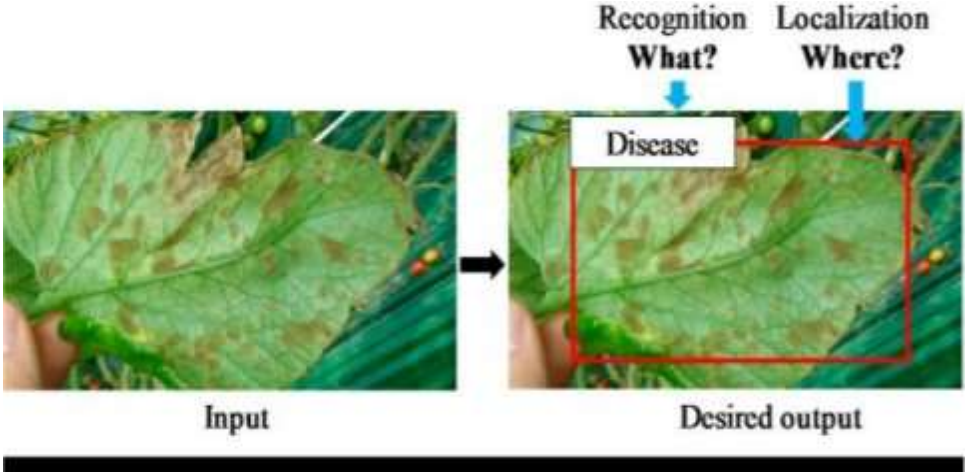

Figure 5.1: **Input and output design**

Figure 5.1 shows the design of the input and the output like it is desired to be got at the end of the paper. The input is general image of the leaf which is captured using a digital camera. The output is detecting the diseased area and the extent of the disease.

Test Case	Description	Procedure	Result	Status
Test 1	Select the image	Click the button	Allows the user to select an image	SUCCESS
Test 2	Pre-processing	pre-process the image	Displays the image with maximum intensity	SUCCESS
Test 3	Segmentation	Image Segmentation process using K-means algorithm	Displays the image with clusters after the segmentation process	SUCCESS
Test 4	Feature Extraction	Extract the feature values using the GLCM matrix	The desired features of the image are extracted	SUCCESS
Test 5	Training	Train the system using the convolutional neural network algorithm	System is trained	SUCCESS

Test 6	Validate	Check the value with the trained system	The corresponding expression is recognized	SUCCESS

Table 5.1: Sample Test Results

6. RESULTS AND DISCUSSIONS

Efficiency of the Proposed System

The proposed system is designed so that it works very efficiently. The efficiency of this system is measured in terms of the accuracy of the obtained output. The accuracy of the result obtained is exceedingly high. This is because the algorithms used in the paper are remarkably effective and efficient and fully accurate.

Comparison of Existing and Proposed System

When the existing system and the proposed system are compared, the proposed system is effective to full extent. The existing system deals with only till the segmentation process. The proposed system extends over the existing system and deals with the classification part also with some mostly accurate algorithms like Convolutional Neural Networks.

Advantages of the Proposed System

The advantages of the proposed system are that the farmers will get to know the disease with which the leaf has got affected with and will know the details of what measures should be taken to eradicate it or cure it. Thus, the proposed system helps the farmers to increase the crop yield and thereby increase the economy of the nation.

Output

Figure 6.1: **Output 1**

Figure 6.1 shows the first output image of the affected leaf. This image shows the original image of the leaf being contrast stretched. The process of contrast stretching is done, and the output is printed.

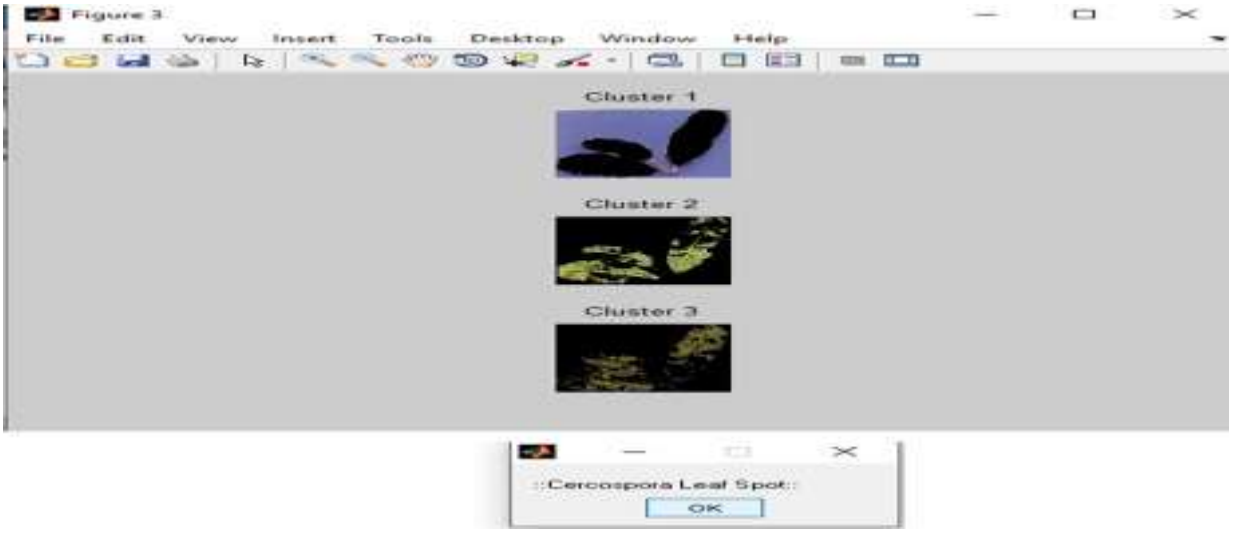

Figure 6.2: **Output 2**

Figure 6.2 shows the second part of the output. It shows the segmentation of the image into the specifies number of clusters, in this case the number being three. the image also shows the final output of the paper being the name of the disease the plant is affected.

7.1 Conclusion

In this work, two types of disease detection technique in leaf are introduced to find the accuracy and complexity level. In the existing technique, man shift clustering algorithm is used for segmentation. Also, fuzzy clustering method is used for classification. The complexity is high, and accuracy is low. To overcome this problem, a new segmentation and classification process is introduced in the proposed system. A computer aided segmentation and classification method is proposed. K-Means clustering algorithm is used for segmentation and classification is done by the support vector machine. The statistical parameters are being used as features for the classification process. This work can be used to identify the condition of any leaf and the work can also be extended for the identification of the diseased leaf or healthy leaf of any plant. And it can classify the different diseases. The proposed disease detection method offers high accuracy and low complexity than the all other existing methods.

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