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Classification of Plant Leaf Diseases using CNN

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Abstract*: Agricultural productive is the dominant issue, which affects the economy of the country excessively. So detection of diseases in plants plays a major role in Agricultural field. In previous day's farmers in the fields used to observe the plants just by seeing with their eye for identification of a disease. But this method may take lot of time, expensive and inaccurate. So advanced technology that can identify plant diseases as easily as possible is needed, in order to decrease the percentage rate of the contamination of crops and increase the fertility. Here in this paper techniques like preprocessing, segmentation and classification of image are used. Here Tomato, Maize, Grape, Potato and Apple plant leaves are used, where different diseases are identified for each plant. For Classification we used Convolution Neural Network Algorithm, so that we can automatically detect the plant leaf diseases. And this will help farmers to identify their diseases as early as possible.

Keywords : Agriculture, Classification of image, Convolution Neural Network, Identification, Pre-processing, Segmentation.

I. INTRODUCTION

In India more than half of the people earn through agriculture and agriculture based other activities. When the percentage of diseased plants increases then the amount of agricultural products produced and quality of them automatically decreases. As the demand for agriculture products is increasing it has now become almost compulsory to produce plants which are healthy. These days' farmers are spending so much money in controlling and eradicating diseases but the technical support provided is very less. When diseases are not controlled people they stop consuming them and go to other foreign foods which may affect their hygiene and cause health issues. In olden days farmers used to consult experts to know the disease and the remedies to cure it, those experts would see the plant with their naked eye and guess which disease it may be, it would cost them a lot and the accuracy is doubted. So the new methods introduced that uses automatic systems are very useful, as they are less time consuming, very cheap and more accurate when compared to traditional method.

Hence diseases on plants reduce the economic growth and increase the usage of imported foods and increases health issues caused due to imported goods.

Tomato is one among the most grown and most profitable plant of India. In total tomatoes produced in the world 11% is from India. Among all the sates in India Andhra Pradesh produces most number of tomatoes. It produces 18% of tomatoes from total tomatoes produced in India.

Potatoes are economic food and temperate crop throughout India. Potato crop has ability to grow in both kharif and rabi seasons in Andhra Pradesh. Potatoes are rich source of starch, vitamins especially C and vitamins. Apple is temperate fruit in India. Apple is primarily grown in northern part of India like J&K and Himachal Pradesh. As sodium content is very less in apple so apple is a rich content of vitamin c, so it is one among the famous fruit in the world. Apples are also useful in weight reduction. Grapes are in different colors and different colors of them have different nutrients and taste. Grapes produced in the world every year are 67 million tons.

The remaining part of the paper is explained as follows: where section II explains the related work for disease identification and section III explains the methodology and section IV explains the results and discussion and followed by section V explains about the conclusion.

II. RELATED WORK

Saranya, et.al., [1] proposed the method where leaf is transformed into a set of number of carbon copies and the carbon copies are converted into negative carbon copy. The carbon copy of a leaf is analyzed by the k-means technique. Which sends to the component segregation it leads in precise values to resolve the values using Support Vector Machine (SVM).

YinMinOo et.al., [2] explains leaf images are segmented with the help of k-means clustering method to form clusters. With the help of LBP and GLCM methods, features are obtained after applying k-means and classification has been done with the help of SVM and detection of plant leaf diseases like powdery mildly, cerospora leaf spot and Bacterial blight.

Machine Learning-based for Automatic Detection of Corn-Plant Diseases Using Image Processing [3] investigates various distinct image processing features to expose color such as Red Green Blue,

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local features on images like scale-invariant feature transform, speeded up robust features, and object detector such as histogram of oriented gradients and oriented fast and rotated brief. They are support vector machines, random forest and decision trees and naive Bayes.

Prajwala, et.al., [4] deals with the various tomato plant diseases and how to avoid the disease as early as possible.

The methodology proposed in this paper consists of data acquisition and data pre-processing and classification is carried out and a certain accuracy around 94% and it detects and identifies around 10 different tomato plant diseases and different learning rates and optimizers could be used for the future work. Bharat Mishra, et.al., in [5] compares the techniques of reduction of noise, and genetic algorithm for segmentation, kNearest Neighbor (KNN) for classification there are three algorithms used they are support vector machine (SVM), decision tree classification, Naïve Bayes Classification.Pooja, et.al., in [6] uses the dataset which consists of 227 training images and 121 testing set images are constructed. Segmentation is processed using k-means, Otus detection. SVM is utilized for classification this gives us accurate results. Vinod, et.al., in [7] aimed feature extraction which was done using oriented gradient in which they used three main feature descriptors they are Hu moments, Harilick texture and colour Histogram. Image is converted from RGB to grayscale. Harlick texture distinguish between the texture of diseased and healthy leaf using SIFT and SURF (speed up robust features).

III. METHODOLOGY

In this methodology first the Architecture of our proposed system is explained and then about the Data Collection, pre-processing, segmentation and classification of image was explained briefly.

3.1 The following is the Architecture we used for our methodology.

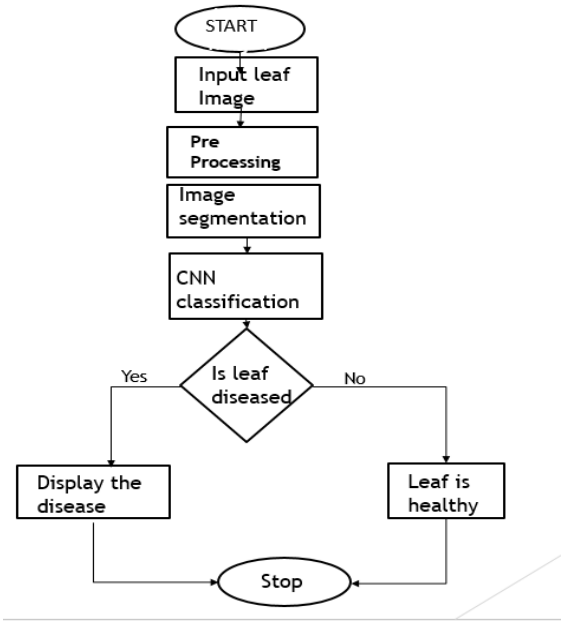

Fig. 1. Architecture for our proposed system.

A. Dataset collection

Dataset is collected from kaggle plantvillage.org the dataset is a subset that contains 375 images of 5 crops infested with 25 diseases. It consists of 25 classes, where the number of images used for training are 375and number of images used for testing are 123.

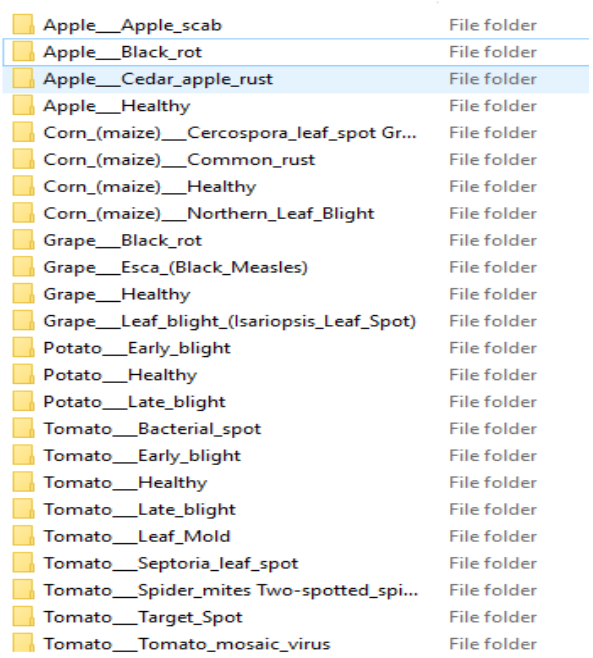

Fig. 2. Dataset consisting of different leaves.

B. Image Pre-Processing

In Image processing operations are performed on image, to boost the image to extract some helpful data from image, a picture may be a two dimensional array of numbers or pixels that area unit move between 0 and 255. f(x,y) defines the mathematical function where x is horizontal co-ordinate and y is vertical co-ordinate. f(x,y) value gives pixel value of that image. Pixel is the smallest unit of image or graphic, basic logical unit, smallest controllable element of a picture.

Fig. 3. Healthy Tomato Leaf & Potato Healthy Leaf.

Here in this paper we used Gaussian blurring which is also called as Gaussian smoothing to remove the noise from the images, here kernel label is used. Noise means that the components in image that show totally different intensity values than the true pixel values which are obtained from the image. Gaussian will blur the image and scale back the distinction. Mathematician is additionally acknowledged as Gaussian smoothing. It won't scale back image noise. We tend to use bilateral filter for edge sweetening to size and reshape the image. Enhancement of image is to brighten image so we can easily identify key features, Edge detection is finding the boundaries and outline of objects within images.

Fig. 4. Input Image of Grape Esca Leaf with Black Measles.

Fig. 5. Grape Image After applying Bilateral Filter.

C. Image Segmentation

Segmentation of a image is, separating background from foreground objects and it's illustration of image into one thing significant and simple to research. Feature extraction is color co-occurrence technique. Here all the hybrid options of a leaf color, texture, form and their geometric options are incorporated.

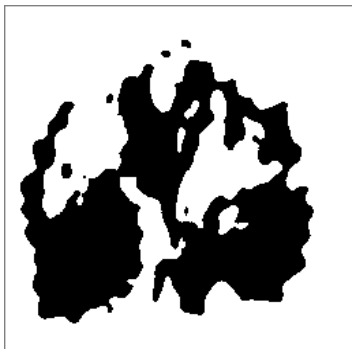

Fig. 6. Grape Image after applying Segmentation.

D. Image Classification

Here in our paper we used CNN classification for our image classification to identify our leaf disease. CNN could be a multi-layered neural network with special design to notice complicated options information. The image is born again into a array type. CNN has completely different layers that are dense, dropout, flatten, convolutional2D, maxpooling2D. Dense layer of totally connected layer is linear operation on input vector. Dropout Neural Network Layer in Keras states that, the technique used to prevent the over fitting problem can overcome by using Dropout. In middle of the fully connected layer and convolutional layer, there is layer called Flatten which transforms a 2 dimensional matrix into a vector that can be fed into a fully connected neural network classification that is Convolutional layer. A CNN algorithm is a congregation of output and input layer and number of masked layers it is the main part of convolutional neural network. In CNN the masked layers encompass a series of convolutional layers that convolute with real, the activation operate could be a RELU layer, and a few convolutions like pooling layers, totally connected layers and normalization layers. The final convolution involves back propagation to achieve rigorous end results. In mathematical reference, it is a dot product or cross-correlation. CNN is a versions of multilayer perceptron's they are intimately connected networks that is the neuron in a layer is connected to all the remaining neurons in other layers.

IV. RESULTS

Fig. 7. Cnn algorithm showing the accuracy.

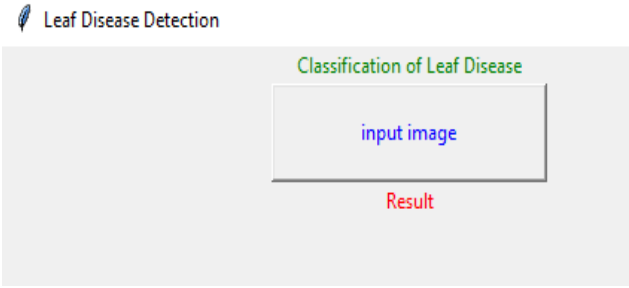

Fig. 8. Gui for disease identification.

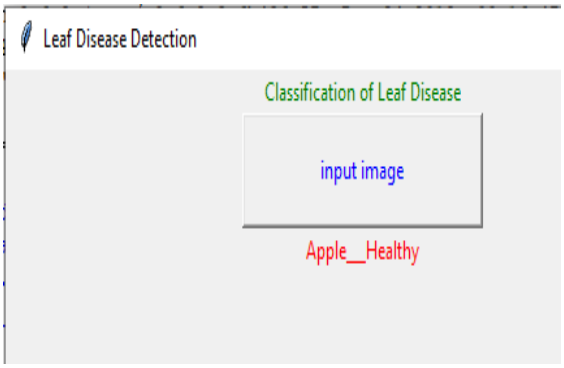

Fig. 9. Apple Healthy leaf.

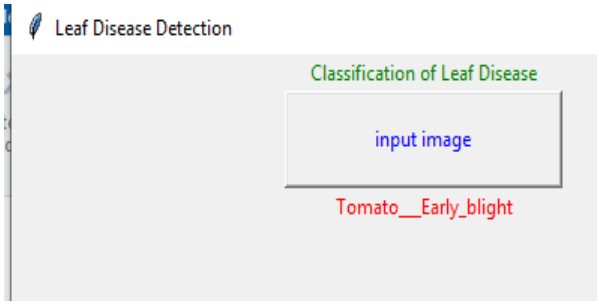

Fig. 10. Result of Tomato Disease Identified.

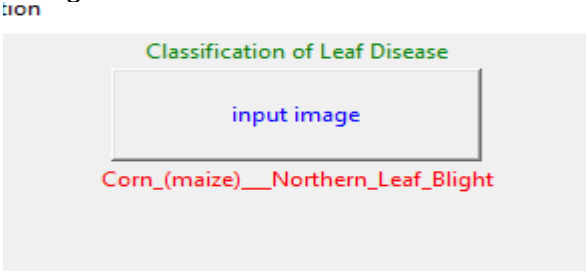

Fig. 11. Results of Corn Disease Identified.

Table-I: Shows the Accuracy Results

Class	CNN classification
Apple leafs	85
Corn	98
Grape	97
Potato	86
Tomato	82

Table.1 Shows the Accuracy obtained for different Leafs.

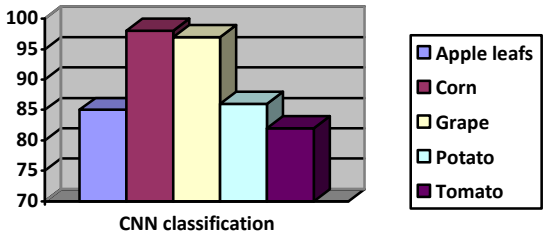

Fig. 12. The Chart Showing the Results.

V. CONCLUSION

The analysis made visually is clear method and less expensive, but it is not accurate. Using image processing technique we can achieve results with higher accuracy. Here in this paper image processing is done in 3 steps that is preprocessing, segmentation and classification of image, which helps us to identify diseases on leaf. CNN classification algorithm is used for by which we created a GUI based Application which automatically identifies the disease of the plant leaf. The crops used in this paper are Apple, Maize, Tomato, Potato, and Grape. As there are large number of diseases complexity is very high and it is very challenging to complete the process. In this paper the most significant diseases identified are apple_scab, Black_rot, Cedar_apple_rust of Apple plant. And three corn leaf diseases that are commonrust, northern_leafblight, corn_cerscospora_leafspot. Three Grape leaf diseases that are grape_blackrot, grape_esca, grape_leafblight, 2 potato leaf diseases that are potato_earlyblight, potato_leafblight and 8 tomato leaf diseases that are tomato_leafspot, tomato_earlyblight, tomato_leafblight, tomato_leafmold, tomato_sepotoria_leafspot,tomato_targetspot,tomato_mosaicvirus, tomato_spider_mites. Over all we are getting a percentage of 90 for accuracy. Our Method will help the farmers in both timesaving and in efficient manner. In future we will plan to identify more numbers of diseases and also for the others crops. As of now we identified the disease name and further we will also add the precautions to be taken for that disease and will create a Phone Application.

REFERENCES

1. S.S.Saranya, Nalluri ChandraKiran, KommaJyotheeswar Reddy "Identification of diseases in plant parts using image processing" International Journal of technology and engineering vol.7 no.2.8 pp. 461-463, 2018.
2. YinMinOo, NayChiHtun "Plant Leaf Disease Detection and Classification using Image Processing" International Journal of Engineering and research vol.5 no.9 PP. 516-523, 2018.
3. Budiarianto Suryo Kusumo, AnaHeryana, OkaMahendra. "Machine Learning-based for Automatic Detection of Corn-Plant Diseases Using Image Processing"International Conference on Control, computer Informatics and its Applications vol.6 pp. 421-424,2018.
4. Prajwala, Alla Pranathi, KandirajuAshritha, Nagaratna B. Chittaragi"Tomato Leaf Disease Detection using Convolutional Neural Networks".
5. Bharat Mishra1,Sumit Nema2,Mamta Lambert3 "Recent Technologies of Leaf Disease Detection using Image Processing Approach" 2017 (ICIIECS)
6. Pooja, Rahul das, Kanchana "Identification of plant leaf diseases using images processing" 2017.
7. ShimaRamesh, RamaChandraHebbar, Vinod "Plant Disease Detection Using Machine Learning" 2018.
8. MonzurulIslam, AnhDinh, KhanWahidPankaj Bhowmik "Detection of Potato Diseases Using Image Segmentation and Multiclass Support Vector Machine".
9. https://www.geeksforgeeks.org/software-engineering-spiral-model/
10. https://online.visual-paradigm.com/
11. https://www.python.org/downloads/
12. https://www.kaggle.com/emmarex/plantdisease

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