Plant Leaf Disease Detection (using MachineLearning)

Shashank Shekhar Singh

Department of ***Computer Science and Engineering***
Raj Kumar Goel Institute ofTechnology,
Ghaziabad 201003, India

Vipin Dwivedi

Department of ***Computer Science and Engineering***
Raj Kumar Goel Institute ofTechnology,
Ghaziabad 201003, India

Vishwabandhu Saah

Department of ***Computer Science and Engineering***
Raj Kumar Goel Institute ofTechnology,
Ghaziabad 201003, India

Guide Name's Sarita Singh
(Assistant Professor)

Department of ***Computer Science and Engineering***
Raj Kumar Goel Institute ofTechnology,
Ghaziabad 201003, India

Abstract

India is a nation of agriculture and over 70 percent of our population relies on farming. A portion of our national revenue comes from agriculture. Agriculturalists are facing losses due to various crop diseases and it becomes tedious for cultivators to monitor the crop regularly when the cultivated area is huge. Se plant disease detection is important in the algorithms in the culture field. Timely and accurate disease detection is important for the loss caused due to crop diseases which affect adversely crop quality and yield. Early diagnosis and intervention can reduce the loss of plants due to disease and reduce unnecessary drug usage. Earlier, automatic detection of plant disease was performed by image processing. Image processing tools and the machine learning mechanism are proposed for disease detection and classification. Crop disease will be detected through various stages of image processing such as image acquisition, pre-processing of image feature extraction, feature classification, disease prediction, and, fertilizer recommendation. detection of disease is important because it will help farmers to provide the proper solution to prevent these diseases.

Keywords - Classification, Feature Extraction, Image Global Features, Image Processing, Machine Learning.

I. INTRODUCTION

The economic growth of farmers depends upon the quality of the yield that they grow, which is directly dependent onthe growth of the plant and the yield they will obtain. Plants are attacked by the different types of diseases that target different parts of the plant body stretch as the leaf, stem, seed, fruit, and, so on. To solve this problem machine learning seems to be a better option. Various machine learning techniques are recently proposed for the r identification as well as classification of plant diseases from plant images. Many crops, most importantly cash crops play a dominant role in the Industrial and Agriculture Economy of the country. India provides direct livelihood to6 million farmers.

Various image processing concepts such as imagefiltering, segmentation, and image feature extraction have emerged in the leaf diseases. There are different image segmentation methods available such as Canny and Sobel segmentation, k-means clustering, and Otsu thresholding. For the Detection of Cotton Disease, different techniques such as Support Vector Machine, Neural Network, and Homogeneous Pixel Counting can be used for classification. Features play a

recent role in a process of classification. Previous proposed works for detecting disease have limitations such as low resulting accuracy and fewer number of images used to detect disease The plant leaves are the primary cause of thedisease. around 90 percent of the plant's disease is on planplant leader before the research of interest is the tree's leaf instead of the whole plant. The leaves are mainly suffered from diseases like insecticide (tudtude, mawa), fungus, foliar leaf, and Alternaria leaf spot.

Different types of algorithms are incorporated into the application. Image processing is an important tool for the segmentation of photoshoots into objects and background images. The identification of the features is one key step in the analysis of the images image recognition has attracted many researchers in the area of pattern recognition, the airflow of concepts are applied to the field of pattern recognition of plant leaves, which is used in diagnosing the leaves diseases. Many methods have been projected in the last two decades which are not fully solved. H, however, this is a challenging problem. The critical issue is how to extract the discriminative and stable features for classification.

II. REVIEW OF LITERATURE

Wan Mohd Fadzil et al. [1], mentioned a method that is used to detect diseases that occur on the leaves of the orchid plant. Images of orchid plant leaflets are obtained utilizing the digital camera. For categorizing images intotwo disease class

the aggregate of several strategies like morphological processing, filtering technique, and border segmentation method is used by the algorithm.. two classes used in this are solar scorch and black leaf spot. However, the segmentation technique proposed and used in this can only distinguish two different types of orchid leaf disease. For classification of other types of leaf disease present on orchids new or other segmentation techniques have to develop. This is because there needs any combination of the processing techniques to find robust border segmentation techniques.

Aditya Parikh et al [2] primarily focuses on the detection of disease and also on estimating the disease stage for a given image of a cotton plant leaf. The proposed work uses two cascaded classifiers, first classifier segments leaf from the background for which local statistical features are used. Then another classifier is trained using luminance and hue from HSV color spaces so that classifier can detect the disease and identify its level. The algorithm that has been developed is universal, as it can be applied to any disease.conditions i.e. border of the leaves is viewable, Leaves are the in size for analysis and the probing requires a controlled environment.

Bhumika S.Prajapati et al [3] presents a survey on cotton leaf disease detection and classification. Itis difficult for human eyes to identify exactly which type of leaf disease exists on the plant leaf. Therefore, the usage of machine learning techniques and image processing techniques can be helpful to accurately identify cotton leaf diseases. The images which are used for this task were acquired using the digit from the cotton fields. To remove the background from the image, the background removal technique is applied in pre-processing step. Then, the background removed images are processed further for image segmentation which is by the thresholding technique. However, describes Anand transcribes only general and different approaches that detect and classify leaf diseases of cotton and describe segmentation as well as background removal techniques.

P. R. Rothe et al [4] present a pattern recognition system that identifies and classifies cotton leaf diseases which areBacterial, Alter, Naria, and Myrothecium. The pictures taken for this purpose are taken from the cotton fields in the Build and Wardha districts and the fields at “Central Institute of Cotton Research Nagpur”. For image segmentation, the n active contour model is used and for the training the of adaptive neuro-fuzzy inference system, Hu’s moments are extracted as features. However, seven invariant features are extracted from 3 types of the disease leaves images and this is done t the train neuro-fuzzy inference neural network. Neural network classification depends on invariant features.

Melike Sardogan et al [5] present a CNN algorithm and Learning Vector Quantization algorithm-based method for leaf disease detection and categorization of the tomato plant. The dataset contains 500 pictures of tomato plant leaves with four symptoms of diseases. They have modeled a CNN so that automatic feature extraction and classification are done. However, for this study one of the main challenges is that the leaves having different diseases are fundamentally the same as one another. Accordingly, this likeness can make a few leaves be collapsed into to wrong classes.

III. PROPOSED METHODOLOGY

The process of diagnosis of leaf diseases involves manytasks, such as image acquisition, preprocessing of

the image, extraction of features for the image, and classifying leaf dases is dependent on features that are color features, shape features, and texture features. The first stage is image acquisition. n this phase, imagine e is uploaded from the images of the leaf dataset. Then the preprocessing of the image is performed using different techniques.

In the third phase, extraction of features is done from the picture fore part of the leaf which is infected. This is done based on particular properties between pixels in the image or their texture Then to classify the features which represent the given image statistical analysis tasks are performed. machine learning is used to compare image features. Finally, t h e classification result shows the identified leaf disease.

Advantages of the proposedsystem

- It consists of two algorithms for classification and feature extraction which are effectively able to extract the disease from the image and gives the actual final result.
- This proposed system is effectively able to extractall the spatial characteristics of an image.
- the detection accuracy using deep learning can be improved.

A. SYSTEM ARCHITECTURE

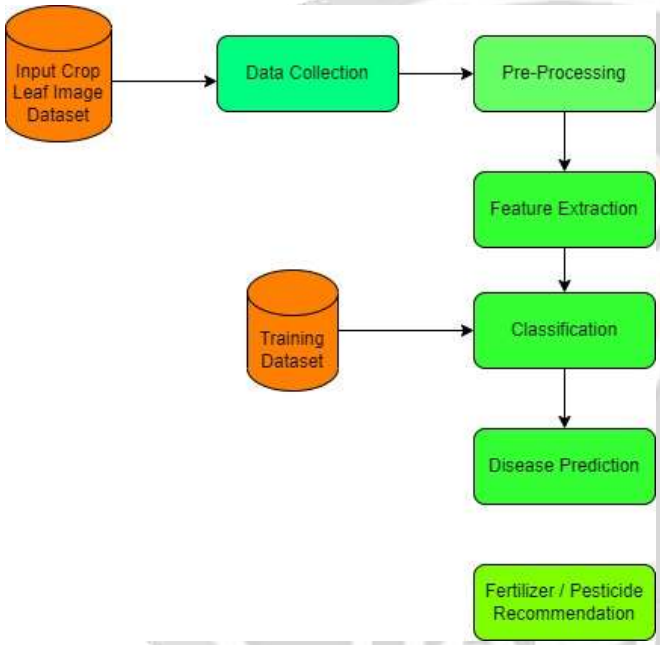

Fig. 1. Proposed System Architecture

B. Mathematical Model

The mathematical model for the Leaf Disease system isasS = {I, F, O}

Where,

I = Set of image leafdatasetF = Set of functions

O=leaf disease predictionF = {F1, F2,F3}

F1=Data Collection, F2=Data Preprocessing,F3=Feature Selection,
F4=Classification F5=Leaf disease detection

C. Algorithm

Convolution Neural Network(CNN) Algorithm:

The structure of the CNN algorithm includes two layers. First is the extraction layer of features in which each neuron's input is directly connected to its previous layer's

local ready fields and local features are extracted. The spatial relationship between it and other features will be shown once those local features are extracted. The other layer is the feature map layer; Every feature map in this layer is a plane, and the weight of the neurons in one planeis the same. The featured plan structure makes use of the function called sigmoid. This function is known as the activation function of the CNN, which makes the feature map has shifted indifferent. In the CNN each convolution layer comes after a computing layer and its usage is to findthe local average as well as the second extract; this extraction of two features is a unique structure that decreases the resolution.

Step 1: Select the dataset.

Step 2: Perform feature selection usinginformation gain and ranking

Step 3: Apply Classification algorithm CNN

Step 4: Calculate each Feature function value of theinput layer

Step 5: Calculate the bias class of each feature

Step 6: The feature map is produced and it goes tothe forward pass input layer

Step 7: Calculate the convolution cores in a featurepattern

Step 8: Produce sub-sample layer and feature value.

Step 9: Input deviation of the kth neuron in theoutput layer is backpropagated.

Step 10: Finally give the selected feature andclassification results.

IV. RESULT AND DISCUSSION

The section shows the overall accuracy of the CNN classification technique. So this works gives better leaf disease prediction compared to the existing method.

Fig. 2. CNN Classification Accuracy Graph Table No1.Method Comparison

	Existing System	Proposed System(CNN)
Precision	60.6	52.70
Recall	75.1	87.64
F-Measure	68.8	74.31
Accuracy	78.29	86.26

V. CONCLUSION

Here, how the disease analysis is done for the leaf disease detection is addressed, the analysis of the different diseases that are present on the leaves can be effectively detected in the early stage before it will damage the whole plant. Here the technique presented can able to detect the disease more accurately, we can say that we can archive good productivity by preventingthe different diseases which are present on the leaves of the plant using weather datasets and image processing. The usage of classification and feature extraction processes has enhanced the performance of the system which provides better results

REFERENCES

1. Chouhan, Siddharth Singh, Ajay Kaul, Uday Pratap Singh, and Sanjeev Jain. "Bacterial foraging optimization

based radial basisfunction neural network (BRBFNN) for identification and classification of plant leaf diseases: An automatic approach towards plant pathology." IEEE Access 6 (2018): 8852-8863.

2. Fadzil, WM N. Wan Mohd, MS B. Shah Rizam, R. Jailani, and M. T.Nooritawati. "Orchid leaf disease detection using border segmentation techniques." In 2014 IEEE Conference on Systems,Process, and Control (ICSPC 2014), pp. 168-173. IEEE, 2014.

3. Parikh, Aditya, Mehul S. Raval, Chandrasinh Parmar, and SanjayChaudhary. "Disease detection and severity estimation in the cotton plant from unconstrained images." In 2016 IEEE International Conference on Data Science and Advanced Analytics (DSAA), pp. 594-601. IEEE,2016.

4. Prajapati, Bhumika S., Vipul K. Dabhi, and Harshadkumar B. Prajapati. "A survey on detection and classification of cotton leafdiseases." In 2016 International Conference on Electrical, Electronics,and Optimization Techniques (ICEEOT), pp. 2499- 2506. IEEE, 2016.

5. Rothe, P. R., and R. V. Kshirsagar. "Cotton leaf disease identification using pattern recognition techniques." In 2015 International Conference on Pervasive Computing (ICPC), pp. 1-6 IEEE, 2015.