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AN AUTOMATIC APPROACH FOR LEAF DISEASE DETECTION USING DEEP LEARNING ALGORITHM

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Abstract: India is an agriculture country and above seventy percent of our population depends on the agriculture. One third of our national income comes from agriculture. Agriculturalists are facing loss due to various crop diseases and it becomes tedious for cultivators to monitor the crop regularly when the cultivated area is huge. So the plant disease detection plays an important role in agriculture field. Timely and accurate disease detection is important for the loss caused due to crop diseases which affects adversely on crop quality and yield. Early diagnosis and intervention can reduce the loss of plant due to disease and reduce the unnecessary drug usage. Earlier, automatic detection of plant disease was performed by image processing. For disease detection and classification, the machine learning mechanism and image processing tools are proposed. Crop disease will be detected through various stages of image processing such as image acquisition, image preprocessing, image feature extraction, feature classification, disease prediction and fertilizer recommendation.

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

I. INTRODUCTION

Farmers' economic growth depends upon the quality of the product that they grow, which is directly dependent on the plants' growth and yield they get. Plants are attacked by the different diseases that target different parts of plant body such as leaf, stem, seed, and fruit and so on. To solve this problem machine learning seems to be a better option. Various machine learning techniques are recently proposed for identification and classification of plant disease 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 to 6 million farmers. Various image processing concepts such as image filtering, segmentation, image feature extraction has emerged to detect the leaf diseases. There are various image segmentation methods available such as k-means clustering, Canny and Sobel segmentation, and Otsu thresholding. Techniques such as Support Vector Machine (SVM), Neural Network (NN), and Homogeneous Pixel Counting technique for Cotton Diseases Detection (HPCCDD) can be used for classification. Features play an important role in the classification process. Previous proposed works for detecting disease have some limitations such as low resulting accuracy and a smaller number of images used to detect disease. The main source for the disease is the leaves of the plant. About 80 to 90 % Of disease on the plant is on its leaf. Hence, the study of interest is the leaf of the tree rather than whole plant. Theleaves are mainly suffered from diseases like insecticide (tudtude, mawa), fungus, foliar leaf, and Alternaria leaf spot.

II. RELATED WORK

Chaowalit Khitthuk et al [9], this paper presents plant leaf disease diagnosis system from color imagery using unsupervised neural network. Images are processed using both color and texture features. The system is mainly composed of two processes: disease feature extraction and disease classification. The process of disease feature extraction analyzes feature appearance

using statistic-based gray level co-occurrence matrix and texture feature equations. The disease classification process deploysthe unsupervised simplified fuzzy ARTMAP neural network to categorize types of disease. Four types of grape leaf disease images are used to test the system's classification performance which are rust, scab, downy mildew and no disease. However unsupervised feature isn't practically suitable in many classifications systems comparing to traditional backpropagation network and machine learning.

III. Proposed METHODOLOGY

Advantages of proposed system:

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

1. Input Image:

Here will upload the Input leaf Image.

2. Image Preprocessing:

In this step will applying the image preprocessing methods like grayscale conversion, image noise removal for further processing.

3. Image Feature Extraction:

In this step will applying the image thresholding and edge detection methods to extract the cell nuclei from leaf image andcount that.

4. Image Classification:

In this step will applying the image classification methods like CNN algorithm to classify the diseases.

5. Result:

In this step will show the final leaf disease result.

Algorithm:

Convolution Neural Network (CNN)

The structure of CNN includes two layers one is feature extraction layer, the input of each neuron is connected to the local ready fields of the previous layer, and extracts the local feature. Once the local features are extracted, the positional relationship between it and other features also will be displayed. The other is feature map layer; each computing layer of the network is collected of an advantage of feature map. Every feature map is a plane, the weight of the neurons in the plane are same. The structure of feature plan uses the sigmoid function as activation function of the convolution network, which makes the feature map have shift in difference. Besides, since the neurons in the same mapping plane share weight, the number of free parameters of the network is decreased. Each convolution layer in the convolution neural network is come after by a computing layer which is used to find the local average and the second extract; this unique two feature extraction structure

decreases the resolution.

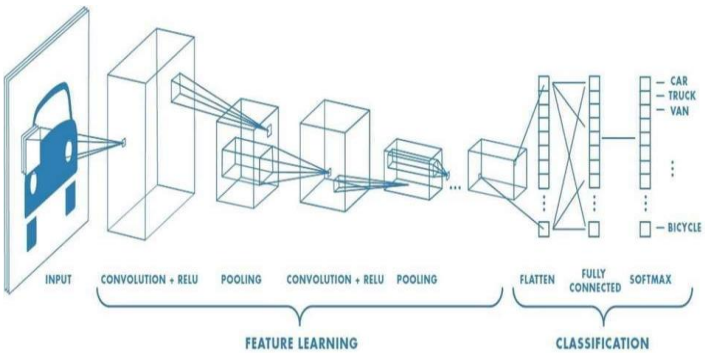

Fig. CNN Layers

Convolution is the first layer to extract features from an input image (leaf image). Convolution preserves the relationship between pixels by learning image features using small squares of input data. Convolution of an image with different filterscan perform operations such as edge detection, blur and sharpen by applying filters i.e., identity filter, edge detection, sharpen, box blur and Gaussian blur filter.

Pooling Layer

Pooling layers would reduce the number of parameters when the images are too large. Spatial pooling also called subsamplingor down sampling which reduces the dimensionality of each map but retains important information.

Fully Connected Layer

In this layer Feature map matrix will be converted as vector (x1, x2, x3, …). With the fully connected layers, we combined these features together to create a model.

SoftMax Classifier

Finally, we have an activation function such as SoftMax or sigmoid to classify the outputs i.e. classify leaf disease.

F-Measure	68.8	74.31
Accuracy	78.29	88.26

IV. RESULT AND DISCUSSION

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

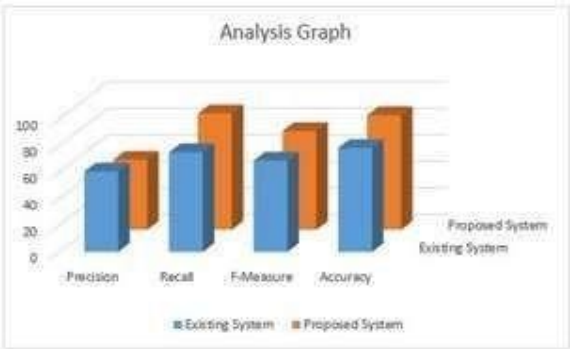

Fig. 2. CNN Classification Accuracy Graph

Table No 1. Method Comparison

	Existing System	Proposed System (CNN)
Precision	60.6	52.70
Recall	75.1	87.64

V. CONCLUSION

In this paper, addressed how the disease analysis is possible for the leaf diseases detection, the analysis of the various diseases 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 preventing the various diseases present on the leaves of plant using weather dataset and image processing. The usage of classification and feature extraction processes has enhanced the performance of the system which provides better results.

VI. REFERENCES

[1] Siddharth Singh Chouhan1 (Student Member, IEEE), Ajay Kaul1, Uday Pratap Singh2 and Sanjeev Jain," Bacterial foraging optimization based Radial Basis Function Neural Network (BRBFNN) for identification and classification of plant leaf diseases: An automatic approach towards Plant Pathology"IEEE ACCESS 2018.

[2] Wan Mohd Fadzil, Shah Rizam, Jailani R, Nooritawati M.T, "Orchid leaf disease detection using Border Segmentation technique," IEEE Conference on Systems, Process and Control (ICSPC), Vol.1, pp.168-179, December 2014.

[3] Aditya Parikh, Mehul S. Raval, Chandrasinh Parmar, Sanjay Chaudhary, "Disease Detection and Severity Estimation in Cotton Plant from Unconstrained Images", 2016 IEEE International Conference on Data Science and Advanced Analytics.

[4] Bhumika S.Prajapati Vipul K.Dabhi Harshad kumar B.Prajapati, "A Survey on Detection and Classification of Cotton LeafDiseases", International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT) 2016.

[5] P. R. Rothe, R. V. Kshirsagar, "Cotton Leaf Disease Identification using Pattern Recognition Techniques". International Conference on Pervasive Computing (ICPC).

[6] Melike Sardogan, Adem Tuncer, YunusOzen," Plant Leaf Disease Detection and Classification based on CNN with LVQ Algorithm" International conference on computer sciences 2018.

[7] Norfarahin Mohd Yusoff, Ili Shairah Abdul Halim, Noor Ezan Abdullah, A'zraa Afhzan Ab. Rahim," Real-time Hevea Leaves Diseases Identification using Sobel Edge Algorithm on FPGA: A Preliminary Study" ICSGRC 2018.

[8] Indumathi.R, Saagari.N, Thejuswini.V, Swarnareka.R," LEAF DISEASE DETECTION AND FERTILIZER SUGGESTION" ICSCAN 2019.

[9] Gayatri Kuricheti, Supriya P "Computer Vision Based Turmeric Leaf Disease Detection and Classification" ICOEI 2019.

[10] Chaowalit Khitthuk*, Arthit Srikaew, Kitti Attakitmongcol and Prayoth Kumsawat," Plant Leaf Disease Diagnosis from Color Imagery Using Co- Occurrence Matrix and Artificial Intelligence System" IEECON 2018.

[11] PENG JIANG, YUEHAN CHEN, BIN LIu, DONGJIAN HE, AND CHUNQUAN LIANG" Real-Time Detection of Apple Leaf Diseases Using Deep Learning Approach Based on Improved Convolutional Neural Networks" IEEE Access 2019.