



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 2, February 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

A Survey on Leaf Disease Detection using Machine Learning Algorithms

Vikas Pawar, Ujjwal Patil, Siddharth More, Prof. Kalyani Sonawane

Department of Information Technology, RMD Sinhgad School of Engineering, Pune, India

ABSTRACT: India is an agricultural country and more than seventy percent of our population depends on agriculture. One-third of our national income comes from agriculture. Farmers face losses due to various crop diseases and it is tiring for growers to monitor crops regularly when the cultivated area is huge (acres). Detection of plant diseases plays a very important role in agriculture. Early and accurate disease detection is important for crop disease losses that adversely affect crop quality and yield. Early diagnosis and intervention can reduce plant disease loss and reduce the unnecessary use of drugs. Previously, the automatic detection of plant diseases was performed by image processing. We design machine-learning mechanisms and image-processing tools for disease detection and classification. Crop disease will be detected through different stages of image processing such as image acquisition, image pre-processing, image feature extraction, and feature classification. We will use the global image feature extraction technique to extract image features.

KEYWORDS-Image processing, machine learning, feature extraction, global image features, classification.

I. INTRODUCTION

The economic growth of farmers depends on the quality of the product they grow, which is directly dependent on the growth of the plants and the yield they get. Plants are attacked by various diseases that target different parts of the plant body such as leaves, stems, seeds and fruits, and so on. To solve this problem, machine learning seems to be a better option, recently various machine learning techniques have been proposed to identify and classify plant diseases from plant images. Many crops grow India's most important cash crops and play a dominant role in the country's industrial and agricultural economy. India provides direct livelihood to 6 million farmers and about 40-50 million people.

Various image processing concepts such as image filtering, segmentation, and image feature extraction have emerged for leaf disease detection. Various image segmentation methods are available, such as k-means clustering, Canny and Sobel segmentation, and Otsu thresholding. Techniques like Support Vector Machine (SVM), Neural Network (NN), and Homogeneous Pixel Counting for Cotton Diseases Detection (HPCDD) technique can be used for classification. Features play an important role in the classification process. Previous proposed works for disease detection have some limitations such as low resulting accuracy and less number of images used for disease detection. The main source of the disease is the leaves of the plant. About 80 to 90% of diseases on a plant are on its leaves. So the four studies we are interested in are the leaves of the tree rather than the whole plant, the leaves mainly suffer from diseases such as insecticidal fungi (culture, male), leaf blight, and Alternaria leaf spot. A machine vision system today typically consists of a computer, a digital camera, and application software.

Different types of algorithms are integrated into the application. Image processing is one important method that helps to segment the image into objects and background images. One of the key steps in image analysis is feature detection. Image recognition has attracted many researchers in the field of pattern recognition, a similar flow of concepts is used in the field of plant leaf pattern recognition, which is used in the diagnosis of leaf diseases. Many methods have been proposed in the last two decades and are not fully resolved. However, these are challenging problems. A critical issue is how to extract a discriminative and stable feature for classification.

II. RELATED WORK

Wan MohdFadzil et al. [1] discussed a method for detecting leaf diseases of orchid plants. Leaflet pictures of orchid plants are taken using a digital camera. The algorithm uses an aggregation of different strategies including boundary segmentation method, morphological processing and filtering technique used to categorize the input images into two disease classes such as black leaf spot and sunburn.

The primary objective of this work by Aditya Parikh et al [2] is to detect disease and estimate its stage in cotton using images. Most of the symptoms of the disease are reflected in cotton. The proposed work uses two cascaded classifiers, so using local statistical properties, the first segments of the classifier browse from the background. Then, using hue and brightness from the HSV color space, another classifier is trained to detect the disease and find its stage. The developed algorithm is generalized because it can be used for any disease.

BhumikaS.Prajapati et al [3], this work presents a review on the detection and classification of cotton leaf diseases. It is difficult for the human eye to identify the exact type of foliar disease that occurs on a plant leaf. In order to accurately identify cotton foliar diseases, the use of image processing and machine learning techniques can be useful. The images used for this work were obtained from a cotton field using a digital camera. In the pre-processing step, a background removal technique is applied to the image to remove the background from the image. Then, the background-removed images are further processed for image segmentation using the Otsu thresholding technique.

P.R. Rothe et al [4], Foliar diseases on the cotton plant must be identified early and accurately as they may prove detrimental to yield. The presented work presents a pattern recognition system for the identification and classification of three cotton leaf diseases, i.e. bacterial blight, myrothecium and alternaria. The images required for this work are captured from fields at Central Institute of Cotton Research Nagpur and cotton fields in Buldana and Wardha districts. An active contour model is used for image segmentation and Huo moments are extracted as features to train an adaptive neuro-fuzzy inference system.

This paper by MelikeSardogan et al [5] presents a convolutional neural network (CNN) algorithm and a method based on Learning Vector Quantization (LVQ) algorithm for tomato leaf disease detection and classification. The dataset contains 500 images of tomato leaves with four disease symptoms. They modeled a CNN for automatic feature extraction and classification.

NorfarahinMohdYusoff et al [6], this paper proposes a real-time edge detection technique for Hevea leaf (rubber leaf) disease identification in images and its hardware implementation. Three major Hevea leaf diseases, Corynespora Leaf Spot, Bird's Eye Leaf Spot and Colletotrichum Leaf Disease used in this study for image comparison. Leaf disease can be detected using edge detection using the Sobel edge detection algorithm. The real-time edge detection result generated by the Cyclone IV E FPGA, which is displayed on the monitor, is compared with the Sobel edge detection algorithm, which is generated in MATLAB.

Indumathi.R et al [7], this system finds the area of the leaf that has been affected and also the disease that has attacked the leaf. This is achieved by using image processing; there are systems that predict diseases in the leaf. Our system uses K-Medoid clustering and the Random Forest algorithm to achieve greater accuracy in leaf disease detection. The image is first pre-processed and then a clustering method is used to find the affected leaf area.

Gayatri Kuricheti et al [8], This work develops an algorithm to detect and prevent the spread of diseases to the entire crop and leads to high quality crop production. A database of different leaf images was created and processed using k-Means image segmentation and textural analysis of leaf images was performed using GLCM. The SVM classifier is used to classify the extracted images after classifying their attributes using an information extraction algorithm.

Chaowalit Khitthuk et al [9], this work presents a plant leaf disease diagnosis system from color imaging using an unsupervised neural network. Images are processed using color and texture functions. The system mainly consists of two processes: disease feature extraction and disease classification. The disease symptom extraction process analyzes symptom appearance using a statistically based gray-level co-occurrence matrix and texture symptom equations. The



disease classification process uses an unsupervised simplified ARTMAP fuzzy neural network to categorize disease types. Four types of grape leaf disease images, which are rust, scab, blight, and no disease, are used to test the classification performance of the system.

PENG JIANG et al [10], In this paper, the apple leaf disease (ALDD) dataset, which consists of laboratory images and complex images under real field conditions, is first constructed using data augmentation and image annotation technologies. Based on this, a new apple leaf disease detection model using deep CNN is proposed by introducing Google Net Inception structure and Rainbow concatenation. Finally, under a long-term test dataset, using a dataset of 26,377 images of diseased apple leaves, the proposed INAR-SSD (SSD with Inception and Rainbow concatenation module) model is trained to detect these five common apple leaf diseases.

Gap Analysis

Sr No	Paper Title	Publication Year	Methodology	Research
1	Orchid leaf disease detection using Border Segmentation technique	2014	image segmentation, morphological techniques	This paper presents an image segmentation technique to classify two different types of orchid leaf diseases such as black leaf spot and sun burn.
2	Disease Detection and Severity Estimation in Cotton Plant from Unconstrained Images	2016	genetic algorithm	The proposed work uses two cascaded classifiers. Using local statistical functions, the first classifier segments leaves from the background. Then, using hue and brightness from the HSV color space, another classifier is trained to detect the disease and find its stage.
3	A Survey on Detection and Classification of Cotton Leaf Diseases	2016	Support Vector Machine	This article presents a cotton leaf disease detection and classification survey. It is difficult for the human eye to identify the exact type of foliar disease that occurs on a plant leaf.
4	Cotton Leaf Disease Identification using Pattern Recognition Techniques	2016	Neural Network	Neuron Network This paper worked on real-time cotton Nagpur dataset for disease detection using machine learning.
5	Detection and Classification of Plant Leaf Diseases Based on CNN with LVQ	2018	Algorithm, Convolutional Neural Network Model (CNN) and learning vector quantization Algorithm (LVQ)	This paper presents a convolutional neural network (CNN) model and a method based on the Learning Vector Quantization (LVQ) algorithm for tomato leaf disease detection and classification.
6	Real-time, Disease Identification of Hevea Leaves Using Sobel Edge Algorithm on FPGA: A Preliminary Study	2018	Sobel edge detection algorithm	Sobel Edge Detection Algorithm This paper proposes a real-time edge detection technique for identifying Hevea (rubber leaf) leaf diseases in images
7	LEAF DISEASE DETECTION AND FERTILIZER DESIGN	2019	K-Medoid Clustering and Random Forest	The image is first pre-processed and then the clustering method is used to find the affected area of the leaf.
8	Computer Vision Based Turmeric Leaf Disease Detection and	2019	k-Means Image Segmentation, GLCM, SVM Classifier	A database of different leaf images was created and processed using k-Means image segmentation and

	Classification			texture analysis of leaf images was performed using GLCM. The SVM classifier is used to classify the extracted feature images
9	Diagnosis of plant leaf diseases from color image using co-occurrence matrix and artificial intelligence system	2018	fuzzy neural networkARTMAP	The system mainly consists of two processes: disease feature extraction and disease classification. The disease classification process uses an unsupervised simplified ARTMAP fuzzy neural network to categorize disease types.
10	Real-time detection of apple leaf diseases using a deep learning approach based on enhancedconvolutional neural networks	2019	Deep-CNN	This paper proposes a deep learning approach based on enhanced convolutional neural networks (CNN) for real-time detection of apple leaf diseases.

III. PROPOSED APPROACHES

Leaf disease diagnosis methodology includes several tasks such as image acquisition, image pre-processing, image feature extraction, and leaf disease classification based on image feature, which are color features, shape features, and texture features. The first phase is the image acquisition phase. In this step, the image is loaded from the dataset images of different sheets. In the second stage, the pre-processing of the image is completed. In the third stage, the extraction of image features for the infected part of the leaf is completed based on specific properties between the pixels in the image or their texture. After this step, certain statistical analysis tasks are completed to classify the features that represent the given image, using machine learning to compare the features of the image. Finally, the classification result shows the identified foliar disease.

Advantages of proposed system:

1. It consists of two algorithms for classification and feature extraction, which can effectively extract the disease from the image and provide a real final result.
2. This proposed system is able to efficiently extract all the spatial characteristics of the image.
3. Try to improve detection accuracy using machine learning.

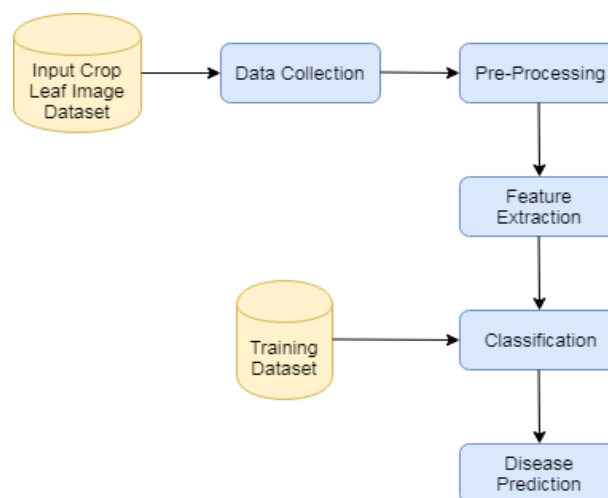


Fig. System Architecture

IV. 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.

REFERENCES

- [1] Wan MohdFadzil, 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.
- [2] Aditya Parikh, Mehul S. Raval, ChandrasinhParmar, Sanjay Chaudhary, “Disease Detection and Severity Estimation in Cotton Plant from Unconstrained Images”, 2016 IEEE International Conference on Data Science and Advanced Analytics.
- [3] BhumikaS.Prajapati, VipulK.Dabhi,HarshadkumarB.Prajapati, “A Survey on Detection and Classification of Cotton Leaf Diseases”, International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT) 2016.
- [4] P. R. Rothe, R. V. Kshirsagar, “Cotton Leaf Disease Identification using Pattern Recognition Techniques”. International Conference on Pervasive Computing (ICPC).
- [5] MelikeSardogan,AdemTuncer, YunusOzen,” Plant Leaf Disease Detection and Classification based on CNN with LVQ Algorithm” International conference on composer sciences 2018.
- [6] NorfarahinMohdYusoff, Ili Shairah Abdul Halim, Noor Ezan Abdullah, AzraaAfhzan Ab. Rahim,” Real-time Hevea Leaves Diseases Identification using Sobel Edge Algorithm on FPGA: A Preliminary Study” ICSGRC 2018.
- [7] Indumathi.R, Saagari.N, Thejuswini.V, Swarnareka.R,” LEAF DISEASE DETECTION AND FERTILIZER SUGGESTION” ICSCAN 2019.
- [8] GayatriKuricheti, Supriya P “Computer Vision Based Turmeric Leaf Disease Detection and Classification” ICOEI 2019.
- [9] ChaowalitKhitthuk*,ArthitSrikaew,KittiAttakitmongcol and PrayothKumsawat,” Plant Leaf Disease Diagnosis from Color Imagery Using Co-Occurrence Matrix and Artificial Intelligence System” IEECON 2018.
- [10] 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.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details