

DETECTION AND ANALYSIS OF PLANT LEAF DISEASE USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Disease detection in crops is one of major task that each farmer practice and takes necessary action for eradicating them as they're harmful to not only crops but also to farmers, consumers, and environment too. Plants are constantly exposure to pathogens such as virus, bacteria and fungi due to the environmental changes such as rainfall, temperature, the crop yield gets affected severely. It is difficult for human eye to detect the exact form of leaf disease which occurs on the leaf of plant. So, to protect the plant from leaf disease and to enhance the agriculture sector, modern technological approaches such as artificial intelligence, machine learning and deep learning algorithm have been utilized to increase the recognition rate and the accuracy of the results. Significant steps involved in disease prediction using image processing are image acquisition, data pre-processing, image segmentation; feature extraction and image classification are mentioned. Standard techniques also used in each step of image processing are reviewed along with various detection and classification techniques such as Support Vector Machine (SVM), Convolution Neural Network (CNN), K-Nearest Neighbors (KNN), K-Means Clustering, Deep Learning etc. These new technologies are capable to detect and analyze the accurate plant leaf disease.

Keywords: Analysis, Detection, Artificial Intelligence, Plant Leaf Diseases.

I. INTRODUCTION

India is a developing country, and agriculture is one of the most important factor of our country's development. The agriculture sector is considered as the backbone for any developing economy. It has a long and prosperous tradition, and it is an integral segment of the business. Agriculture is the primary source of earnings and provides raw materials to the food sector. But due to the climatic changes, Diseases in India tend to change with the seasons, depending on the environmental conditions. They can be harmful to both the environment and farming land. To get the maximum yield from the crops, it is required that farmers should be provided with the simplest technologies and methodologies. Now a days, Artificial intelligence is having its applications in various sectors. As a result, modern proposals are needed.

II. LITERATURE SURVEY

S.No.	Author Name	Title	Publication	Comments
1	Prof.Madhavi Patil ,Gaurav Langar, Purvi Jain, Nikhil Panchal	Tomato Leaf Disease Detection Using Artificial Intelligence and Machine Learning.	2020 International Journal of Advance Scientific Research and Engineering, ISSN (Online) 2456-0774.	In this paper, the main motive is to reduce the use of pesticides and thus yield a good crop and increase the production rate. Plant disease can be detected using image processing.
2	Pushpa. B R, A. Ashok and Shree Hari. A V.	Plant Disease Detection and Classification Using Deep	2021 Third International Conference on Inventive Research in Computing Applications	This paper presents a model for detecting and identifying crop leaf disease using CNN based AlexNet model. This proposed model is compared with other CNN model (VGG-16 and Lenet-5) that shows our

		Learning Model.	(ICIRCA), 2021.	proposed AlexNet model is more accurate than VGG-16 and Lenet-5. The proposed method will successfully identify the crop species with 96.76 %accuracy.
3	Varshney, Babukhanwala, Khan, Saxena and Singh	Machine Learning Techniques for Plant Disease Detection.	June 2021 Conference: 5 th International Conference on Trends in Electronics and Informatics(ICOEI2021) At: Tirunelveli, Tamil Nadu, India during 3-5, June 2021	The aim is to identify the plant diseases using image analysis. It also, after detection of the illness, says the name of fertilizer to be used. The pests and insects accountable for the pandemic are also described.
4	Mrs. M. Geetha Yadav, Rajasekhar Nennuri, Devarakonda Rajeshwari, Voggu Rishitha,Tandur Puneeth.	Identification of Plant Leaf Diseases using Machine Learning Algorithms.	2021 Department of computer science and Engineering, Institute of Aeronautical Engineering, Hyderabad, India, Annals of R.S.C.B.	Machine learning is being used for a new development. Machine learning is used to detect diseases in plants. Machine learning is one of the subsections of artificial intelligence to work automatically or to give instructions for a specific task. As a result, we can use machine learning to detect plant diseases. It helped make good decisions and predict the large amount of data.
5	S. Raina and A. Gupta	A Study on Various Techniques for Plant Leaf Disease Detection.	2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS), 2021.	Study of the various approaches suggested is also given. Image Acquisition, Image Preprocessing, Image segmentation, Feature Extraction and Statistical Analysis, Classification based on classifier are the key steps for the identification of diseases. This paper provides, along with the available datasets, a survey of the available approaches to solving the problem discussed.

III. PLANT LEAF DISEASES

Symptoms may include a change in color, shape or function of the plant as it responds to the pathogen. Here we are discussing these diseases symptoms that should be keep in mind if the plant growth seems low. The classification and detection of leaf diseases accurately is the key to prevent the agricultural loss. Different plant leaf bears different diseases and have different symptoms as shown in figure 1.

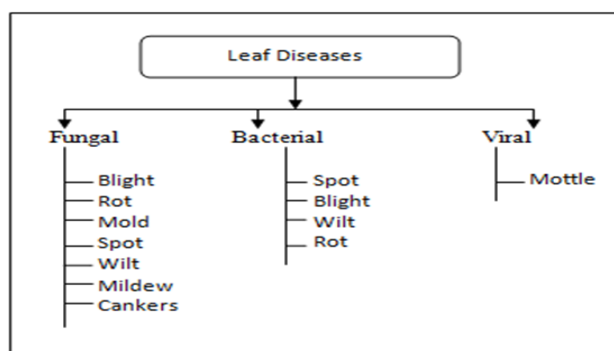


Figure 1: Plant Leaf Diseases.

A. Fungal Diseases:

The most common group of fungus are the plant infections. Thousands of fungi can cause diseases of plants. Usually, microscopic are these multicellular plants. A fungus shell is made up of filament-like fibers called hyphae. Paroles of hyphae are called mycelia. when they are big enough such masses can be seen without a microscope. Common fungal symptoms include spots of the leaf wilts, blights, tumors, rots of the fruit, and dieback etc.

Ex - Septoria Leaf Spot.

B. Bacterial Diseases:

Bacteria are single-celled organisms that are microscopic. By cell division, bacteria rapidly divide and absorb nutrients from their immediate surroundings. New websites on contaminated seeds or transplants are introduced to bacterial pathogens, bacteria persist in and around tomato plantings. Bacteria have several types of diseases.

Ex - Bacterial Leaf Spot.

C. Viral Diseases:

Viruses are objects smaller than a single cell that may not be seen by a light microscope. Some are mechanically transmitted by exposure to infected sap from plant injuries but some viruses transmit by humans. Sampling and feeding behaviors of insects such as aphids, mealy bugs and leafhoppers bearing viruses to infect plants in insect transmission. There are many diseases of viral plants, and there are two important types of them in the tomato plant, namely tomato pale leaf curl virus, and tomato mosaic virus.

Ex -Tomato Yellow Leaf Curls virus.

IV. PROPOSED METHODOLOGY

The figure 2 describes the block diagram of plant Leaf disease detection. In this the leaf image is taken as input. The image is given for spatial filter for pre-processing. Pre-processing is used to enhance the image. The image is given for segmentation after pre processing. Segmentation is used for partitioning. After partitioning the segmented part is given for feature extraction. The Region of interest (ROI) is given for classification. The following steps for plant leaf disease detection and classification using image processing.

System Architecture:

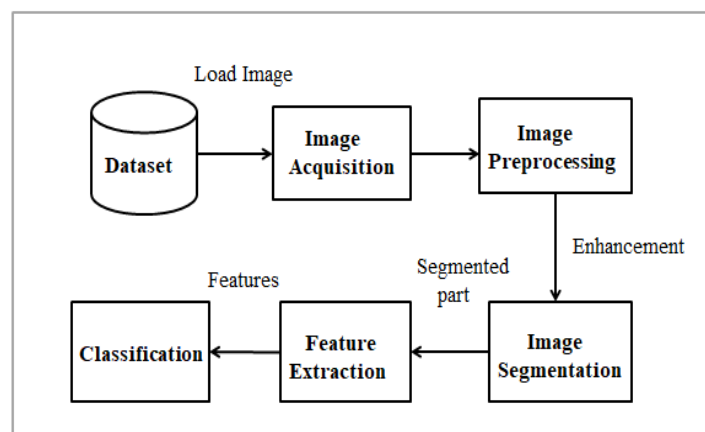


Figure 2: Block Diagram of Plant Leaf Disease Detection.

Image acquisition:

Image acquisition is the method of digital image processing and it is described as capturing the image through digital camera and stores it in media for further MATLAB operations. It is an action of retrieving an image from hardware, so it can be passed through further process.

Image Pre-processing:

The main purpose of image pre-processing is to improve the image data having unwanted distortions or to enhance some image features for further processing. Pre-processing method uses different types of techniques

such as changing image size and shape, image conversion, filtering of noise, enhancing image and morphological operations.

Image Segmentation:

This method is used for the conversion of digital image into numerous segments having some similarity. Image segmentation helps within the detection of objects and boundary line of the image.

Feature Extraction:

In feature extraction desired feature vectors like color, texture, morphology and structure are extracted. Feature extraction is technique for involving number of resources needed to describe a large set of data accurately.

Classification:

Classification is used within the interpretation of the extracted diseased region in an image which helps in the identification of the type of disease infection in leaves. Some Classifiers are as Follows -

➤ **Support Vector Machine:**

Support vector machines (SVM) are powerful yet flexible supervised machine learning algorithms which are used each for classification and regression. Support vector machines have their distinctive way of implementation as compared to different machine learning algorithms. They are extremely popular because of their ability to manage multiple continuous and categorical variables. The real power of this algorithm totally depends on the kernel function being used. The commonly used kernels are linear kernel, gaussian kernel, and polynomial kernel.

➤ **Convolutional Neural Network:**

Convolutional Neural Network (CNN, or ConvNet) are a special kind of multi-layer neural networks, designed to acknowledge visual patterns directly from pixel images with negligible pre-processing. It is a special design of artificial neural networks. Convolutional neural network uses number of its features of visual cortex and have therefore achieved state of the art results in computer vision tasks. Convolutional neural networks are comprised of two simple elements, namely convolutional layers and pooling layers. The most commonly used designs of convolutional neural network are LeNet, AlexNet, ZFNet, GoogLeNet, VGGNet, and ResNet.

➤ **K-Means Clustering:**

K-means clustering is a simple unsupervised learning algorithm that is used to solve cluster issues. It follows a easy procedure of classifying a given data set into a variety of clusters, defined by the letter "k," which is fixed beforehand. The clusters are then positioned as points and all observations or data points are associated with the nearest cluster, computed, adjusted and then the method starts over using the new changes until a desired result is reached.

➤ **Deep Learning:**

Deep learning is a type of machine learning and artificial intelligence that imitates the way humans gain certain types of information. Deep learning is an important part of data science, which includes statistics and predictive modelling. It is extremely helpful to data scientists who are tasked with collecting, analysing and interpreting large amounts of data; deep learning makes this process faster and easier. At its simplest, deep learning are often thought of as a way to automate predictive analytics. While traditional machine learning algorithms are linear, deep learning algorithms are stacked within a hierarchy of increasing complexity and abstraction.

V. CONCLUSION

Agriculture is usually compensating the economic development of the nation. Thus the main aim of planned work is to decrease the use of pesticides to decrease cultivation cost and save the environment. By the use of data mining concepts with image processing it will be easy to detect whether crop is infected or not, which type of diseases and what can be the solution for that. This paper has various methods for the Identification and classification of plant leaf diseases like pattern recognition method, back propagation, neural network, support vector machine etc. The planned work discusses the fundamental idea of plant leaf disease detection and various leaf diseases. As per our survey paper we tend to started our analysis on every crop and every part of it but soon we realized that it is not possible for us now in this period of span as we were in our learning and

active stage .So specifically we tend to shifted our goal with our own country's staple crop 'tomato' and began to figure out all the diseases of it which can be detected from the changes developed within the leaves of the tomato plant.

VI. REFERENCES

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