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Survey Paper on Plant Disease Identification Using Machine Learning

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Abstract - Farming is a significant aspect of a farmer's life. Sometimes manual illness identification requires more labor takes a lot of time. The most significant factor that inhibits plant growth is disease attack. Research on agriculture as a whole demonstrates that a variety of plant diseases may result in a decrease in the quality and quantity of agricultural goods. When compared to a manual method, a machine learning approach makes it easier to identify certain disorders. Therefore, it is possible to identify the impacted leaf photos using machine learning techniques. Different image processing techniques will be used to process the images that the camera captures. These methods will aid in the detection of plant diseases, enhancing plant productivity. This review article discusses how to identify plant diseases using machine.

Keywords: SVM, PNN, ANN, GA, and image processing methods such as feature extraction

I. INTRODUCTION

Plant diseases can cause significant damage to crops and affect food security. Traditional methods of disease identification are often time-consuming and labor-intensive. Machine learning techniques have the potential to automate the process of disease identification and improve its accuracy. In this paper, we present a survey of the different machine learning approaches used for plant disease identification. Farming is a significant aspect of a farmer's life. Sometimes manual illness identification requires more labor and takes a lot of time. The most significant factor that inhibits plant growth is disease attack. Research on agriculture as a whole demonstrates that a variety of plant diseases may result in a decrease in the quality and quantity of agricultural goods. When compared to a manual method, a machine learning approach makes it easier to identify certain disorders. Therefore, it is possible to identify the impacted leaf photos using machine learning techniques. Different image processing techniques will be used to process the images that the camera captures. These methods will aid in the detection of plant diseases, enhancing plant productivity. This review article discusses how to identify plant diseases using machine learning.

Fig. 1.1: Plant leaves with disease

Figure 1.1 shows various photos of sick plants; this sickness can be quickly detected by a machine learning automated image processing methods as opposed to doing it by hand.

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1.1 Techniques for Machine Learning

Computer science's branch of machine learning employs statistical methods to offer computers the capacity to Without being expressly coded, systems "learn" from data.

1.2 Decision Tree Learning:

A decision tree is a system of rules that allows you to link a particular chemical property or set of descriptor values to a particular location of interest.

1.3 Learning by association rules

A technique for identifying intriguing relationships between variables in huge databases.

1.4 Artificial Neural Network:

Also known as neural networks, artificial neural networks (ANN) are modelled after biological brain networks.

1.5 Support Vector Machines (SVMs):

A group of similar supervisory techniques used in regression and classification.

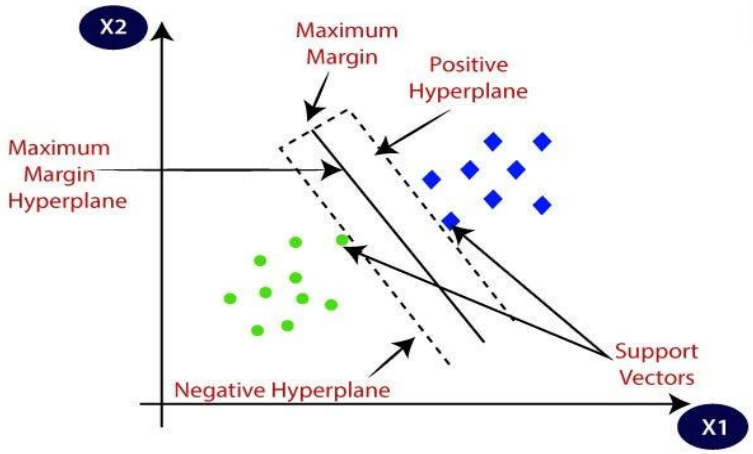

Fig:1.2 SVM

1.6 K-Nearest Neighbour:

The K-Nearest Neighbour algorithm for recognising patterns. In machine learning approaches, the k-Nearest Neighbour is a straightforward classifier that works by locating the samples that are closest neighbours to the query and using those neighbours to determine the class of the query. K-Nearest Neighbour learning is a lazy learning method. For KNN, Euclidean distance is a popular distance measurement.

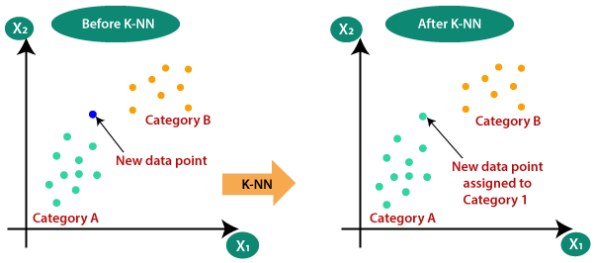

Fig: 1.3 KNN

1.7 METHODS OF DISEASE DETECTION

The course of plant infection recognition framework essentially includes four stages as displayed in Fig 1.4 The first stage includes obtaining of pictures either through computerized camera and cell phone or from web. The subsequent stage fragments the picture into different quantities of bunches for which various procedures can be applied. Next stage contains include extraction techniques and the last stage is about the order of infections.

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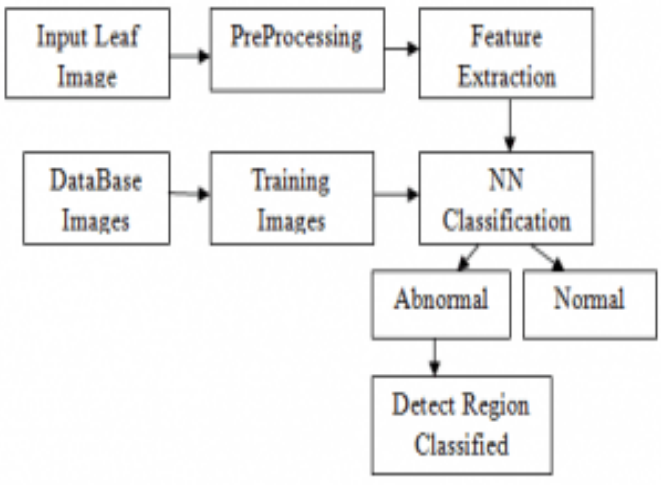

Fig 1.4 Phases of plant disease detection system.

Fig.1.4 Periods of plant infection recognition framework Picture Securing In this stage, pictures of plant leaves are assembled utilizing computerized media like camera, cell phones and so forth with wanted goal and size. The pictures can likewise be taken from web. The arrangement of data set of pictures is totally subject to the application framework designer. The picture information base is liable for improved productivity of the classifier in the last period of the discovery framework.

Picture Division

This stage targets improving on the portrayal of a picture to such an extent that it turns out to be more significant and more straightforward to Investigate.

As the reason of component extraction, this stage is likewise the crucial methodology of picture handling. There are different techniques utilizing which pictures can be sectioned, for example, k-implies grouping Otsu's calculation and thresholding and so on.

The k-implies grouping groups items or pixels in light of a bunch of highlights into K number of classes. The grouping is finished by limiting the number of squares of distances between the objects and their comparing groups. Include Extraction (BPNN), Gullible Bayes and Choice tree classifiers.

The most generally utilized classifier is viewed as SVM. Each classifier enjoys its benefits and disservices, SVM is easy to utilize and strong method. Various classifiers have been utilized previously scarcely any years by analysts, for example, k-closest neighbor (KNN), support vector machines (SVM), fake brain network (ANN), back spread brain organization (BPNN), Gullible Bayes and Choice tree classifiers. The most generally utilized classifier is viewed as SVM. Each classifier enjoys its benefits and disservices, SVM is easy to utilize and strong method.

Table 1.1 Comparison Table

Method	Description	Pros	Cons
Visual Symptoms	Observing physical changes in plant appearance	Simple and non-technical approach	Limited accuracy; subjectivity in interpretation
Image Recognition	ML algorithms analyze images for disease signs	Can handle large datasets; automated processing	Requires training data and development of ML models

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Spectral Imaging	Capturing and analyzing plant spectral data	Non-invasive; provides detailed data	Requires specialized equipment and expertise
Hyperspectral Imaging	Analyzing plant data across multiple spectra	Increased accuracy and detection capabilities	Complex data processing and analysis
Mobile Apps	Smartphone apps using ML for disease detection	Convenient and accessible; instant identification	Relies on ML model accuracy and quality of image dataset
DNA/RNA Sequencing and ML	Sequencing plant DNA/RNA and using ML for pathogen identification	Accurate identification of pathogens; can detect emerging diseases	Expensive equipment and expertise required; longer turnaround time
Data Fusion and Integration	Integrating multiple data sources (e.g., images, weather data)	Comprehensive analysis; can enhance accuracy and predictive capabilities	Requires data integration and processing; may require expertise in data fusion

The ring project-based segmentation models defined to explore the features of leaf mages. Once the features are identified, the next work is to apply the PNN classifier to identify the existence of a disease. The work is about to identify the health and infected disease based on featured region dentification.

The work is applied to randomly collect leaf mages from the web for different plants. The simulation results show a clear and accurate dentification of diseased leaf. This approach by using different algorithms for segmentation, classification. By using this concept, the disease dentification s done for all kinds of leaves and also the user can know the affected area of leaf in percentage by identifying the disease properly the user can rectify the problem very easily and with less cost.

CONCLUSION

In this paper, survey on various techniques for Leaf Disease Detection s done. n the leaves, disease is the main reason for less production of vegetables and fruits. To overcome that issue using Deep Learning and image Processing techniques. Different author used those techniques and different datasets for accurate result.

After reviewing techniques, we can conclude that there are number of ways by which we can detect disease of plants. Each has some advantages and limitations. According to survey Deep Learning Techniques s more accurate than image Processing Techniques.

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