# Some Plant Disease Identification and Prevention using Machine Learning

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## Abstract:

India is an agricultural country and the livelihood of 58% of its population depends on it. In the agriculture sector, plant diseases in plants are responsible for major economic food losses, and it may also result in hunger and starvation . Food losses due to crop diseases from pathogens such as bacteria ,viruses and fungi are major issues. In order to minimize the disease induced damage in the crop during growth, Prevention is the only effective method in crops diseases. Earlier, crop disease inspection, and plant disorders were identified by farmers or experts based on their training or experience. This manual method was costly and it requires constant monitoring and was not feasible for larger fields. Plant diseases cannot be easily diagnosed by the experienced agronomist and plant pathologists. It is also worth noting that many agricultural areas are too difficult to be properly monitored throughout and recognize the need for developing rapid, costeffective and reliable health monitoring diseases detection technologies for advancement in agriculture. A leaf is one of the most important parts of the plants. The most challenging job for both the farmer and researcher is the identification of the diseased leaf. For the identification of plant diseases, farmers need to adapt some modern techniques. Through this paper, we will overview various plants and their illnesses and the different procedures that can be utilized to identify these diseases.

Keywords:Image Processing, Plant Disease Identification, Machine Learning

# I. Introduction

In India agriculture is the primary source of living and earning for most of the families. A large number of Indian population depends directly or indirectly on agriculture production. Agriculture plays an eminent role in the country's economy. As the population increases so the demand for food also increases . So in order to meet the demand of food farmers need to use hybrid seeds, insecticides, pesticides, various other fertilizers and so on. Sometimes farmers didn't know how much the actual amount of pesticide needed. They are recklessly using chemical fertilizers, insecticides, pesticides, and so on for their massive crop growth and it increases the quality of food but at the same time it decreases its quality.

In India, earlier people used the method of organic farming as a result of which food was healthier at that time as per now. They have deep knowledge about plants and plant diseases, and they can easily identify them using their naked eyes. The best method to avoid disease is prevention.

But now, farmers have adopted modern tools and techniques in order to meet the demand of an agricultural products according to the needs of the world. So, farmers use modern agriculture techniques and in this approach crops are more vulnerable to plant diseases and if plant diseases are determined in the earlier stage it can create massive loss to crops and countries economy also and the best way to prevent diseases in the plants is the prevention. If plant diseases are not cured at time it may result in food scarcity as a result of which a large number of the population may fall prey to food starvation.

To counter the challenges of modern farming and to provide solutions to the farmers. We have adopted the technique of image processing for plant disease .By using this technology we try to help the farmers in the detection of plant disease detection, and providing solutions to the disease plant.

# II. Challenges

During the project we face numerous challenges and here we listed few of them are as follows:-

- Collection of data.
- Poor quality of data.
- Irrelevant or unwanted features.
- Less amount of training data.
- Large amount of data needs to be considered.
- Taken data may have noises.
- Partitioning of the disease spot is difficult.
- Preparation of training and testing data from input images.
- Due to different weather conditions, the colour of plant leaves change.
- Every different plant needs precise monitoring.
- Identification of diseases for different plants is exacting..

#### I. Plant Diseases

Plant diseases are majorly responsible for food losses. There are many factors which are responsible for plant diseases such as the climate, quality of seeds, plantation way, and so on there are various types of plant disease, which may be categorized as bacterial disease, viral disease and fungal diseases. Plant diseases can be recognized on the basis of color, form and texture.

#### A. Bacterial diseases:

Bacteril diseases are diseases which are caused by bacteria. The diseases caused by bacteria are relatively difficult to control. Losses from bacterial diseases are reduced by the use of pathogen free seeds. Resistant varieties of crop plants should be developed to reduce losses. Bacterial diseases are majorly detected in plants such as cherry, plum,tomato,sweet corn, tobacco, cucumber, etc.

Temperature and moisture are also responsible for all bacterial diseases. The size of Spot is irregular in nature.

Bacterial spots occur on the different parts.Bacterial pathogens enter plants through wounds, by adverse weather, humans, tools and machinery and so on.



Fig.1 Bacterial Disease

#### B. Viral Diseases:

Viral diseases are caused by viruses. It is not easy to identify plant diseases. They invade plants and virus creates a harsh impact on the production capacity.

It can affect any region of plants such as leaves, roots, stem. Plant virus can cause major loss to the farmers yields.Once the virus invades the plant it is very difficult to protect the crops. The total lifespan of plants affected with viral diseases is less.So it is primarily required to prevent the crops. It is the worst of all types of diseases..



**Fig.2 Viral Disease** 

C. Fungal Disease:

Fungal illnesses are the illnesses which arise because of fungi or fungal organisms. Fungi has an extremely large group of microorganisms. Fungi reproduced by different methods, both sexual and asexual fungi spreads with wind and the water. Infected seeds, soil, animals, crop residues are the main reason for fungal infections. Symptoms which are associated with the plant diseases are blight, scab, rots, and so on. Fungi are generally spread through pores by wind, water, soil, insects, birds, and the residuals of the infected plants.



Fig.3 Fungal Disease

#### II. Module

• Image Acquisition

In this module of an image acquisition, user can select an existing image from the gallery or can capture a new image from the gallery using the mobile's camera

• Image Preprocessing

The images which might be obtained from the actual world can also additionally include dust, spores and water spots as noise. In this module of an image processing the noise needs to be removed from the images.

• Image Segmentation

Image segmentation is the 3rd step in our proposed system. It is the process of partitioning of digital images into multiple segments.

The aim of this step is to simplify and to alternate the illustration of an image in to something which has greater significance and is less complicated to analyze.

Feature Extraction

This is the fourth module that is Feature extraction and it is quite complex. It is the process that identifies the essential feature or attributes of the data .Here in this module feature extraction of shape and textural feature is done. Feature extraction is related to dimensionality reduction. It aims to reduce the number of features by creating new features from the existing one. For example, features extracted from the image are like square, rectangle, triangle, circle, and it also includes properties like edges, corners, points, and so on.

• Detection and identification of disease

In this module our system will make a decision if the leaf is healthy or diseased using ML algorithms and then create a file containing the results. Results will include either the plant is affected or not and how much it is affected and from which disease.

#### III. Proposed Solution

In this, we provide the solution which will help the farmers in the identification of plant diseases and what kind of prevention and remedies they should take to prevent their crops from the disease and here are some pictures of the proposed solution.



Fig.4 farmer can choose or click an image



Fig. 5 selected crop will be predicted



Fig.5 disease, prevention, remedies will be predicted

## **IV.** Literature Review

Plant leaf disease by insects and environmental changes are major problems in the agriculture sector. By predicting the leaf disease fast and accurately and treating it in an early stage can help in reducing economic loss. Advancements in modern technology like deep learning have allowed researchers to automate leaf disease detection with a high rate of accuracy. So in our project we introduce a deep learning approach to detect leaf disease in crops. Our goal is to develop a more accurate and suitable model for our task and that we are using a Convolutional Neural Network. Our proposed model can effectively identify different diseases in plants.

A Convolutional Neural Network has three layers: input layer, hidden layer and output layer.Convolutional layers are the building blocks of CNN and it convolves the input and passes its output to the next layer. Pooling layer convolutional networks may include local or global pooling layers along with traditional convolutional layers. Pooling layers reduce the dimensions of data and the amount of parameters by combining the output of neuron clusters at one layer in to a single neuron and passes to the next layer. Max pooling is the most common type of polling. Relu Layer is Rectified Linear Unit which applies non saturating activation function. It effectively removes negative values from an activation map by setting them to zero. Fully connected layer: After several convolutional and max pooling layers, the final classification is done via fully connected layers. It connects every neuron in one layer to every neuron in another layer.





#### V. Conclusion:

The proposed methodology in the proposed plant disease detection system focuses on generating an advanced and efficient system which makes the process of creating high yields of crops much easier for farmers. The farmers will be able to accurately detect the type of disease a particular plant is having using the image of the plant the proposed system is based on these modules

In this study, we describe the comparison of our system with pre-existing system with proper methodology and implementation. The System can be a boon to the agricultural sector as it advances crop production, as agriculture is the major reason to facilitate growth of per capita income of our country.

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