

# Automated Plant Disease Recognition System

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**Abstract-** Plants are very essential in our life as they provide source of energy and overcome the issue of global warming. Plants now a days are affected by diseases like bacterial spot, late blight, Septoria leaf spot. These diseases effect the efficiency of crop yield. So ,the early detection of diseases is important in agriculture. Detection of diseases as soon as they appear is vital step for effective disease management. Aim of the project is to detect plant leaf disease by Machine Learning using image and videos. For Image, the proposed algorithm is Random forest classifier-Machine learning Algorithm used for classification andfor video the proposed technique is Resnet50- Deep Learning Algorithm. These techniques will obtain prediction results using various metrics like accuracy, precision and efficiency. This project can be implemented in agriculture.

**Keywords-** Plant leaf disease detection using machine learning and deep learning, image and video processing, early disease identification, crop yield improvement, precision agriculture, Random Forest for image classification, ResNet-50 for video analysis, bacterial spot, late blight, Septoria leaf spot, automated disease prediction, accuracy, precision, efficiency, smart farming, and sustainable agriculture.

## I. INTRODUCTION

### **Project Objective:**

The primary objective of plant disease detection is to identify and diagnose plant diseases accurately and quickly. This is important to prevent the spread of the disease and to minimize crop loss. Early detection of plant diseases is crucial to prevent the spread of the disease and to minimize crop damage. Disease detection using Machine Learning Algorithms should be reliable and produce consistent results.

### **Plant Leaf Disease:**

A disturbance in the stock situation of a herb that destroys or alters crucial. All types of herbs, both unbroken and educated, are susceptible to illness. Each family is prone to specific diseases, but each of these is relatively rare. The incidence and prevalence of plant illness vary from prime to prime, pivoting on the company of pathogens, territory conditions, and supply and cultivars grown. Some plant varieties are particularly susceptible to disease epidemics, while others are more resilient. See also list of herb illness.

### **Plant disease**

Generally, when plants are consistently disturbed, they might catch illness. pathogens that result in abnormal physiological processes that disrupt the normal structure, growth, function, or other activities of the plant. The essential physiological or biochemical processes of the plant are disrupted, which results in the typical diseased states or symptoms. Depending on whether the primary cause of the disease is infectious or non- infectious, plant diseases may be broadly categorized.

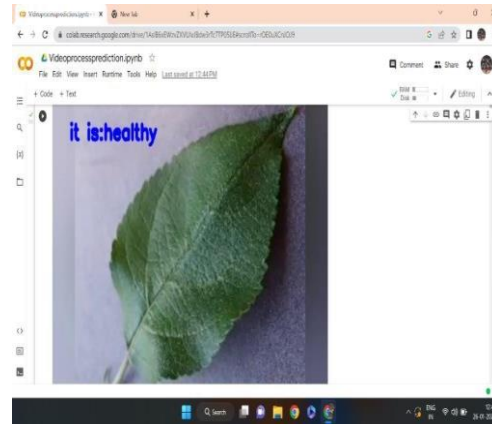
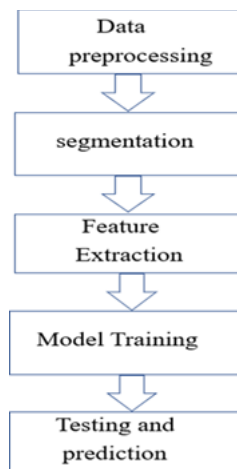
### **Digital Image Processing:**

Computer-based numerical picture variation is made possible with the use of digital processing techniques. Defects can be found in the raw data from satellite imaging sensors. Information must go through a number of processing stages in order to overcome these defects and get originality. When employing digital technique, all forms of data must go through three general phases: pre-processing, enhancement and display, and information extraction. Digital computers are utilised in this instance to process the image. A digital scanner-digitizer will be used to turn the image into digital form, which will then be processed. It is described as the process of performing a sequence of operations on a numerical representation of an item to produce the desired outcome. Starting with a single image, it

creates a altered form of the original. Consequently, a picture which transforms one image into a new.

## II. METHODOLOGY FOR IMAGE PROCESSING:

Fig.1. Flow Chart



### Image Processing:

It is a technique for translating a physical image to digital form so that it can be manipulated, added to, or extracted information from. In the field of image science, image processing denotes to any category of indication treating where the contribution is an image, such as a picture or video frame, and the yield can either be another copy or a set of parameters or characteristics that relate to the image. Although optical and analogue image processing are also feasible, digital image processing is the most common type. Imaging is the process of acquiring images, which initially produces the input image.

Image processing is used to improve an existing image or to extract useful data commencing it. This is significant in various Deep Learning-based Computer Visualization applications, because such preprocessing can significantly improve model performance. Another application, particularly in the entertainment business, is picture manipulation, such as adding or deleting items from photos.

The bulk of image processing algorithms treat the image as a two-dimensional signal, which is subsequently processed using standard signal processing techniques. Sub-images in a photograph might be thought of as ROIS plain counties. This concept considers the fact that images typically comprise clusters of elements, each of which might serve as the foundation for an entire province. Because the damaged portion will be the focus of attention, image processing has been employed to detect surface imperfections. It is currently one of

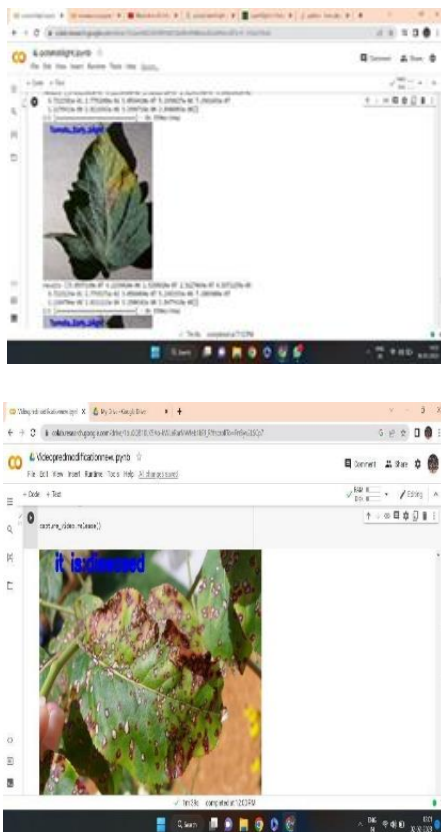


Fig .2. Sample Leaf Images For Disease Detection

the most rapidly emerging technology, with applications popular a wide range of industries. Image processing is a key study topic in the manufacturing.

#### **Image Data Generator methods:**

There are a few methods in the ImageDataGenerator class which implement augmentation.

Flow from directory : While the neural network model is learning on the training data, the flow\_from\_directory() method allows you to read photos directly from the directory and enhance them. This technique wants photos from various classes to be present in different files but within the same parent folder. The following are some critical parameters of this method:

1. directory: This is the pathway to the parent binder which contains the subfile for the dissimilar class images.
2. Size of the target: Given the input image size.
3. Mode of the color: rgb is set for coloring pictures else scaling gray.
4. Scope of batch: Size of the groups of information.
5. Mode of class: The setting is for 1 dimensional labels(binary), however the unconditional setting is for two-Done parameters.
6. Seeding :Result is set to reproduction

#### **Flowing from frames of data:**

The flow-from-frame data() is additional prodigious technique in the Image\_Data\_Generator session that consents you to unswervingly supplement images by understanding its term and board value from a data frame. This originates very conveniently when we had many pictures deposited inside the equivalent file .This method also has a few parameters.

1. Frames of data: It comprehends the picture labels and board values.
2. manual: The pathway to the file that encompasses all the pictures.
3. xcol: Support name in the Data Frame that had twin variable terms.

4. ycol: Support name in the Data Frame that has the goal values.
5. classmode: Fix to binary values is for one dimensional binary parameters whereas unconditional is for two dimensional 1-hot values.
6. Size of target: Input pictures size.
7. Size of batch: Batches size
8. seed: Set to reproduce the result.

#### **Features extraction using Resnet50:**

Feature extraction is part of the dimensionality reduction process, which splits and condenses a starting collection of raw data into smaller, easier-to-manage groupings. As a result, processing will be more straightforward. The fact that these massive data sets contain a large number of diverse variables is their most important aspect. Processing these variables necessitates a significant amount of computational resources. Feature extraction helps to extract the best feature from enormous data sets in order to efficiently reduce the amount of data by selecting and combining variables into features. These features are straightforward to utilise while correctly and uniquely describing the actual data set.

#### **Need of Feature extraction:**

When you have a large data set and need to reduce the number of resources without sacrificing any critical or relevant information, the feature extraction technique comes in handy. Feature extraction assists in reducing the amount of redundant data in a data source. Finally, data reduction allows the prototypical to be built with low mechanism struggle while simultaneously growing learning space and generalisation processes in the ML method.

#### **Building the Resnet50 model:**

So initializing the model with random weights.include\_top=False to not include the final pooling and fully connected layer in the original model. Different Pooling layers can be added based on the requirement and a dense output layer to the ResNet-50 model.Number of Classes parameter depends on the dataset.

### Training the model:

The Python deep learning modules `keras.fit()` and `keras.fit_generator` can be used to train our machine learning and deep learning models(). These two functions can achieve the same result. The primary difference is that `fit` is employed when the entire

### III. CONCLUSION AND FUTURE WORK:

Plant leaf disease detection using machine learning algorithms has shown promising results in recent years. Machine learning algorithms can accurately classify plant leaves into healthy and diseased categories, thus helping farmers to identify and treat plant diseases early on, and preventing crop damage and yield loss.

In this project, we have explored various machine learning algorithms such as Logistic Regression, KNN, Navie Bayes, Support Vector Machines (SVMs), and Random Forests for plant leaf disease detection. We have also examined the performance of these algorithms on different datasets and evaluated their accuracy, precision, recall, and F1 score.

we also explored the use of ResNet-50, a deep convolutional neural network, for plant leaf disease detection using machine learning algorithms for video datasets. ResNet-50 is a powerful algorithm that can extract high-level features from images, making it well-suited for plant leaf disease detection. We evaluated the performance of the algorithm on various datasets and achieved high accuracy in detecting plant diseases.

Overall, the results of our experiments show that Random Forests Classifier outperform other algorithms in terms of accuracy and generalization on image datasets and Resnet-50 for video datasets. Therefore, these algorithms can be used as a reliable and efficient algorithm for plant leaf disease detection.

The use of automated monitoring and management systems are gaining increasing demand

training dataset fits into memory without the need for data augmentation. The `fit_generator` is used when fitting a huge dataset into memory or when data augmentation is required. Before training, the model must be built. After training the model, we can use the `keras.fit` method to determine its validity.

with technological advancement. In the agricultural field loss of yield mainly occurs due to widespread disease. Mostly the detection and identification of the disease is noticed when the disease advances to severe stage therefore, causing the loss in terms of yield, time and money. The proposed system is capable of detecting the disease at the earlier stage as soon as it occurs on the leaf, Hence saving the loss and reducing the dependency on the expert to a certain extent is possible. It can provide the help for a person having less knowledge about the disease, Depending on these goals, we have to extract the features corresponding to the diseases.

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