ABSTRACT

One of the important and tedious tasks in agricultural practices is detection of disease on crops. It requires huge time as well as skilled labor. This work proposes a smart and efficient technique for detection of crop disease which uses machine learning and image processing techniques. The proposed system is able to detect 20 different diseases of 4 common plants with 75% accuracy.

Keywords:

Image processing,VGG-19, Convolutional Neural Networks, Machine learning,Plant disease detection.

INTRODUCTION:

In India about 70% of the population relies on agriculture. Identification of the plant diseases is important in order to prevent the losses within the yield. It's terribly troublesome to observe the plant diseases manually. It needs tremendous quantity of within the plant diseases, and conjointly need the excessive time interval. Hence, machine learning labour, expertize models can be employed for the detection of plant diseases. In this project, we have described the technique for the detection of plant diseases with the help of their leaves pictures. Machine learning is a sub part of artificial intelligence which works automatically or give instructions to do a particular task. The main aim of machine learning is to understand the training data and fit that training data into models that should be useful to the people. So it can assist in good decisions making and predicting the correct output using the large amount of training data.

The colour of leaves, amount of damage to leaves, area of the leaf, texture parameters are used for classification. In this project we have analyzed different image parameters or features to identifying different plant leaves diseases to achieve the best accuracy. Previously plant disease detection is done by visual inspection of the leaves or some chemical processes by experts. For doing so, a large team of experts as well as continuous observation of plant is needed, which costs high when we do with large farms. In such conditions, the recommended system proves to be helpful in monitoring large fields of crops. Automatic detection of the diseases by simply seeing the symptoms on the plant leaves makes it easier as well as cheaper.

The proposed solution for plant disease detection is computationally less expensive and requires less time for prediction than other deep learning based approaches since it uses statistical machine learning.The past scenario for plant disease detection involved direct eye observation, remembering the particular set of disease as per the climate, season etc. These methods were indeed inaccurate and very time consuming. The current methods of plant disease detection involved various laboratory tests, skilled people, well equipped laboratories etc. These things are not available everywhere especially in remote areas. Detection of disease through some automatic technique is helpful because it reduces an oversized work of watching in huge farms of crops, and at terribly early stage itself it detects the symptoms of diseases means that afterthey seem on plant leaves.

There are several ways to detect plant pathologies. Some diseases do not have any visible symptoms, or the effect becomes noticeable too late to act, and in those situations, a sophisticated analysis is obligatory.

However, most diseases generate some kind of manifestation in the visible spectrum, so the naked eye examination of a trained professional is the prime technique adopted in practice for plant disease detection. Variations in symptoms indicated by diseased plants may lead to an improper diagnosis since amateur gardeners and hobbyists could have more difficulties determining it than a professional plant pathologist. An automated system designed to help identify plant diseases by the plant's appearance and visual symptoms could be of great help to amateurs in the gardening process and also trained professionals as a verification system in disease diagnostics.

Advances in computer vision present an opportunity to expand and enhance the practice of precise plant protection and extend the market of computer vision applications in the field of precision agriculture. The problem of efficient plant disease detection is closely related to the problems of sustainable agriculture andclimate change In India, Farmers have a great diversity of crops. Various pathogens are present in the environment which severely affects the crops and the soil in which the plant is planted, thereby affecting the production of crops,Various disease are observed on the plants and crops .The main identification of the affected plant or crop are its leaves.The various colored spots and patterns on the leaf are very useful indetecting the disease. On the other hand, deep architectures like CNN (Convolutional Neural Networks) have also been heavily used in studies that are concerned with plant disease detection.

VGG-19 is a convolutional neural network that is trained on more than a million images from theImageNet database. The network is 19 layers deep and can classify images into 1000 object categories, such as keyboard, mouse, pencil and many animals. As a result, the network has learned rich feature representations for a wide range of images.

LITERATURE SURVEY:

1) Review In 2015, S. Khirade et Al. tackled the problem of plant disease detection using digital image processing techniques and back propagation neural network (BPNN). Authors have elaborated different techniques for the detection of plant disease using the images of leaves. They have implemented Otsu's thresholding followed by boundary detection and spot detection algorithm to segment the infected part in leaf. After that they have extracted the features such as color, texture, morphology, edges etc. for classification of plant disease. BPNN is used for classification i.e., to detect the plant disease.

2) Shiroop Madiwalar and Medha Wyawahare analyzed different image processing approaches for plant disease detection in their research. Authors analyzed the color and texture features for the detection of plant disease. They have experimented their algorithms on the dataset of 110 RGB images. The features extracted for classification were mean and standard deviation of RGB and YCbCr channels, gray level cooccurrence matrix (GLCM) features, the mean and standard deviation of the image convolved with Gabor filter. Support vector machine classifier was used for classification. Authors concluded that GCLM features are effective to detect normal leaves. Whereas color features and Gabor filter features are considered as best for detecting anthracnose affected leaves and leaf spot respectively. They have achievedhighest accuracy of 83.34% using all the extracted features.

3) Peyman Moghadam et Al. demonstrated the application of hyperspectral imaging in plant disease detection task visible and near-infrared (VNIR) and short-wave infrared (SWIR) spectrums were used in this research. Authors have used k-means clustering algorithm in spectral domain for the segmentation of leaf. They have proposed a novel grid removal algorithm to remove the grid from hyperspectral images. Authors have achieved the accuracy of 83% with vegetation indices in VNIR spectral range and 93% accuracy with full spectrum. Though the proposed method achieved higher accuracy, it requires the hyperspectral camera with 324 spectral bands so the solution becomes too costly.

4) Sharath D. M. et Al. developed the Bacterial Blight detection system for Pomegranate plant by using features such as color, mean, homogeneity, SD, variance, correlation, entropy, edges etc. Authors have implemented grab cut segmentation for segmenting the region of interest in the

image. Canny edge detector was used to extract the edges from the images. Authors have successfully developed a system which can predict the infection level in the fruit.

5) Garima Shrestha et Al. deployed the convolutional neural network to detect the plant disease. Authors have successfully classified 12 plant diseases with 88.80% accuracy. The dataset of 3000 high resolution RGB images were used for experimentation. The network has 3 blocks of convolution and pooling layers. This makes the network computationally expensive. Also, the F1 score of the model is 0.12 which is very low because of higher number of false negative predictions.

6) Revathi et al proposed a new approach for the detection of visual diseases of the plant. Digital images ofthe plant are made and pre-processed. The extraction methods, such as edge detection, color space and textural elements, are then performed. The features that are extracted are passed to the classifiers. This research aims to find the infected part in cotton leaf using image processing. Authors in proposed a method, where an input color image is color transformed. The green pixels in the image are hidden and eliminated by means of threshold value. The process of segmentation is performed next. The texture statistics is computed for all reliable segments. Next classifier is used to classify disease. The authors in paper have compared the classification methods used in image processing.

OBJECTIVES:

The Major objective of the mini project are:

1. To study and learn existing Machine learning methodologies
2. To study and learn about existing plant diseases.
3. To learn image processing and training techniques.
4. To provide much accurate results in detection of plant leaf disease.

METHODOLOGY:

In the initial step, the RGB images of all the leaf samples were picked up. The step-by-step procedure ofthe proposed system:

- RGB image acquisition;
- Convert the input image from RGB to HSI format;
- Masking the green-pixels;
- Removal of masked green pixels;
- Segment the components;
- Obtain useful segments;
- Evaluating feature parameters for classification;
- Configuring SVM for disease detection.

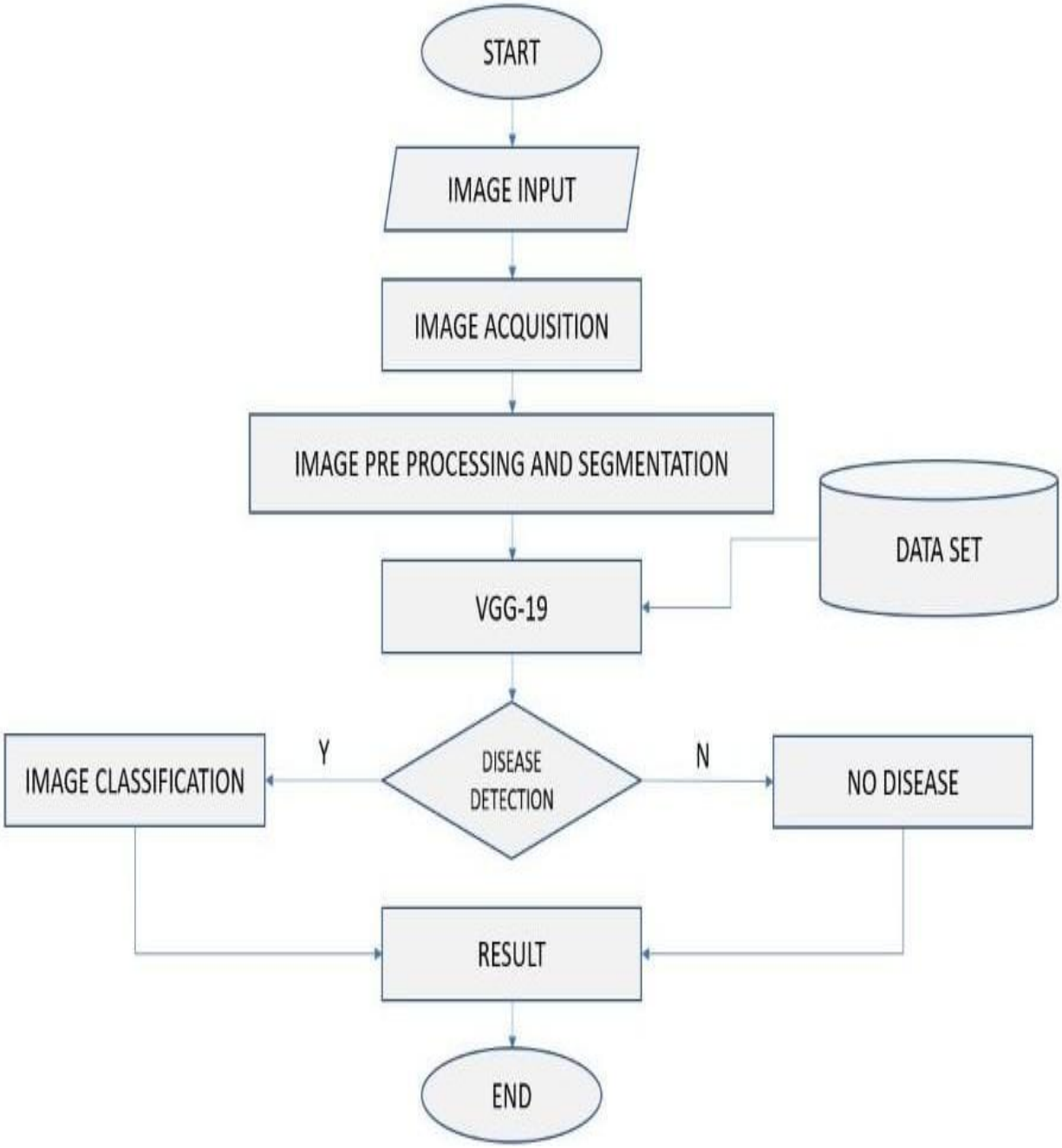
Colour Transformation: HSI (hue, saturation, intensity) colour model is a popular colour model because it is based on human perception. After transformation, only the H (hue) component of HSI colour space is taken into account since it provides us with the required information.

Masking Green Pixels: This is performed as green colour pixel represent the healthy region of a leaf.Green pixels are masked based on the specified threshold values.

Segmentation: The infected portion of the leaf is extracted by segmenting the diseased part with other similar coloured parts (say, a brown coloured branch of a leaf that may look like the disease) which have been considered in the masked-out image, are filtered here. All further image processing is done over a region of interest (ROI) defined at this stage.

Classification: From the previous results we analyze and evaluate the features like the area of the leaf, percentage(%) of the leaf infected, the perimeter of the leaf, etc., for all the leaf images, and pass it to theSVM classifier.

FLOW CHART


START
IMAGE INPUT
IMAGE ACQUISITION
IMAGE PRE PROCESSING AND SEGMENTATION
DATA SET
VGG-19
IMAGE CLASSIFICATION
Y
DISEASE DETECTION
N
NO DISEASE
RESULT
END

TOOLS:

Google Colab

LIBRARIES:

- Numpy
- Pandas
- Matplotlib
- keras

ADVANTAGES

1. The project would provide rational understanding of machine learning
2. The proposed system helps in detecting plant diseases in prior.
3. Its efficiency is more than 75% so the probability of detecting a wrong disease manually could be prevented.
4. It helps amateur farmers to detect disease easily.
5. It helps farmers in effective crop management and save them from losses.

APPLICATIONS

1. The major application of this proposed system is in the agricultural sector. The model can be directlyused in the farm lands by the farmers to detect the diseases.

2. It can be used in chemical laboratories to detect diseases and to find the preventive measures.

3. Research is a never ending process. So it is used in Research and Development for detection of variousnew diseases and to discover more about existing diseases.

FUTURE SCOPE

1. The model can be trained to give about 90% or more efficiency.
2. It can be extended to suggest pesticides to the diseases.
3. We can apply robotics to build a model by installing camera where the diseases can be detectedwithout the human interference on live field.

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