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PLANT DISEASE DETECTION IMPLEMENTATION USING TENSORFLOW

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ABSTRACT

In this paper we proposed to create a Convolutional Neural Network (CNN) model for detecting diseases on plant leaves. So, we'll talk about how we can address real-world challenges with current technologies like TensorFlow and Keras. We've opted to use TensorFlow to construct a neural network to detect various illnesses on plant leaves. As a result, we'll utilize Plant Village data. After that, we'll save the model as a ".h5" file and use it to identify illnesses on the leaves.

Keywords: Tensorflow, Convolutional Neural Network, Model Defining And Training, Hyper-Parameter, Train-Test Split, Plant Leaf Disease, Optimizer, Data Set.

I. INTRODUCTION

Every year, severe weather, viruses, and various agricultural diseases cause significant crop loss. Typically, farmers are unable to detect new illnesses on their crops and plants. Agriculture has traditionally been the lifeblood of developing countries. We need to harvest excellent quality and quantity from agriculture to make people in such a country economically well and powerful. Every year, severe weather, viruses, and various agricultural diseases cause significant crop loss. Typically, farmers are unable to detect new illnesses on their crops and plants. The plant does not receive any special care. Many farmers are unable to afford professional guidance owing to a lack of funds as well as other factors such as long-distance travel to obtain assistance and time-consuming processes. We have excellent technological tools to address all of these issues. To ensure quality yield we definitely need to use different techniques and available technologies. Time to time diagnosis is very important now days to maximize yield. We can take use of emerging technology such as. To solve the issue that normally occurs, artificial intelligence and machine learning are used. The rest of the paper is laid out as follows: Section III describes how a single neuron and a large neural network operate. Finally, in section we conclude this paper along with possible future directions to improve the model and features.

II. CAUSES FOR PLANT DISEASES

Plant diseases are caused by two types of causes: biotic factors and abiotic factors. Fungi, Bacteria, and Viral illnesses are caused by living components such as fungi, bacteria, and viruses.

Abiotic influences include illnesses induced by dietary inadequacies, low soil pH, inadequate lighting, and severe weather. The diseases caused by nutritional deficiencies, poor soil pH, poor light and extreme weather belongs to abiotic factors.

III. STEPS FOR PLAT DISEASE DETECTION

Image Acquisition:

In Image acquisition step, Images of plant leaves are captured in the Picture acquisition stage in order to execute actions on the image in the Image processing system. The photos can be taken with a digital camera or downloaded from a reputable plant image website. An image database is used to store the captured pictures and their attributes. A healthy collection of photos and a sick set of images make up the image database. The effectiveness of the images of plant leaves are acquired to perform some operations on image in Image processing system The photos can be taken with a digital camera or downloaded from a reputable plant image website. The captured pictures and their attributes are saved in an image database, which includes both healthy and sick images.

Image Pre-Processing

To make the picture suitable for further processing, pre-processing procedures are used. In the preprocessing phase of plant disease detection, the picture is scaled. Image enhancement, colour conversion, and noise reduction are all part of the pre-processing process.

Picture enhancement improves the quality of an image in order to improve its aesthetic appeal. The RGB picture is converted to a different colour space in colour space conversion. After performing the resizing, color space conversion and enhancement, Histogram equalization methods are used to designate intensities.

Image Segmentation

The picture is divided into multiple parts based on the similarity between various characteristics in Image Segmentation. Parts with similar characteristics are grouped together. With segmentation, it is simple to examine an image. Picture segmentation may be divided into two types: local segmentation, which considers only a the image, and global segmentation, which considers the entire image. Image Segmentation the image is segmented into various part based on the similarity between various features. The parts having same features are grouped together. Image can be analyzed easily with segmentation. Image segmentation can be Local segmentation in which a specific part of image is considered and Global segmentation in which the whole image is considered.

IV. LITERATURE SURVEY

During literature survey we found that that many people have explore this problem and have come up with one and other solutions that could identify diseases in better ways. But now many new tools and software has been introduced that are very efficient and accurate than existing tool and techniques. New frame work of Neural Network i.e., TensorFlow provide highly efficient calculations. Convolutional Neural Network are very efficient and powerful to determine underlying data in images and perform better for images. Hence, we decided to use CNN to determine Plant Disease.

Title	Author	Year	Advantages
Plant Disease Detection Using Leaf Pattern: A Review	Vishnu S, A. Ranjith Ram	2015	This study examines and discusses image processing approaches for identifying plant diseases. BPNN, SVM, K-means clustering, and SGDM are the most used approaches for detecting plant diseases.
Plant Disease Detection	Alka Dixit, Erande Rani, LokhandeYogita, Nighot Rutuja, Mr.Kote S.V.	2016	This paper reviews The use of ANN methods for classification of disease in plants such as self organizing feature map, back propagation algorithm, SVMs etc. can be efficiently used for plant disease detection
Crop disease detection Plant Disease Detection Using Different Algorithms	Trimi Neha Tete, Sushma Kamlu	2017	A number of segmentation approaches have been used to identify plant leaf disease. To produce grouping and classification of plant leaf diseases, researchers employed image thresholding, K-means clustering, and Neural Networks (NN).
Title	**Author**	**Year**	**Advantages**
Plant Disease Detection And its Solution using Image Classification	Saradhambal.G, Dhivya R, Latha.S, R.Rajesh	2018	This programme employs a novel concept to detect damaged crops and provide remedies to the agriculture sector. The k-mean clustering approach is used to segment and evaluate the sick area of the leaf.

Disease Detection in Plant Leaves using K-Means Clustering and Neural Network	P. Harini,L. V. Chandran	2019	The precise recognition and grouping of the plant infection are vital for the effective development of plants and this is possible by utilizing image processing
Identification and Recognition of Rice Diseases and Pests Using Convolutional Neural Networks	Chowdhury Rafeed Rahman, Preetom Saha Arko, Mohammed Eunus Ali, Mohammad Ashik Iqbal Khan, Sajid Hasan Apon, Farzana Nowrin, Abu Wasif	2019	With our memory stacked CNN design, we've also added two stages of training to achieve required accuracy. We did a thorough investigation into rice disease and pest identification, which included nine different types of rice illnesses, pests, and healthy plants. On each of the CNN architectures, we used a variety of training approaches.
Title	**Author**	**Year**	**Advantages**
Plant Disease Detection using Image Processing	Mr.V Suresh, D Gopinath, M Hemavarthini, K Jayanthan, Mohana Krishnan	2020	Thus, an application for identifying disease-affected plants and healthy plants has been developed, with the suggested work focusing on accuracy values in field circumstances, and this work is implemented using different plant disease pictures.
Plant Disease Detection by Imaging Sensors - Parallels and Specific Demands for Precision Agriculture and Plant Phenotypings	Anne-Katrin Mahlen	2019	This is a method for automatically detecting sick plants that is both accurate and efficient. The colour features extraction is carried out on samples of healthy and sick plant leaves.

V. PROPOSED SYSTEM

The processing scheme includes image acquisition via digital camera or the internet, image pre-processing, which includes image enhancement and image segmentation, in which the affected and useful areas are separated, and image post-processing, which includes image enhancement and image segmentation. As illustrated in Fig. 6, the key procedures for detecting plant leaf diseases are as follows: Image capture by digital camera or web, picture pre-processing, which includes image enhancement and image segmentation (where the impacted and usable areas are segmented), feature extraction, and classification are all part of the processing scheme. Finally, disease presence on the plant leaf will be determined.

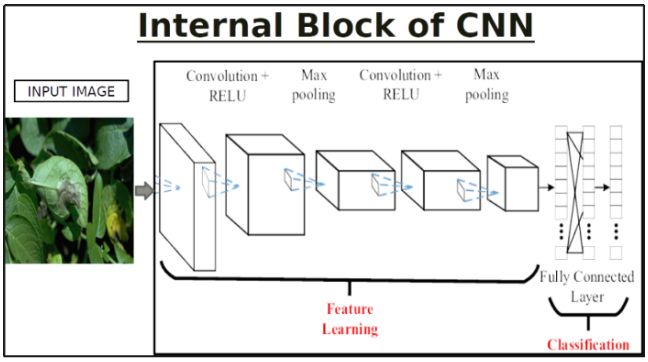
The step-by-step procedure as shown below:

1) Segment the components
2) Computing the texture features
3) RGB image acquisition
4) convert the input image into color space
5) obtain the useful segments
6) Configuring the neural networks for recognition

A. Image acquisition

To begin, photographs of various leaves were taken with a digital camera that had the required resolution for better quality. Obviously, the application has an impact on the construction of an image database. The enhanced

performance of the classifier is due to the picture database, which influences the system's durability.

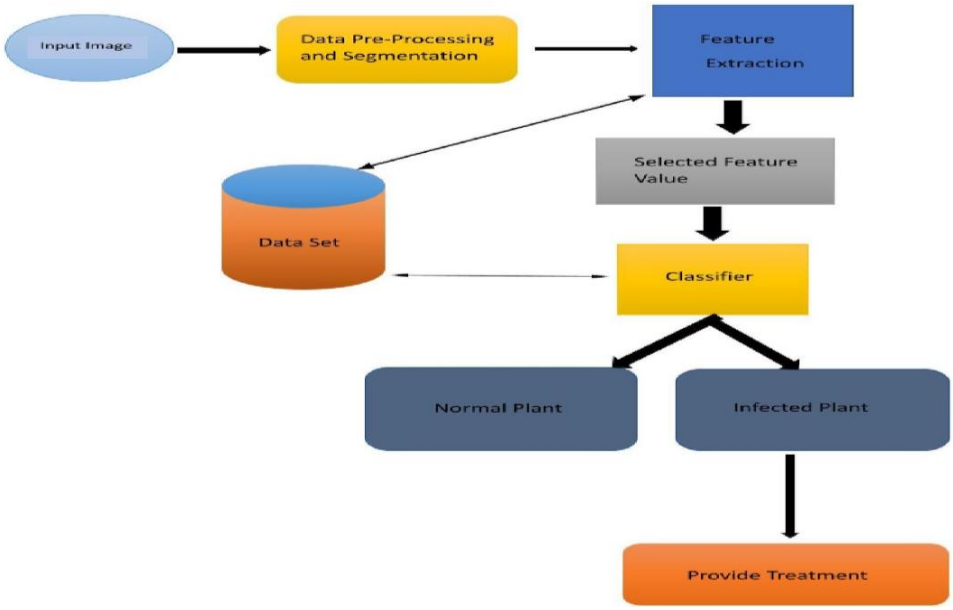


B. Image pre-processing

The second stage entails In the second step, this picture is pre-processed to enhance the image data by reducing noise. Color space conversion, picture enhancement, and image segmentation are all included. The RGB pictures of the leaves are first transformed to HSI colour space representation. The goal of the colour space is to make it easier to specify colours in a uniform, widely understood manner. HSI, intensity) Because it is based on human perception, the colour model is a common colour model (Gonzalez and Woods, 2008.

1) Edge-based: Data may also be segmented using edge detection techniques. Some of the techniques accessible include gradient, log, canny, sobel, laplacian, and robert. Using this method, the boundary is identified and segmented. To find image discontinuities, edge detection is employed. For classification, they use both fixed and adaptive support vector machine features. To identify t, edges are identified.

VI. STATE TRANSITION DIAGRAM



VII. VALIDATING AND TESTING

Definition of Train, validation and test datasets To reiterate the findings from researching the experts above, this section provides unambiguous definitions of the three terms.

- **Training Dataset**: this is the sample which data uses to fit for model.
- **Validation Dataset** When adjusting model hyper parameters, a sample of data is utilised to give an impartial evaluation of a model fit on the training dataset. As competence on the validation dataset is included into the model design, the evaluation becomes increasingly biassed..
- **Test Dataset :** An unbiased evaluation of a final model fit on the training dataset using a sample of data.

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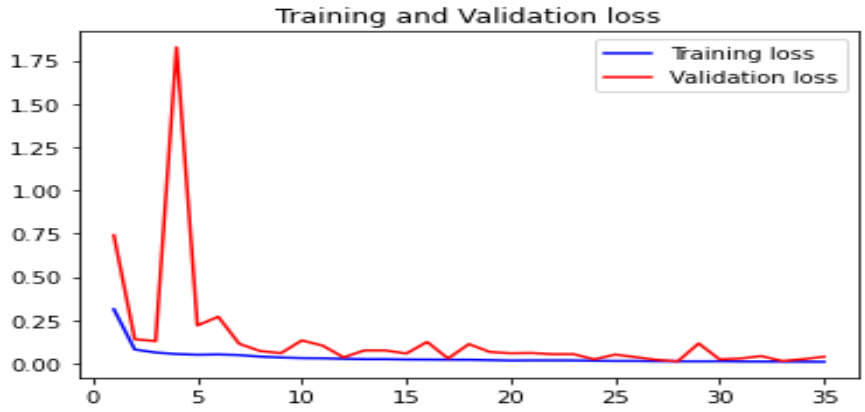
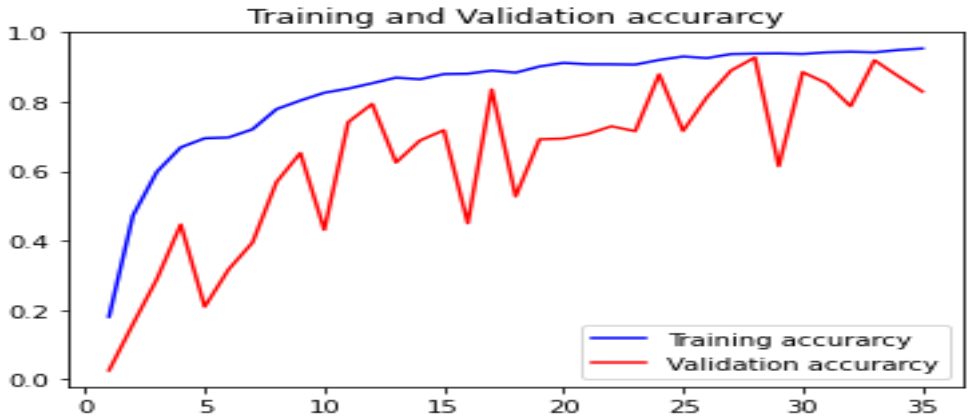


Model validation testing has a number of advantages. Initial Detection of Deficiencies and Errors- It is simple to discover deficiencies and errors using Model Validation testing before Model verification. Model Validation testing examines flaws so that they may be ignored, making it simple to decrease different sorts of expenses. Identifying Additional Deficiencies and Errors. Enhancing the Model's Quality – Enhancing the model's quality occurs when more flaws and mistakes have been discovered. Analysis of Model-Related Data and Information — The data is the model's backbone, and appropriate interpretation of the data and information may be accomplished with the aid of validating model testing.



VIII. APPLICATION

Diseases are changes in a plant's natural condition that affect or stop key activities including photosynthesis, transpiration, pollination, fertilisation, and germination. Pathogens, such as fungus, bacteria, and viruses, as well as unfavourable environmental factors, cause these illnesses. As a result, early stage identification of plant disease is critical Farmers are an alteration to a plant's natural condition that alters or stops critical activities such as photosynthesis, transpiration, pollination, fertilisation, and germi- nation, among others. Pathogens, such as fungus, bacteria, and viruses, as well as unfavourable environmental factors, cause these illnesses. A less expensive and more reliable approach for automatically detecting illnesses based on symptoms that develop on the plant leaf is critical. This enables image-based automated inspection, process control, and robot guiding using machine vision. The aim is to focus on detecting plant leaf disease based on the texture of the leaf.Leaf presents several advantages overflowers and fruits at all seasons worldwide

IX. CONCLUSION

Image processing methods for plant diseases are examined and discussed in this paper. The most often used methods for identifying plant illnesses include BPNN, SVM, K-means clustering, and SGDM. These techniques are used to inspect both healthy and ill plants' leaves. One of the issues with these techniques is the impact of background data on the final image . These procedures are used to examine the leaves of both healthy and sick plants. Some of the difficulties with these approaches include Background data and influence on the resultant image, technique optimization for a specific plant leaf disease, and technique automation enabling continuous automated monitoring of plant leaf diseases in real-world field settings According to the review, this disease

detection technology has a lot of potential and certain drawbacks, including the capacity to identify plant leaf illnesses. As a result, there is room for improvement in the current research. It is of considerable practical importance to develop a cost-effective and reliable system for automatically detecting illnesses based on symptoms that emerge on the plant leaf. This enables image-based automated inspection, Machine vision is used for process control and robot guidance. The objective of this research is to determine whether or not plant leaf illness can be detected based on the texture of the leaf. The leaf offers several advantages over flowers and fruits at all times of the year.

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