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Development of Tomato Leaf Disease Prediction System to the Farmers by using Artificial Intelligent Network

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Abstract: When plants and crops are affected by pests, it affects the agricultural production of the country. Usually, farmers or experts observe the plants with naked eye for detection and identification of disease. But this method can be time processing, expensive and inaccurate. Automatic detection using image processing techniques provide fast and accurate results. This project is concerned with a new approach to the development of Tomato Leaf Disease recognition model, based on leaf image classification, by the use of deep convolution networks. 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. Novel way of training and the methodology used facilitate a quick and easy system implementation in practice. All essential steps required for implementing this disease recognition model are fully described throughout the paper, starting from gathering images in order to create a database, assessed by agricultural experts, a deep learning framework to perform the deep CNN training. This method project is a new approach in detecting Tomato Leaf-Disease using the deep convolution neural network trained and fine-tuned to fit accurately to the database of a plant's leaves that was gathered independently for diverse plant diseases. The advance and novelty of the developed model lie in its simplicity; healthy leaves and background images are in line with other classes, enabling the mode l to distinguish between diseased leaves and healthy ones or from the environment by using deep CNN.

I.INTRODUCTION

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. In order to achieve accurate plant disease diagnostics a plant pathologist should possess good observation skills so that one can identify characteristic symptoms. 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. Exploiting common digital image processing techniques such as color analysis and thresholding. Were used with the aim of detection and classification of plant diseases. In machine learning and cognitive science, ANN is an information-

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processing paradigm that was inspired by the way biological nervous systems, such as the brain, process information. Neural networks or connectionist systems are a computational approach used in computer science and other research disciplines, which is based on a large collection of neural units (artificial neurons), loosely mimicking the way a biological brain solves problems with large clusters of biological neurons connected by axons. Each neural unit is connected with many others, and links can be enforcing or inhibitory in their effect on the activation state of connected neural units. Each individual neural unit may have a summation function which combines the values of all its inputs together. There may be a threshold function or limiting function on each connection and on the unit itself, such that the signal must surpass the limit before propagating to other neurons. These systems are self-learning and trained, rather than explicitly programmed, and excel in areas where the solution or feature detection is difficult to express in a traditional computer program. Neural networks typically consist of multiple layers or a cube design, and the signal path traverses from front to back. Back propagation is the use of forward stimulation to reset weights on the "front" neural units and this is sometimes done in combination with training where the correct result is known. More modern networks are a bit freer flowing in terms of stimulation and inhibition with connections interacting in a much more chaotic and complex fashion. Dynamic neural networks are the most advanced, in that they dynamically can, based on rules, form new connections and even new neural units while disabling others. The goal of the neural network is to solve problems in the same way that the human brain would, although several neural networks are more abstract. Modern neural network projects typically work with a few thousand to a few million neural units and millions of connections, which are still several orders of magnitude less complex than the human brain and closer to the computing power of a worm. New brain research often stimulates new patterns in neural networks. One new approach is using connections which span much further and link processing layers rather than always being localized to adjacent neurons. Other research being explored with the different types of signals over time that axons propagate, such as Deep Learning, interpolates greater complexity than a set of Boolean variables being simply on or off. Their inputs can also take on any value between 0 and 1. Also, the neuron has weights for each input and an overall bias. The weights are real numbers expressing importance of the respective inputs to the output. The bias is used for controlling how easy the neuron is getting to output 1. For a neuron with really big bias, it is easy to output 1, but when the bias is very negative then it is difficult to output.

II. REVIEW OF LITERATURE

In this section describes various approaches for detecting the disease in plant leaf using image processing technique Author: Sachin D. Khirade & et al Description: Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. It requires tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time. Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. This paper discussed the methods used for the detection of plant diseases using their leaves images. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. The

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accurately detection and classification of the plant disease is very important for the successful cultivation of crop and this can be done using image processing. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. 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. From these methods, we can accurately identify and classify various plant diseases using image processing technique. Author: Prof. Sanjay, B. Dhaygude& et al Description: The application of texture statistics for detecting the plant leaf disease has been explained Firstly by color transformation structure RGB is converted into HSV space because HSV is a good color descriptor. Masking and removing of green pixels with pre-computed threshold level. Then in the next step segmentation is performed using 32X32 patch size and obtained useful segments. These segments are used for texture analysis by color co-occurrence matrix, finally if texture parameters are compared to texture parameters of normal leaf. Author: Amandeep Singh, Maninder Lal Singh& et al Description: The most significant challenge faced during the work was capturing the quality images with maximum detail of the leaf color. It is very typical task to get the image with all the details within a processible memory. Such images are formed a through high resolution and thus are of 6-10MB of size. This was handled by using a Nikon made D5200 camera which served the task very well. Second challenge faced was to get rid of illumination conditions as from the start to the end of paddy crop season, illumination varies a lot even when the image acquiring time is fixed. However, the solution to this is variable user defined thresholding and making necessary adjustments to the shades of LCC. Author: M. Malathi, K.Aruli& et al. Description: They provides survey on plant leaf disease detection using image processing techniques. Disease in crops causes significant reduction in quantity and quality of the agricultural product. Identification of symptoms of disease by naked eye is difficult for farmer. Crop protection especially in large farms is done by using computerized image processing technique that can detect diseased leaf using color information of leaves. Depending on the applications, many image processing technique has been introduced to solve the problems by pattern recognition and some automatic classification tools. In the next section present a survey of those proposed systems in meaningful way.There are many methods in automated or computer vision for disease detection and classification but still there is lack in this research topic. All the disease cannot be identified using single method. Author: Malvika Ranjan, Manasi Rajiv Weginwar& et al Description: Describes a diagnosis process that is mostly visual and requires precise judgment and also scientific methods. Image of diseased leaf is capture.As the result of segmentation Color HSV features are extracted. Artificial neural network (ANN) is then trained to distinguish the healthy and diseased samples. ANN classification performance is 80% better in accuracy. Author: Y.Sanjana, AshwathSivasamy& et al Description: In this it describes the uploaded pictures captured by the mobile phones are processed in the remote server and presented to an expert group for their opinion. Computer vision techniques are used for detection of affected spots from the image and their classification. A simple color difference-based approach is followed for segmentation of the disease affected lesions. The system allows the expert to evaluate the analysis results and provide feedbacks to the famers through a notification to their mobile phones. The goal of this research is to develop an

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image recognition system that can recognize crop diseases, image processing starts with the digitized color image of disease leaf. A method of mathematics morphology is used to segment these images. Then texture, shape and color features of color image of disease spot on leaf were extracted, and a classification method of membership function was used to discriminate between the three types of diseases.

III. IMPLEMENTATION

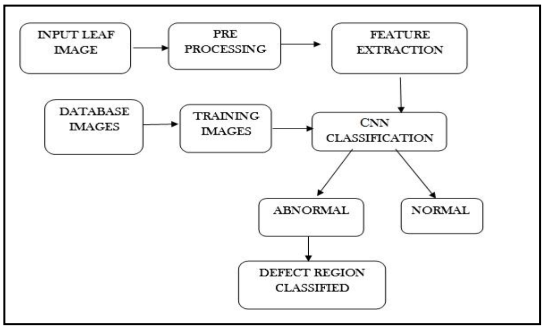

FIG-3: System Architecture

Methodology

Image dataset acquisition:

Dataset can be captured manually using various digital camera, enhance and segment it if required and save it in separate folders distinguishing the different diseased images and healthy images for different plant leaves. Images stored can be either color, grayscale or segmented images. Dataset can also be downloaded from open-source websites. Usually, datasets used in deep learning architectures for pretraining are ImageNet for object classification; Plant Village for image classification and Malaya knew dataset for plant identification

Preprocessing of Images:

Preprocessing includes reduction in size and cropping the image to a specified size and region of interest respectively. It also enhances the image to the required color scale and is processed. Input resolution of each architecture and the size of the model by calculating the number of parameters in each layer based on summation of the product of weights and biases in each layer. Similarly in the proposed CNN architecture the size of the input image is 64x64 and the size of the model is 45K. A segmented and gray scale version of the image doesn't give high performance when compared to the RGB images processing. Therefore, the proposed work takes color images and is resized to 64x64 resolutions for further processing.

Feature Extraction:

The convolution layers extract features from the resized images. When compared to general crafted feature extractors like SIFT, Gabor filter, etc., CNN learns the weights and biases of different feature maps to a specific feature extractor. The Rectified non-linear activation function (ReLu) is applied after convolution. This introduces the non-linearity to CNN. The pooling layer reduces the dimensionality of the extracted features. Different types of pooling are max pooling and average pooling. Hence convolution and pooling together act as a filter to generate features. To extract features mainly it requires convolution and pooling.

Classification:

Fully connected layers act as classifiers, where each neuron provides a full connection to all the learned feature maps obtained from the previous layer. This can be implemented using a flattening which converts all the pooled images into a continuous single dimensional vector using the following statement, classifier. Add (Flatter ()).

IV.RESULT

Open project folder then clicks on run, run the software it opens the command prompt it runs then it executes code internally and at last gives the URL copy that URL and paste it in the chrome tab.

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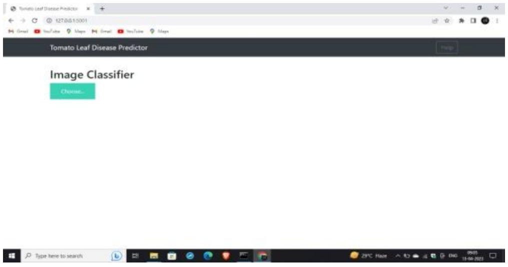

Fig-3.3: Choose any leaf image from dataset

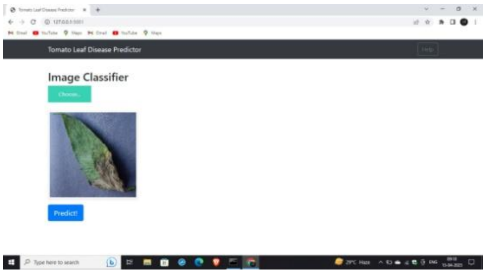

Fig-7.4: Upload Image

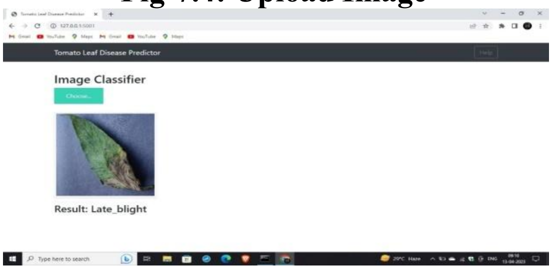

Fig-7.5: Predicted the type of disease

V.CONCLUSION

In our system specialized deep learning models were developed, based on specific convolution neural networks architectures, for the detection of plant diseases through leaves images of healthy or diseased plants. Our detector applied images captured in-place by various camera devices and also collected from various resources. Our experimental results and comparisons between various deep-architectures with feature extractors demonstrated how our deep-learning-based detector is able to successfully recognize different categories of diseases in various plants and also give solution for concern diseases. Pests/diseases are generally not a significant problem in systems, since healthy plants living in good soil with balanced nutrition are better able to resist pest/disease attack. We hope our proposed system will make a suggestive contribution to the agriculture research. Agriculture is mostly compensating the economic development of the nation. It is considered as the vital part of society. Thus, the main aim of proposed work is to decrease the use of pesticides to decrease cultivation cost and save our environment. By using data miningconcepts with image processing it will be simple to recognize whether crop is infected or not, which type of diseases, what can be the solution for the same. it has various methods for the Identification and classification of plant leaf diseases like pattern recognition method, back propagation, neural network, support vector machine etc. The proposed work also discusses the basic concept of plant leaf disease detection and various leaf diseases symptoms. As per our survey paper we started our research on every crop and every part of it but soon we realized that it is not possible for us right now in this period of span as we were in our learning and practicing stage .So specifically we shifted our goal with our very own country's staple crop 'tomato' and started to figure out all the diseases and causes of it that can be predicted from the changes developed in the leaves of the tomato plant

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