Detection & Prevention of Plant Disease Detection using Deep Learning

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Abstract:- **Plant Disease is necessary for every farmer so we are created Plant disease detection using Deep learning. We are using deep learning for this task because here we are working with image data. Deep learning has a Convolution neural network that is used to find features from the leaf of the plant. The CNN Code build in Pytorch Framework. For Training we are using Plant village dataset. In India,an estimated 15-20 percent of potential crop production annually is lost due pest,weeds and diseases. The Project presents plant leaf disease detection, effect of disease on plant yield and what pesticides should be used for its cure. In agriculture, research of automatic plant disease is essential one in monitoring large fields of plants, and thus automatically detects symptoms of disease as soon as they appear on plant leaves. Our research aims to solve the problem of detecting and preventing diseases of agricultural crops. When plants are affected by heterogeneous diseases through their leaves that will effects on production of agriculture and profitable loss. Also reduction in both quality and amount of agricultural production. Leaves are important for fast growing of plant and to increase production of crops. Identifying diseases in plants leave is challenging for farmers also for researchers. Currently farmers are spraying pesticides to the plants but it effects human directly or indirectly by health or also economically. To detect these plant diseases many fast techniques need to adopt. This Project uses CNN, RELU, And Batch Gradient Descent Algorithm to analyze the leaf find its deseases and to provide a solution to the farmers to prevent it form it.**

Keywords — CNN, Pytorch, Relu

I. INTRODUCTION

India is agriculture country where in more than 60% population depends on agriculture.Common methods for the diagnosis and detection of plant diseases include visual plant disease estimation by human raters,but Without proper identification, disease control efforts can be a waste of time and money if an incorrect approach is taken. Early and accurate detection and diagnosis of plant diseases are key factors in plant production and the reduction of both qualitative and quantitative losses in crop yield. It's terribly troublesome to observe the plant diseases manually. It needs tremendous quantity of labor, expertize within the plant diseases, and conjointly need the excessive time interval. Hence, Deep Learning (Convolutional Neural Network model) with PyTorch can be employed for the detection of plant diseases[1].

Deep-learning-based techniques, particularly CNNs, are the most promising approach for automatically learning decisive and discriminative features. Deep learning (DL) consists of different convolutional layers that represent learning features from the data. In this project, we have described the technique for the detection of plant diseases with the help of their leaves pictures[2].

It's identify the most common diseases seen in Plant Leaf. Tomato, potato, and pepper are the three types of plants employed in this research. This system can detect 15 different forms of illnesses in these three plants.

The user can upload a leaf image, and if the leaf has a disease, the name of the disease, as well as the prescribed pesticides, will be presented on the user's screen after pressing the predict button. If there is no disease in the plant leaf after uploading the image, a message reading "There is no disease on the Plant" will be displayed.

The system also displays the proportion of impacted areas and recommends pesticides based on that percentage.

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II. Literature Survey

The implementation of proper techniques to identify healthy and diseased leaves helps in controlling crop loss and increasing productivity. This section comprises different existing machine-learning techniques for the identification of plant diseases. 2.0.1 Shape- and Texture-Based Identification

In, the authors identified diseases using tomato-leaf images. They used different geometric and histogrambased features from segmented diseased portions and applied an SVM classifier with different kernels for classification. S.Kaur et al.identified three different soybean diseases using different color and texture features.

In P Babu et al.used a feed-forward neural network and backpropagation to identify plant leaves and their diseases. S. S. Chouhan et al. used a bacterial-foragingoptimization - based radial-basisfunction neural network (BRBFNN) for the identification of leaves and fungal diseases in plants. In their approaches, they used a region-growing algorithm to extract features from a leaf on the basis of seed points having similar attributes.

The bacterial-foraging optimization technique is used to speed up a network and improve classification accuracy. 2.0.2 Plant Leaf Disease Detection Using Machine Learning.

In paper [1], In 2018 in the International Journal of Science and Engineering Applications Mr.Ko Ko Zaw, Dr. Zin Ma Ma Myo,Mr. Daw Thae Hsu Thoung proposed Image processing is the only way to build the simple, robust and accurate disease detection system While working with image processing. Detailed studies should be performed on the types of diseases, their symptoms, and the patterns of disease. The system will be designed based on the patterns of disease. The mainly occurring diseases on leaves are Bacterial disease, Fungal disease, Viral disease and diseases due to insects. These diseases are detailed in the paper 2.0.3 Plant diseases and pests detection based on deep learning.

In paper [5], In 2021 in BMC(Biomedcentral) Jun

Liu and Xuewei Wang proposed plant disease and pest detection using SVM algorithm. SVM is used for recognizing image samples. The accuracy of implementation is about 92with a sufficient and stable dataset used for the project.

III. Methodology & System Architecture

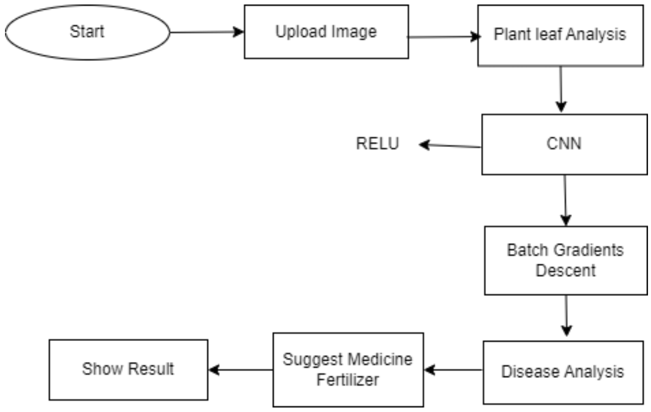

Fig 1: Proposed System

The first step is the farmer will upload the image

of the leaf on the website. After uploading the image, farmers can click on the predict button and wait for the result. For this CNN algorithm , the keras module is used to train the model and the Plant Village dataset is used for model training and validation of the entire system.

Now there are two possibilities after uploading the image: either the plant leaf will be infected or the plant leaf won't be Infected. If the leaf is found to be infected the image of the leaf will be displayed on screen along with the name of the disease in English and Hindi language.

Also the proposed system is capable of calculating the percentage area Infected and displaying it on the screen and also suggesting the pesticides on the basis of the area Infected. The name of the pesticide, image of the pesticide is displayed along with the quantity and all of the information is displayed in two languages English and Hindi for better understanding of farmers as many of the farmers won't be able to understand name of disease in English but the farmers would be familiar with regional hindi names of the disease that is present on plant leaf.

Alternatively, if the leaf is not infected, the image

along with the message "There is no disease in the leaf of the plant" is displayed. This dataset consists of 39 different classes of different healthy- and diseased-leaf images of 14 different species. We used six different augmentation techniques for increasing the data-set size. The techniques are image flipping, Gamma correction, noise injection, PCA color augmentation, rotation, and Scaling. Afeter split the data into train , test and validation data. Total 36584 for train , 15679 for validaiton and remaining images for testing.

IV. Findings & Suggestions

The early detection and identification of plant diseases using deep-learning techniques has recently made

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tremendous progress. Identification using traditional approaches heavily depends on some factors such as image enhancement, the segmentation of disease regions, and feature extraction. Our approach is based on the identification of diseases using a deep-learning-based Convolutional neural network approach. First we Resize every image into 224 x 224. After that this image feed into the Convolutional Neural Network. We feed color image so it has 3 channels RGB. First conv layer we apply 32 filter size or output channels. That means 32 different filters apply to the images and try to find features and after that using 32 features, we create a features map that has channels 32. So from 3 x 224 x 224 it will become 32 x 222 x 222. After that we are applying ReLU activation function to remove non linearity and after that we are applying Batch Normalization to normalize the weights of the neuron. After that this image we feed to the max pool layer which takes only the most relevant features only so that why we get the output image in shape 32 x 112 x 112. After that, we feed this image to the next convolutional layer and its process is the same as mentioned above.

At last, we flatten the final max pool layer output and feed to the next linear layer which is also called a fully connected layer, and finally, as a final layer, we predict 39 categories. So as a model output we get tensor 1x39 size. And from that tensor, we take an index of the maximum value in the tensor. That particular index is our main prediction.

V. CONCLUSION

In our work, we used Deep Learning (CNN) model with PyTorch for the detection of plant diseases using healthy- and diseased-leaf images of plants.

There are many developed methods in the detection and classification of plant diseases using diseased leaves of plants. However, there is still no efficient and effective commercial solution that can be used to identify the diseases. To train and test the model, we used the standard Plant Village dataset with 39 different classes of images, which were all captured in laboratory conditions.

This dataset consists of 39 different classes of different healthy- and diseased-leaf images of 14 different species. We used six different augmentation techniques for increasing the data-set size. We found that if we upload the exact same image then the project will work at the best of its efficiency and provide great solutions. But if some blur images are uploaded then AI is not able to analyze the images properly and can't provide the best solutions.

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