Detection Of Diseases In Crop Using Predictive Analysis

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Abstract *— Disease detection and recognition on crop through image processing will help farmers for managing field in time. Agricultural productivity is something on which economy highly depends. This is the one of the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected. In the agriculture environment, the detection and classification of the plant disease system plays very important role.*

Keywords *— Crop leaf diseases, Disease detection, Classification, Image processing, Feature Extraction,Convolution Neural Network(CNN)*

I. INTRODUCTION

Agriculture is one of the most important industry in India. Indian economy is highly dependent on agricultural activity. Most of the people depend on agriculture for their livelihood. In crops, leaves are one of the important part because they are the primary source of photosynthesis, which is how plants feed themselves. Detection of crop disease is quite tough for farmers . The only method of detection used by farmers is through their naked eyes Identifying the type of crop leaf disease is difficult and challenging. So use of automatic crop disease detection is beneficial. Detection of crop disease in early stage is very necessary, because loss of crop can lead to loss of income as well as starvation. Detection and classification of plant leaf diseases have a wide applications in various areas such as agricultural , biological research etc. Hence there is a need to build a system which is cheap, handy and easy to use so that detection becomes easier for the farmers . Using image processing techniques we can define images over two dimension (feasibly more) by which we can have more precise image pattern in detecting leaf disease of crop.

The crop disease depends upon three things they are:

- Environment
- Pathogens
- Host

If environment is favourable for pathogens the host is prone to the disease. If environment is not favourable for the pathogens then the host are safe.

Table-1 - Types of Diseases on Tomato

Sr.No.	Diseases on Tomato Plant	Symptoms
1	Mosaic Virus	Plant viruses can be difficult to detect as symptoms look similar to many nutrient deficiencies and vary depending on the age of the plant when infection occurs. Look for: Wrinkled, curled or small leaves
2	Leaf Spot	Infected plants have brown or black water-soaked spots on the foliage, sometimes with a yellow halo, usually uniform in size. The spots enlarge and will run together under wet conditions. Under dry conditions the spots have a speckled appearance. As spots become more numerous, entire leaves may yellow, wither and drop
3	Early Blight	Common on tomato and potato plants, early blight is caused by the fungus *Alternaria solani* and occurs throughout the United States. Symptoms first appear on the lower, older leaves as small brown spots with concentric rings that form a “bull’s eye” pattern.

II. SYSTEM ARCHITECTURE

i] Input Image: The user(farmer) will give image as an input to check its features.

ii] Feature Extraction: In this the features of leaves are checked based upon green pixels so that how many healthy and infected
areas are there. This is also done with the present data in dataset.

iii] Matching Content: In this the contents like features, pixels are compared from the user's image feature and leaf image's features present in dataset.

iv]Display Disease and Solution: Depending upon the output from matching content the system will display whether the crop is healthy or infected. If it is infected then it will provide suitable fertilizers so as to prevent further damage to the crop.

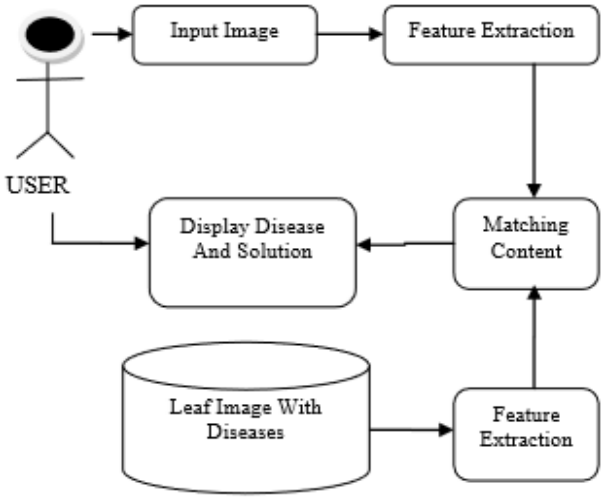

Fig -1: Architecture

III. IMPLEMENTATON

CNN- Convolution Neural Network

CNN has many layers like convolution layer, pooling layer and fully connected layers. Lets see each layer in details as following:

• CONV layer (convolution layer): Convolutional layers apply a convolution operation to the input, passing the result to the next layer. The convolution emulates the response of an individual neuron to visual stimuli. Each convolutional neuron processes data only for its receptive field.

• Pooling (Max Pooling): Convolutional networks may include local or global pooling layers which combine the outputs of neuron clusters at one layer into a single neuron in the next layer. For example, max pooling uses the maximum value from each of a cluster of neurons at the prior layer.

• ReLU(Rectified Linear Unit): It increases the nonlinear properties of the decision function and of the overall network without affecting the receptive fields of the convolution layer. This layer applies the non-saturating activation function as:

{f(x)= max(0,x)}

• Fully Connected Layer: Fully connected layers connect every neuron in one layer to every neuron in another layer.

• Weights: CNNs share weights in convolutional layers, which mean that the same filter(weights bank) is used for each receptive field in the layer; this reduces memory footprint and improves performance

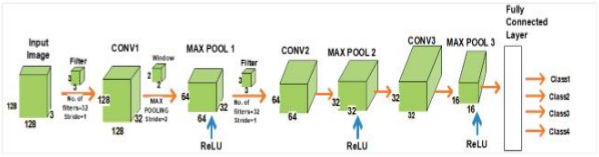

Fig-2: CNN Architecture

Input: : Image, Label .
Output: train model
1. Get input image with label
2. Repeat for number of convolution layer
(a) CONV Layer : take filter size and no. of filters
i. Generate weights and bias
ii. Do matrix multiplication of input with filter
(b) Max pooling and input= CONV layer
i. Get max value from window and generate new output matrix
(c) Apply ReLU on input= MAX POOL layer
3. Flatten layer input = last layer
4. Generate fully connected layer
5. Get label for that image

Testing Phase: Input: Image, train model
Output: Label
1. Get input image from user
2. Get train model

3. Compare FC layer of input with train model
4. Get output label with preventions

IV. RESULT ANALYSIS

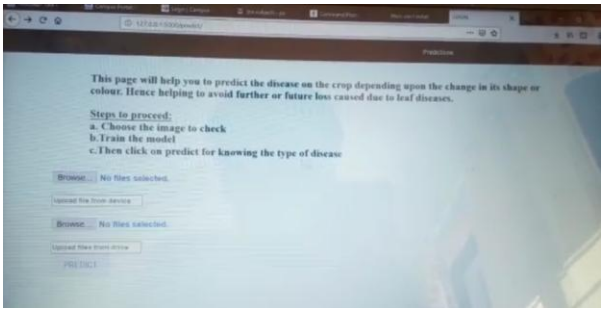

Fig-3: Prediction Page

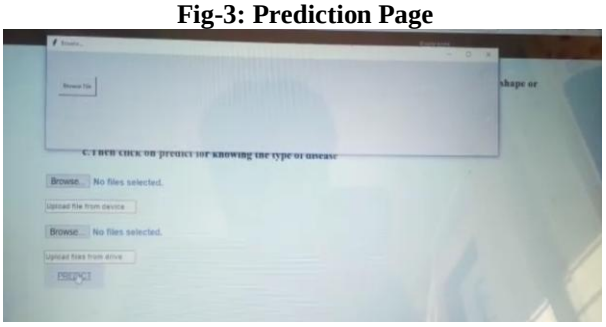

Fig-4: Browse Page

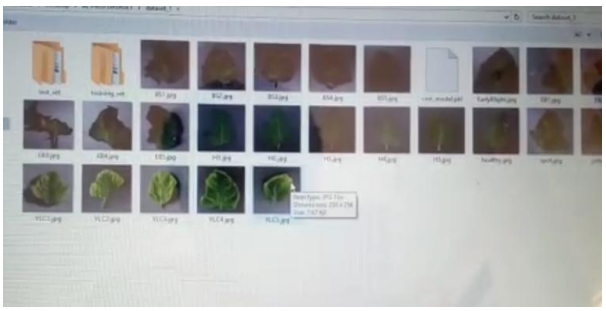

Fig-5:Dataset Page

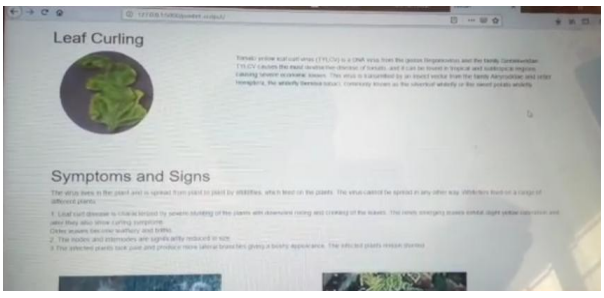

Fig-6: Disease Page

The user will login to home page. Afterwards the user will move to prediction page[Fig3]. Go to browse page[Fig4] so that image to be detected can be choosen. From dataset[Fig5] choose the image.The disease detected will redirect the user to its respective disease page[Fig6].

V. CONCLUSION AND FUTURE SCOPE

Though there is a progress in technology, there are no economically viable technologies available which would help the farmers to detect the crop diseases at early stage and hence avoid loss of crops.

This technology would help the farmers to detect the disease and get immediate solutions for it at a very affordable price.

The technology would help in increasing productivity, enhance resilience and improve crop varieties for higher yields

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