Detection & Recognition of Disease in Leaf using Deep Learning

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Under the Guidance of-

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Abstract: Diseases in the leaves of plants are very crucial issue in this day and due to which yield of high-quality crops gets devasted, and the longevity of the plant hampers. And also, it is very difficult to understand the current condition of the leaf with the naked eye. Which results in the reduction of yield of high-quality crops. To overcome this problem, we planned to use machine learning based approach to segment, to select every small part of the leaf and detect the disease, also to analyse the quality of the plant. The main vision of the research is to detect all possible diseases of the leaves of the plant by applying *Region Convolutional Neural Network(R-CNN)* to pre-process the image based on the colour changes in comparison to the analytical available data set, providing the best fit output.

Index Terms- Plant Leaf, Image Segmentation, Regional Convolutional Neural Network, Image processing, Extraction.

I. INTRODUCTION

Deep learning has made a significant progress in the wide domain of machine learning for the real-time applications such as image classification, object recognition, object detection, speech recognition, language translation, etc. Many deep learning methods empowered in many life crucial applications, raising great concerns in the field of safety and securities.

Detection and recognition of the disease in leaf identifies a particular disease in a plant using image processing. To perform image processing, R-CNN (Regional Convolutional Neural Network) method is used.

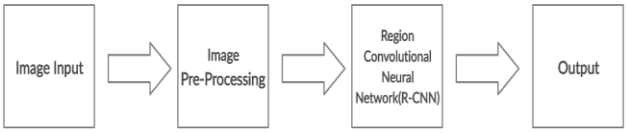


Fig. 1. Block diagram of proposed methodology

The Image processing goes through the following steps:

Image is taken in such a way that there will not be any distortion like direct sunlight.

A. ***Input Image:*** The image will be inputted by storing the path of the image data set into a variable and load folder containing images into arrays.

B. ***Image Pre-processing:*** In image pre-processing, the image will be resized first because some of the images are captured in different cameras and resizing the image will set a base size of all images fed into this process. After resizing unwanted noise must be removed using gaussian blur. Then the image will be segmented and separated from the background by performing image thresholding, which will also remove further background noises.

C. ***Feature extraction:*** Feature extraction is a method of extracting some of the essential features of the defective leaf used. This

approach is achieved by converting the observed vector subset into the observer vector. The observation is processed in such a way that valuable information can be preserved for further processing.

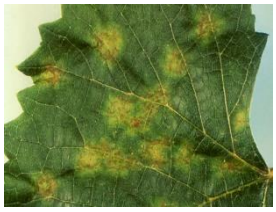
II. Problem Statement

- Detection of Unhealthy leaves on a particular plant.
- Using R-CNN will help to do the scan on entire plant.

Potato Blight

Rust Fungus

Powdery Mildew



Downy Mildew

Potato Blight-

Leaf spots are normally rather unmistakable spots of differing sizes, shapes and hues. There is almost constantly a particular edge. Once in a while the spot, which might be brought about by microscopic organisms or parasites, is encompassed by a yellow radiance. Whenever brought about by an organism, there is almost consistently parasite development of some kind in the spot, especially in clammy climate. This parasite development might be minor pimple-like structures, frequently dark in shading, or a rotten development of spores. It is regularly important to utilize a hand focal point or a magnifying instrument to see these structures. On the off chance that the spots are various or near one another, unhealthy zones may combine to frame sporadic territories called "blotches."

Rust Fungus-

Leaf scourges are commonly bigger unhealthy territories than leaf spots and all the more sporadically molded. Once in a while the "cursing" appearance of leaves is the aftereffect of the mixture of various little spots.

Powdery Mildew-

Powdery Mildew is a shallow, white to light greyish, fine to coarse development on leaves, however may likewise happen on stems and blossoms. Influenced leaves as a rule turn yellow, shrivel and kick the bucket quickly.

Downy Mildew-

Downy Mildew (fleece mold) are light yellow green to yellow territories on the upper leaf surface; light grey to purplish rotten development on the under surface of the leaf. Twisted plant development ("insane top") may result from fleece mold as on account of sorghum downy mildew of corn or grain sorghum.

III. Literature Survey

In reference [1] and [2], CNN has been used, where detection is done on a single leaf. CNN is unable to detect diseases in all the leaves. [1] has used cotton leaves for their test and [2] has used tomato leaves for their test. In reference [3], K-mean Clustering used and they also use neural network for detecting disease of cotton plant leaf.

Our method is a detection & recognition-based approach. We use R-CNN to distinguish the disease of the plant leaf. The high classification capability of the R-CNN model guarantees detection & recognition performance.

Advantages:

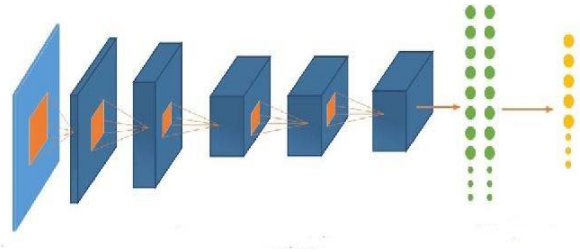
- High Accuracy
- Low Complexity

Can be implemented in:

- Green House Management Firms
- Plant Nurseries

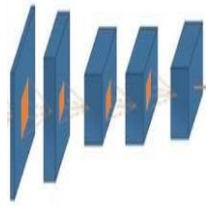
- Bio-Farming

Proposed System (R-CNN)



Index-

→ ***Input Image***



→ ***Convolutional Layers + ReLu + pooling***

→ ***Fully Connected Layers***

→ ***Outputs***

IV. Module Description

The image will be fed to the system, and then it will be pre-processed by using Python, and after pre-processing, the image will be segmented into small parts and start checking with data sets and finally gives the output with the help of **R-CNN *(Regional Convolutional Neural Network*).**

In ***convolutional layer***, we have three features, we multiply the pixel value of image with corresponding to pixel value of filter given and then divide by the total no of pixel to get the output.

In ***ReLu layer***, we remove every negative value from the filtered images and replaces it with zero. This is done to avoid the values for summing up top zero. The ***ReLu*** transform function possibly initiates a node if the information is over a specific amount, while the information is underneath zero, the yielded answer is zero, yet when the information transcends as certain edge Linear association with the dependent variable.

In ***pooling***, it shrinks the image stack in a smaller size.

The fully connected layer is the final layer where the actual classifications happen. Here we take our filtered and shrink image and put them in, a single list.

The **output** we expect here is disease will be detected after comparison of data set and the original data.

V. References

[1] Detection of Disease in Cotton Leaf using Artificial Neural Network Nikhil Shah, Sarika Jain, Amity Institute of Information Technology, Amity University Uttar Pradesh nsnikhilshah@gmail.com, ashusarika@gmail.com

[2] Plant Leaf Disease Detection and Classification based on CNN with LVQ Algorithm Melike Sardogan *Institute of Science and Engineering Yalova University* Yalova,Turkey melikesardogan@gmail.com Adem Tuncer *Department of Computer Engineering* Yalova University Yalova,Turkey adem.tuncer@yalova.edu.tr Yunus Ozen Department of Computer Engineering Yalova University Yalova,Turkey yunus.ozen@yalova.edu.tr

[3] **Detection of Diseases on Cotton Leaves Using K-Mean Clustering Method Pawan P. Warne1, Dr. S. R. Ganorkar2** *Student, Department of E&TC, SCOE, Pune, Maharashtra, India, Professor, Department of E&TC, SCOE, Pune, Maharashtra, India, srganorkar*