ISSN 2395-1621

Implementation on Machine Learning for Plant Leaf Disease Detection and Classification

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ABSTRACT

It is not always possible for the farmers to predict the situation that can arise and their prediction can fail. The main reason is the plant disease. So to assist the farmers in safeguarding the plants from diseases becomes the motivation. The majority of the researchers have identified that leaf images play a crucial role in the automatic detection of plant diseases. Currently, various advancement techniques are used in automatic disease detection of plants such as Machine Learning, Deep Learning, Computer Vision, Internet of Things (IoT), Expert Systems. The purpose of this system is to detection leaf disease using the machine learning technique based on Healthy and Unhealthy Image Dataset for processing the plant leaf image to detect diseases.

Keywords: Machine Learning, Leaf Dieses Detection, Languages and compilers, Optimization, Image Processing

ARTICLE INFO

Article History

Received: 1st July 2021

Received in revised form : 1st July 2021

Accepted: 4th July 2021

Published online :

4th July 2021

I. INTRODUCTION

The plant diseases mean the studies of visually observable patterns seen on the plant. Health monitoring and disease detection on plant is very critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. One major effect on low crop yield is disease caused by bacteria, virus and fungus. It can be prevented by using plant diseases detection techniques. It requires tremendous amount of work, expertize 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. So to detect the plant diseases in advance and to detect the diseases with the help of modern computer technology, proposed a model for the efficient distinguishing plant diseases. Resistance.

Fig 1. Simple Leaf Dieses

II. PROPOSED SYSTEM

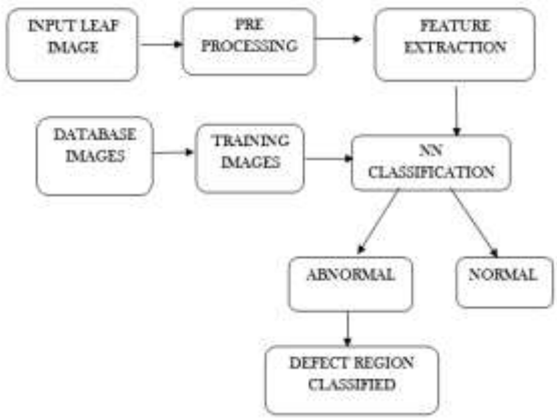

Fig 2. System Architecture

A. Description:

It focuses on the finding prominent accuracy of the leaf image diseases using deep learning approach. Acquiring the better performance in disease identification.

Proposed model provides an improved solution in disease control for leaf diseases with high accuracy.

B. Mathematical Model

The mathematical model for Leaf Disease system is as

S = {I, F, O, Si, Fi}

Where,

I = Set of image leaf dataset

F = Set of functions

O=leaf disease prediction

F = {F1, F2, F3}

F1=Data Collection,

F2=Data Preprocessing,

F3=Feature Selection,

F4=Classification

F5=Leaf disease detection.

Si: Success Condition

When the leaf disease identified from proposed algorithm.

Fi: Failure Condition

When Leaf disease not identified.

C. Flow Diagram

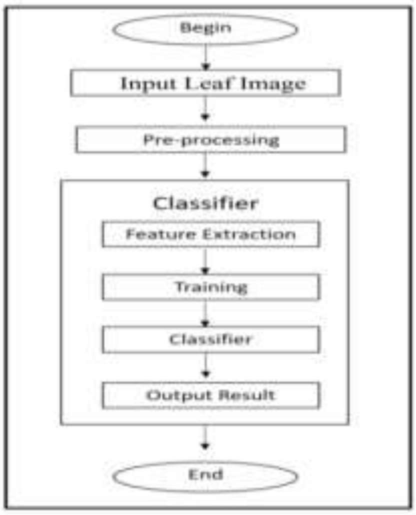

Fig 3. Flow Diagram

III. ALGORITHM USED

CNN ALGORITHM:

Step 1: Convolution Operation
Here are the three elements that enter into the convolution operation:

1. Input image
2. Feature detector
3. Feature map

Step 1(b): ReLU Layer
The reason we want to do that is that images are naturally non-linear.
When you look at any image, you'll find it contains a lot of non-linear features (e.g. the transition between pixels, the borders, the colors, etc.). The rectifier serves to break up the linearity even further in order to make up for the linearity that we might impose an image when we put it through the convolution operation.

Step 2: Pooling
Again, max pooling is concerned with teaching your convolutional neural network to recognize that despite all of these differences that we mentioned, they are all images are same. In order to do that, the network needs to acquire a property that is known as "spatial variance." This property makes the network capable of detecting the object in the image without being confused by the differences in the image's textures, the distances from where they are shot, their angles, or otherwise.

Step 3: Flattening
This will be a brief breakdown of the flattening process and how data move from pooled to flattened layers when working with Convolutional Neural Networks.

Step 4: Pooling
What happens after the flattening step is that you end up with a long vector of input data that you then pass through the artificial neural network to have it processed further which is called pooling.
Types of pooling: Mean, Max, Sum

Step 5: Full Connection
In this part, everything that we trained throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

Step 6:Summary
In the end, it will wrap everything up and give a quick recap of the concept covered in the training.

Step 7: SoftMax & Cross-Entropy
Optimization Functions for CNN model. To calculate final accuracy and losses.

CNN IN Our Project:

1. Classify dataset under labeled folders such as leaf images healthy and unhealthy images
2. Read dataset
3. Read features of all images and label (here name of dataset folder) of it
4. Store it in model file
5. Get input image
6. Read features of input image
7. Compare features of stored features

8. Show label as prediction of nearly matched features.

IV. RESULT AND DISCCUSION

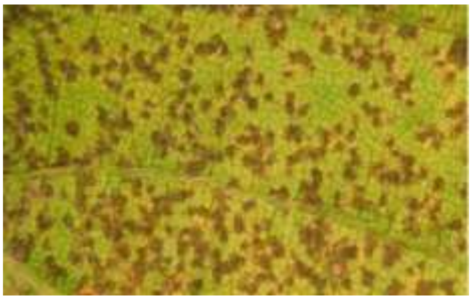

Fig 4. Disease Leaf

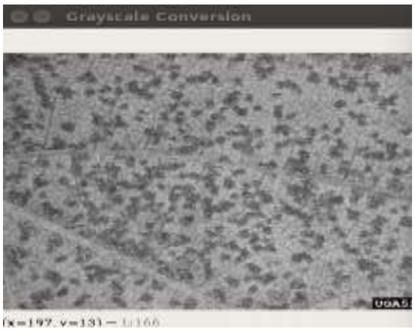

Fig 5. Gray scale Conversion

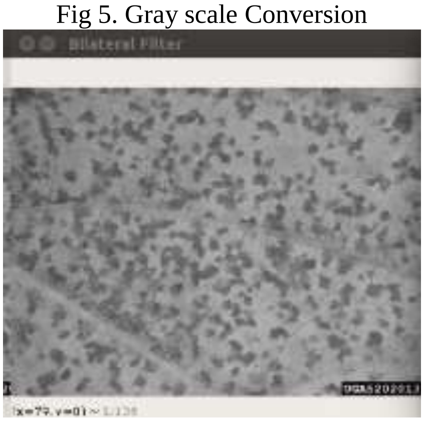

Fig 6. Bilateral Filter

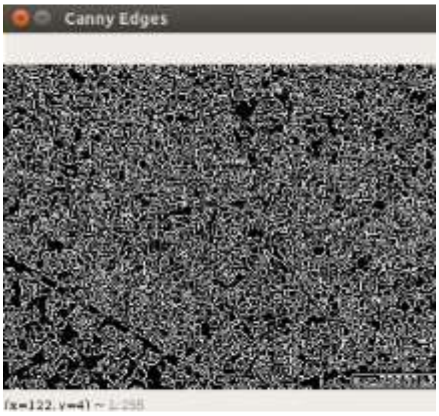

Fig 7. Canny Edges

V. ACKNOWLEDGEMENT

I wish to express my profound thanks to all who helped us directly or indirectly in making this paper. Finally, I wish to thank to all our friends and well- wishers who supported us in completing this paper successfully I am heartily thankful to my project guide for his valuable guidance and inspiration. In spite of their busy schedules they devoted their self and took keen and personal interest in giving us constant encouragement and timely suggestion. Without the full support and cheerful encouragement of my guide, the paper would not have been completed on time.

VI. CONCLUSION

The model not only adapts to complex environments, but also increases the accuracy of identification. Compared with the traditional model, the plant disease identification model based on deep learning proposed in this module can overcome the complexity of the environment and improve the accuracy of identification. When scaled, this approach can help in digitally monitoring crop health and could lead to significant improvement in the agriculture productivity and yield.

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