



International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 7, Issue 5, May 2019

Plant Leaf Disease Detection using Neural Networks

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ABSTRACT: Indian population mainly depends on agriculture. So farming field requires recognition of sickness in plant leaves. Proper care has to be taken for the plant leaves so as to enhance the product quality, amount or profitability. Hence detection of disease at the right time is necessary to the farmer. Plant disease recognition by visual way is a more tiresome task and at the same time it will not be perfect and can be applied only in some regions. Whereas if digital detection procedure is made use, it will not take more efforts and more time and also give accurate results. Machine Learning, a sub-field of soft computing, plays a big role in a vast range of applications, such as data mining, language processing, image recognition, and expert systems. Machine Learning is the technique that gives ability to the computer systems so that it can learn by its own output, without being programmed by external source. In our project we are identifying and classifying the diseased plant leaf. For doing so we use machine learning techniques for extracting the features and to improve the recognition rate in classification process we use Convolutional Neural Network.

KEYWORDS: Machine Learning, Convolutional Neural Network

I. INTRODUCTION

In this section different techniques used in our project are described. The project domain is Machine Learning. Machine Learning is a subsection of Artificial Intelligence in the field of Computer Science that utilizes factual procedures to enable Machines to learn with information, without being programmed by external source. Machine learning gives importance on the improvement of computer programs that can get the data and use it to learn independent from anyone else. The procedure of learning starts with perceptions or information, for example, precedents, coordinate involvement, or guidance, with the end goal to search for examples in information and settle on better choices later on based on the models that we give. The basic point is to permit the frameworks adapt as needs be without the human mediation.

A convolution neural network in Machine Learning is a category of deep, feed-forward artificial neural networks, most frequently applied to analyse images. Convolution neural systems were spurred by organic visual procedures that are like the mix of the creature visual cortex. CNN consists of three main layers that are input layer, output layer and hidden layers. The input to the Convolution layers applied by the convolution operation and the result is passed to the next layers. For minimal pre-processing CNN uses a variety of multilayer perceptrons. Compare to other image classification algorithms CNN utilize generally less pre-processing.

The project aims at identifying disease on the plant's leaf using Neural Network techniques. For this purpose, the software is developed for the automatic detection of leaf disease.

II. PROBLEM STATEMENT

The project "Plant Leaf disease Detection using Neural networks" is to design and develop a system for detecting and classifying plant leaf diseases using neural networks.

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III. ARCHITECTURE OF PROPOSED MODEL

An architecture diagram is a diagram describing about the various components that forms the entire system and gives a brief overview of the system.

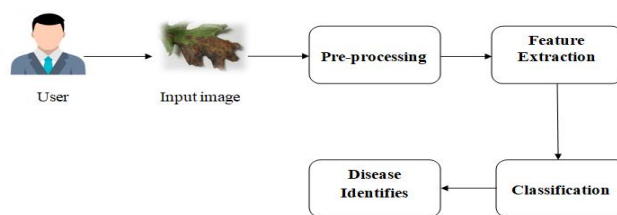


Fig -1: Architecture diagram for abusive comment classification system

The general architectural diagram of Plant Leaf Disease Detection System is seen in the Fig -1. The diagram depicts various phases such as user, input image, pre-processing, classification, disease identified.

The user has to first register himself/herself by giving the personal details. The user then logs in using the registered username and password. After the successful validation of the user, the user can upload the image of the leaf on which identification disease has to be made. This image is taken as the testing data. The uploaded image will be pre-processed. The features are extracted and are fed to the system. The trained classifier is then able to classify the image as one among the 8 class which we have defined.

IV. IMPLEMENTATION

The methodology is the description of steps that are involved in the working of the system. Methodology tells about the distinct parts of the system such as its input, output and others.

A. Algorithm for Plant Leaf Disease Detection System

1. The user registers to the system
2. The user logs in using the registered username and password
3. The system validates the user. If the validation is successful, the user is logged in, else the error message is displayed
4. The user uploads the image of the leaf and clicks on the analyze button
5. The system is trained using the training dataset and features are extracted
6. The user inserted image is fed to system as testing data
7. The user inserted image is pre-processed and Features are extracted using TensorFlow
8. The CNN algorithm is used as a classifier to classify the images
9. If the status is Healthy, then it is displayed as plant is healthy, else if status is Unhealthy then it will display the name of the disease
10. The user logs out

V. RESULTS AND ANALYSIS

This section elaborates on various test cases that are used to test the system. Leaf image dataset was used to train the model. It consists of 8 classes as mentioned in the Table-1.

The user input was used to test the model. Test cases and results are shown below.



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A. Test Cases

Table -1: Test cases of proposed system

TC ID	Input	Test Case description	Output
1	Enter correct username and correct password	Username and password match	Username and password accepted
2	Enter incorrect username and correct password	Username mismatch and password match	Incorrect username and password
3	Enter correct username and incorrect password	Username match and password mismatch	Incorrect username and password
4	Enter incorrect username and incorrect password	Username and password mismatch	Incorrect username and password
5	Enter details for registration	Valid details	Registration successful
6	Enter details for registration	Invalid details	Registration unsuccessful
7	Upload image	Diseased pepper leaf	Status:unhealthy and pepper bacterial spot
8	Upload image	Healthy pepper leaf	Status:healthy
9	Upload image	Diseased potato leaf	Status: unhealthy and potato late blight
10	Upload image	Diseased potato leaf	Status: unhealthy and potato early blight
11	Upload image	Healthy potato leaf	Status: healthy
12	Upload image	Diseased tomato leaf	Status: unhealthy and tomato late blight
13	Upload image	Diseased tomato leaf	Status: unhealthy and tomato early blight
14	Upload image	Healthy tomato leaf	Status: healthy
15	Upload image	Other than leaf image	Invalid Classification

B. Results

The Fig -5.2.1 depicts a graph of Accuracy versus Epoch for the training. The accuracy obtained for comment classification is 99 percent. Although the system provides better accuracy, there is a slight delay while training the model.

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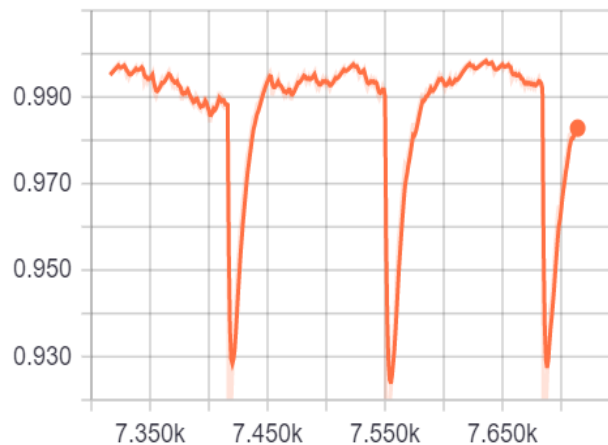


Fig -5.2.1: Graph of accuracy v/s Epoch

The Fig -5.2.2 depicts a graph of Loss versus Epoch for training. Loss is the measure of the deviation of the actual output from the predicted output. The prediction becomes more accurate as the loss decreases. Epoch is the number of iterations used to train and test the model. The size of epoch is set to 8. It is inferred that loss decreases as epoch increases.

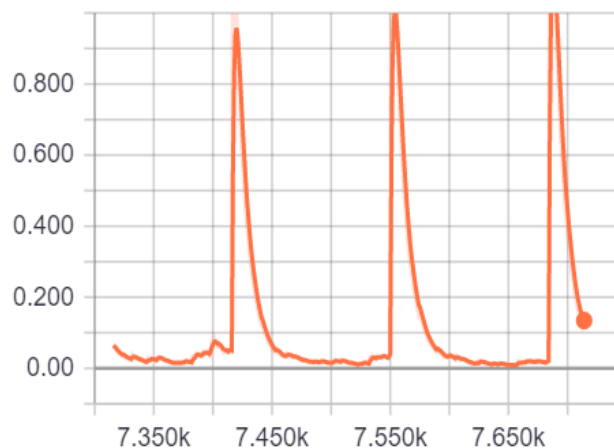


Fig -5.2.2: Graph of loss v/s Epoch

VI. CONCLUSION AND FUTURE WORK

The project is developed with an objective of classifying diseased leaf. The aim is satisfied with the help of neural network techniques which classifies the diseased plant leaves accurately. The infected plant leaves are classified utilizing a Neural Network algorithm called Convolutional Neural Network (CNN) where the dataset trained by extracting visual features.

The proposed system gives better accuracy with some delay during training. The future work is focused on classifying more number of diseased leaf of different plants.



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