International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 03 | Mar 2021 www.irjet.net p-ISSN: 2395-0072

DETECTION OF PLANT LEAF DISEASES USING MACHINE LEARNING

Mr. Rishikesh R. Kulkarni[1]

Zeal College of Engineering and Research Pune
Student in Information Technology
Savitribai Phule Pune University Maharashtra

Ms. Ashwini D. Sapariya[2]

Zeal College of Engineering and Research Pune
Student in Information Technology
Savitribai Phule Pune University Maharashtra

Mr. Sachin N. Kad[3]

Zeal College of Engineering and Research Pune
Student in Information Technology
Savitribai Phule Pune University Maharashtra

Dr. Swapnaja Ubale

Zeal College of Engineering and Research Pune
Asst. Prof Information Technology Department
Savitribai Phule Pune University Maharashtra

Abstract - *Every country's primary need is Agricultural products. If plants are infected by diseases, this impacts the country's agricultural production and its economic resources. In agriculture for an efficient crop yield early detection of diseases is important. Automatic methods for classification of plant diseases also help taking action after detecting the symptoms of leaf diseases. In the agricultural sector, identification of plant diseases is extremely crucial as they hamper robustness and health of the plant which play a vital role in agricultural productivity. These problems are common in plants, if proper prevention methods are not taken it might seriously affect the cultivation. The current method of detecting disease is done by an expert's opinion and physical analysis, which is time-consuming and costly in the real world. We are introducing the artificial intelligence based automatic plant leaf disease detection and classification for quick and easy detection of disease and then classifying it. This main aim of ours system is towards increasing the productivity of crops in agriculture. In this approach we have follow several steps i.e. image collection, image preprocessing, segmentation and classification.*

Key Words: Agriculture, Plant Disease, Image Processing, Dataset

1. INTRODUCTION

In the economic growth of any Country Agriculture plays a very important role. It is the field which highly affect the GDP of the countries. Agriculture sector contributes around16% of GDP of India. There are various factors that affects the quality and quantity of crops cultivated. Due to different weather and local conditions these plants are exposed to various diseases. And if these diseases remain undetected may cause some serious losses. In India itself around 15-25 percent of crops are lost due to diseases, pest, and weeds. Also, we can take reference of the incident of Georgia (USA) in 2007 in which there was loss of around 540 USD due to plant diseases. With the advancement of new advances, the field of agriculture becomes more prominent as it not only used as food feeding to major population but also used in many applications. Plants are very essential in our life as they provide source of energy and overcome the issue of global warming. Plants nowadays are affected by many diseases such as they cause devastating economic, social and ecological losses and many more. Hence, it is most important to identify plants disease in an accurate and timely way. Plant diseases can be extensively grouped by the idea of their essential causal operator, either irresistible or non-infectious.

Digital image processing tools are employed by the used method to obtain the desired output. It is not possible for a human eye to identify the disease extent accurately, as the resultants are subjective in nature. The observations done by the naked eye are usually used to decide diseases severity in the area of production. The significant development has done by the image processing in the field of agriculture. For the identification of the fungi disease, several neural network techniques have been utilized such as Back Propagation, Principal Component Analysis (PCA).To detect plant leaf disease by improving required rate in classification technique. Till now linear SVM is used which is a multi-class classification that only classify the data into two classes which is very inefficient and reduce accuracy of classification. The main objective that were focused in this system is to study different types of diseases which are found in plant leaf and also to study and analyse different techniques for plant leaf disease detection using image processing technique and main goal was to propose improvement in existing classification techniques for plant leaf disease detection using machine learning.

2. LITERATURE SURVEY

They explore the capability of SVM associated with millimeter-wave (mm-wave) low-terahertz (THz) measurements. First, they tackled the problem of classifying a mix of fruits with a multiclass SVM using the Digital Binary Tree architecture. With this method, the error rate does not exceed 2%. Secondly, moved from the W- to D-band (low THz). The main reason is the increase of the lateral resolution and the possibility to have more compact systems in the view of an industrial deployment. They have found a drastic decrease compared to the microwave region. It is consistent with the behavior of the water, which is one of the

main components of the apple. Then trained the SVM with the D-band database and finally performed the classification on unknown samples and obtained an accuracy of 100% [1]

In this paper they presented, white and red mulberry fruit were classified according to maturity stage using image processing and artificial intelligence classification algorithms. First, mulberry image segmentation was performed using the RGB color space. Among the tested color channels, the channel 'B' was selected as the best channel to classify fruit into three unripe, ripe, and overripe categories. In the next step, color, geometric, and texture features were extracted with two feature selection methods, namely CFS and CONS. After the image processing step, feature extraction, and dimension reduction, ANN and SVM were applied to classify each fruit as one of the six possible classes. Comparing the performance of the two methods (ANN and SVM), the ANN showed a significant advantage over the SVM for the mulberry classification. The best classification performance was obtained by using the CFS subset feature extraction method (14 selected features) with ANN [2].

This paper presents the various image processing techniques such as feature extraction and automatic detection for the image. The survey shows the efficient and simple existing methodologies. Several techniques are illustrated here to obtain the knowledge of different background modeling for pest detection such as image filtering, median filtering for noise removal, image extraction and detection through scanning. This paper depicts some promising results to present enhanced methods and tools for creating fully automated pest identification including the extraction with detection. Worldwide faces the challenge of crop production reduction by viruses, pathogens, animal pests, and weeds. Pest groups attack resulting in the loss rates and absolute losses. Under high productivity, conditions lead to a high crop grown rate in tropic and sub-tropics regions [3].

They developed an algorithm to detect three diseases in pomegranate that are bacterial blight, borer and cercospora. The preventive measures is provided according to the disease detected. The disease detection accuracy was found to be 85%. This can be further improved by using advanced methods of image enhancement, edge detection can be further improved in images which are corrupted by different type of noise. Also, using deep learning methods to train the algorithm with images can provide better accuracy. Overall, this method of disease detection in plants using image processing can be done in lesser time and lesser cost compared to manual methods where experts examine the plants to detect the diseases evaluated with different parameters like sensitivity, specificity, F-score and accuracy by implementing 2-fold, 5-fold as well 10-fold cross-validations and reported overall accuracy of 99.68% on 150 CT abdominal images [4].

3. OBJECTIVES

- The objective of this study is to detect plant diseases by an automated system based on image processing.
- We use image processing algorithms to detect diseases on plants.
- To recognize abnormalities that occur on plants in their Greenhouse or Natural Environment
- To classify the disease using CNN Classifier

4. PROBLEM STATEMENT

Agricultural products are the primary need for every country. If plants are infected by diseases, this impacts the country's agricultural production and its economic resources. Agriculture has played a key role in development of human civilization. Plant diseases are very important as this can especially imply both the quality and quantity of plant in the development of agriculture. To present a model that employs the techniques to extract relevant features related to images of leaf along with CNN (Convolutional Neural Network), with alternate functions in order to detect and identify types of diseases that infects the plant or leave.

5. IMPLEMENTATION DETAILS OF MODULE

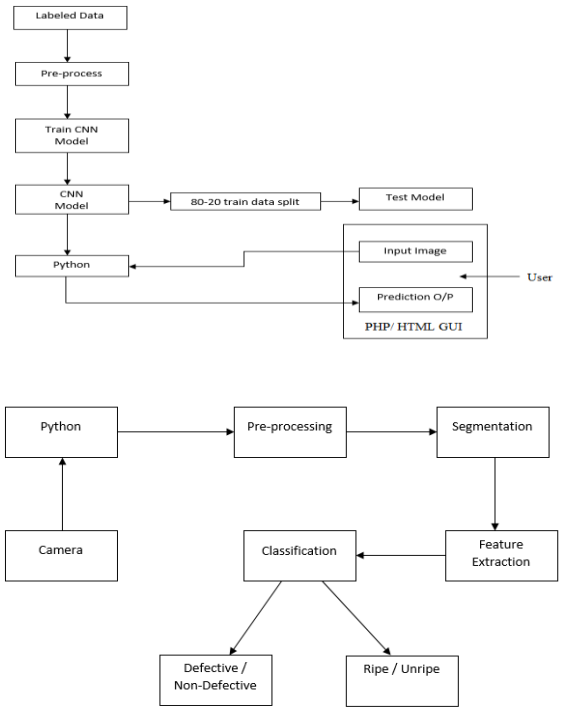

Fig: - System Architecture

Convolutional Neural Network (CNN):-

Step 1: Convolution Operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.

Step 1(b): ReLU Layer:-

The second part of this step will involve the Rectified Linear Unit or ReLU. We will cover ReLU layers and explore how linearity functions in the context of Convolutional Neural Networks. Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.

Step 2: Pooling

In this part, we'll cover pooling and will get to understand exactly how it generally works. Our nexus here, however, will be a specific type of pooling; max pooling. We'll cover various approaches, though, including mean (or sum) pooling. This part will end with a demonstration made using a visual interactive tool that will definitely sort the whole concept out for you.

Step 3: Flattening

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

Step 4: Full Connection

In this part, everything that we covered 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.

CONCLUSIONS

In this system the identification of normal and defective Leaf Diseases based using CNN algorithm is proposed. This method can also be applied to identify quality of vegetables with more accuracy. The image processing is carried out, and features such as color, size, and glare are extracted and processed for detection of various diseases of leaf. This proposed system helps in speed up process, improve accuracy and efficiency.

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