IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020

# Real-Time Detection of Apple and Tomato Leaf Diseases Using Deep Learning

**Taariq Dawood Buhari. SA[1], Mohan. SR[2], Vinod. D[3]**

UG Scholar, Department of Computer Science and Engineering, SMK Fomra Institute of Technology[1, 2]

Assistant Professor, Department of Computer Science and Engineering, SMK Fomra Institute of Technology[3]

**Abstract:** The plant diseases are a main summon in the agriculture section and quick recognition of diseases in plant could help to develop an early treatment method and span the valuable reducing economic loss. In this work, the Apple Leaf Disease Dataset (ALDD) and Tomato Leaf Disease Dataset (TLDD), which is composed of laboratory images and complex images under real old conditions, is rapid storage technology constructed via data augmentation and image annotation technologies. Based on this, a new apple leaf and tomato disease detection model that uses deep-CNN (Convolution Neural Network) is proposed by introducing the Google Net Inception structure and Rainbow concatenation. The novel INAR-SSD model provides a high-performance solution for the early diagnosis of apple and tomato leaf diseases that can perform real-time detection of these diseases with higher accuracy and faster detection speed than previous method.

**Keywords:** Deep Learning, Apple leaf diseases, Tomato leaf diseases, real-time detection, convolutional neural networks.

## I. INTRODUCTION

The apple leaf and tomato leaf diseases are detected using convolutional neural network for high accuracy detection. Plant diseases are a major threat to plant growth and crop yield and many researchers have expended substantial efforts on detecting plant disease. In recent years, through the development of computer technology, machine learning has been widely utilized to train and detect plant diseases and is a satisfactory alternative for the detection of plant diseases. It is easier to realize higher accuracy by using a deep learning approach that is based on convolution neural networks. In this proposed system a deep learning approach that is based on improved Convolution Neural Networks (CNN) for the real-time detection of apple and tomato leaf diseases. The proposed deep-learning based approach can automatically identify the discriminative features of the diseased apple and tomato images detect the types of apple and tomato leaf diseases with high accuracy.

## II. DEEP LEARNING

Deep Learning is a specialized form of Machine Learning that uses supervised, unsupervised, or semi-supervised learning to learn from data representations. It is related to the form and task of the human nervous system, where a mesh network of bonded numbered units works in a collaboration mania to process complicated information. Machine Learning is an approach of Artificial Intelligence that is based upon the concept that mechanism can be given access to information along with the skill to learn from it. Deep Learning takes Machine Learning to the next level.

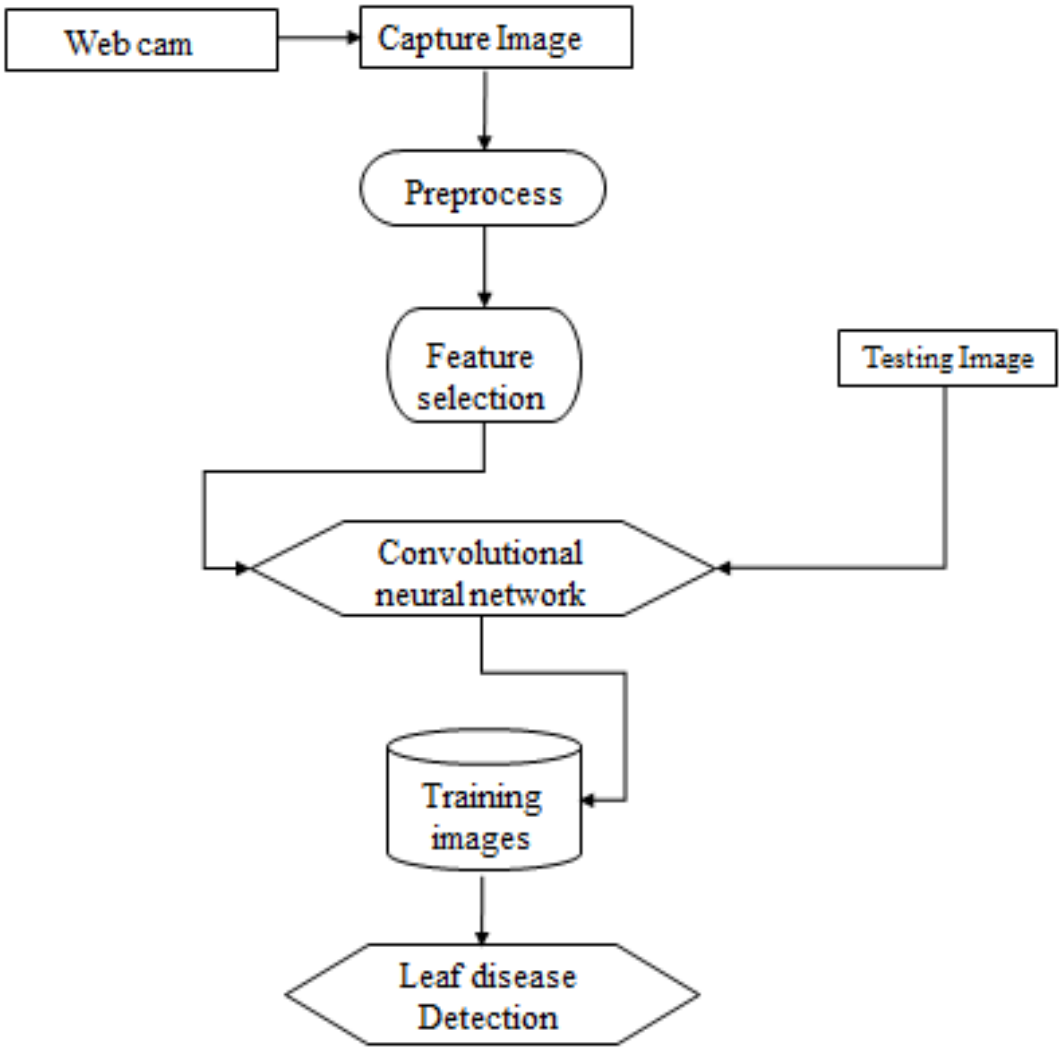
## III. EXISTING SYSTEM

In recent years, with the popularization of digital cameras and other electronic devices, automatic plant disease diagnosis has been widely applied as a satisfactory alternative. Nevertheless, in most cases, traditional machine learning approaches such as Support Vector Machine (SVM) and K-means clustering have complex image pre-processing and feature extraction steps, which reduce the efficiency of disease diagnosis.

## IV. PROPOSED SYSTEM

In this proposed system a deep learning approach that is based on improved Convolution Neural Networks (CNN) for the real-time detection of apple and tomato leaf diseases. The proposed deep-learning based approach can automatically identify the discriminative features of the diseased apple and tomato images and detect the types of diseases with high accuracy. At the same time the proposed approach can detect not only various diseases in the same diseased image but also the same disease of different sizes in the same diseased image.

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 9, Issue 6, June 2020




## V. MODULE DESCRIPTION

### A. Image Capturing

In this module we create a basic infrastructure to establish the proposed feature of image handling in python. The python framework to approach video input device in this case a camera. Apple and tomato leaf image will be captured first and it will check the captured image are stored in ALDD and TLDD. Perform image processing tasks by removing image noises and creating high-resolution from low-resolution images.

### B. Feature Selection

Image annotation is a vital step of which the objective is to label the positions and classes of object spots in the diseased images. For this stage, a convolution neural networks (CNN) algorithm that provides a frame selection function is developed in Python. The knowledge that is provided by experts in the field of agriculture, the diseased areas of an image can be selected and labelled with the corresponding classes. All the disease images in the data set have been annotated, after annotation step the program will generate XML files for each annotated image that contain information such as the coordinate values of each lesion's bounding boxes and the classes of the diseases.

### C. Classification

The bounding box will be detected in which the disease is affected in the apple leaf. Eventually the disease will be described which types of disease are affected. The bounding box will be detected in which the disease is affected in the apple and tomato leaf. For classification of image using TensorFlow API. TensorFlow is the free and available origin software information centre for data flow and programming various across an area of job, it is a symbolic math library and is also used for deep learning application. TensorFlow is mainly used for Classification of image. Finally, the disease will be labelled which types of disease are affected in leafs.

IJARCCE

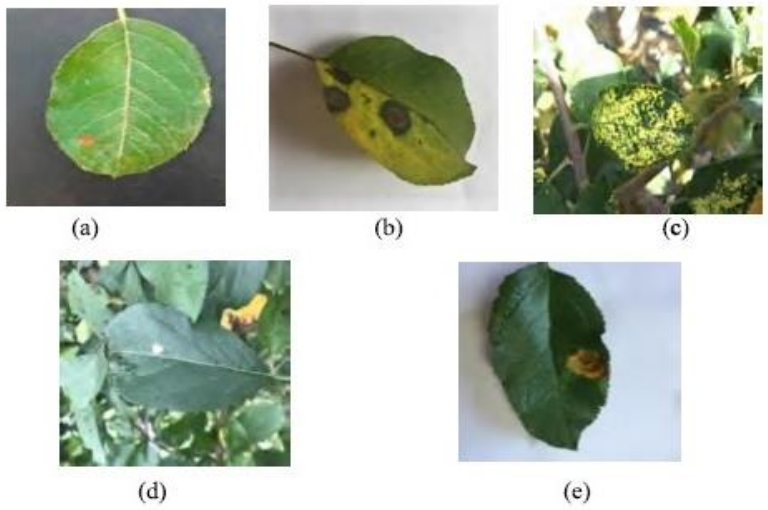
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020

## VI. APPLE LEAF DISEASES DATASETS

In the beginning of our work, many human and material resources were devoted to the collection of diseased apple leaves because few appropriate datasets were available for the real-time detection of apple leaf diseases. The disease patterns of apple leaves vary with the season and with other factors such as the humidity, temperature and illuminance. For example, rainy weather is conducive to the generation and spread of germs, thereby resulting in the expansion and diffusion of the disease spots on affected leaves. Taking that into consideration, images of ALDD are collected under various weather conditions for more comprehensive applications. A total of 2029 images of diseased apple leaves are obtained, which correspond to five classes: Alternaria leaf spot (caused by Alternaria alternata f.sp mali), Brown spot (caused by Marssonina coronaria), Mosaic (caused by Papaya ringspot virus), Grey spot (caused by Phyllosticta pirina Sacc and Coryneum foliicolum) and Rust (caused by Pucciniaceae glue rust). These five common diseases of apple leaves are selected for two reasons: initially, these five types of diseases can be visually identified from leaves, which is essential for the application of CNNs. In addition, they are responsible for substantial yield reductions in the apple industry.




**Five common types of apple leaf diseases. (a) Alternaria leaf spot. (b) Brown spot. (c) Mosaic. (d) Grey spot. (e) Rust.**

## VII. TOMATO LEAF DISEASES DATASETS

In this work we concentrate on identifying tomato leaf disease by deep learning. In this part, the abstract mathematical model about identifying tomato leaf disease is displayed at first. For now, the process of typical CNN is described with formulas. Ten, the data set and data augmentation are presented. Eventually, we introduced three sturdy deep neural networks accepted in this paper, i.e., AlexNet GoogLeNet, and ResNet. The main process of tomato leaf disease identification in this work can be abstracted as a mathematical model. First, we assume the mapping function from tomato leaves to diseases is **f:X->Y** and then send the training samples to the optimization method. The hypothesis set **H** means possible objective functions with different parameters; through a series of parameters update, we can get the final assumption **g≈y**.


DOI 10.17148/IJARCCE.2020.9627

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 6, June 2020

## VIII. EXPERIMENTS

In this work, we also discussed some feature extraction and classification techniques to extract the features of infected leaf and the classification of apple and tomato diseases. And we also extract and classified the uninfected leaf of apple and tomato to detect the healthy accuracy of the leaf.According to these studies, convolution neural networks have been used extensively in the field of crop disease identification and satisfactory results have been obtained. However, object detection has not been applied to the real-time monitoring of apple and tomato leaf diseases, which is of high practical value for agricultural applications. Therefore, in our work, an object detection model for the detection of apple and tomato leaf diseases is proposed. And we also proposed remedies for infected leaf.

## IX. CONCLUSION

In this work we proposed a real-time detection approach is based on improved convolutional neural networks for apple and tomato leaf diseases. Inception module and integrating the Rainbow concatenation to enhance the multi-scale disease object detection and small diseased object detection performances. And we concentrate on identifying tomato and apple leaf disease using deep convolutional neural networks by transfer learning. The total available of data, layer-wise fine-tuning may provide a practical way to attain the greatest execution of the application at hand. We trust that the results get in this work will bring some inspiration to other similar visual recollection problems, and the pragmatic study of this work can be easily extended to other plant leaf disease recognition problems. The apple and tomato leaf image will be captured both the images of leaf will be first unmasked and then image will be masked to detect whether the leaf is infection or non-infection. The captured image will be trained by the ALDD and TLDD to specify the disease of the leafs.And ,then testing the captured images of apple and tomato leaf to detect the accuracy of infection in leaf with high rate. Tested leaf images of apple and tomato will show the status of leaf ,status of leaf can be healthy or unhealthy.If tested leafs are unhealthy then remedies will be given in output.

## ACKNOWLEDGEMENT

We are very grateful to our guide **MR. VINOD D**, Asst. Professor, Department of CSE, for her valuable guidance and suggestions. We also wish to thank all our respected teachers and friends for their excellent contributions and support for the completion of this paper.

## REFERENCES

[1]. Chunxe Wu, C. Luo, N. Xiong, W.Zhang, and T. Kim, “A greedy deep learning method for medical disease analysis," IEEE Access, vol.6. 2018
[2]. Z. Chuanlei, Z. Shanwen, Y. Jucheng, S. Yancui, and C. Jia, ``Apple leaf disease identi_cation using genetic algorithm and correlation based feature selection method," *Int. J. Agricult. Biol. Eng.*, vol. 10, no. 2, pp. 74_83, 2017.
[3]. S.P.Mohanty, D.P.Hughes, & M.Salathé, “Using deep learning for image-based plant disease detection," *Frontiers Plant Sci.*, vol.7, p. 1419, Sep. 2016.