Chapter 7
Infected Plant Leaves Detection Using Multilayered Convolutional Neural Network and Quantum Classifier

Damandeep Kaur

Chitkara University Institute of Engineering and Technology, Chitkara University, Punjab, India

Shamandeep Singh

Code Quotient, Mohali, India

Simarjeet Kaur

Chitkara University Institute of Engineering and Technology, Chitkara University, Punjab, India

Gurpreet Singh

Chitkara University Institute of Engineering and Technology, Chitkara University, Punjab, India

Rani Kumari

Chitkara University Institute of Engineering and Technology, Chitkara University, India

ABSTRACT

The objective of this chapter is to establish an accurate and efficient approach to diagnosing symptoms of disease, and therefore develop an optimal method to solve the problem efficiently and cost-effectively. Quantum-based classifiers also play an essential role in detecting the leaf profile features in recognizing leaves using a computer vision system that can be used with a quantum computer. Enhanced double quantum images encryption (EDQRCI) enables automation to produce and create quantum pictures that transform color pixels into well-defined shapes ways. Therefore, a novel model is proposed to identify and diagnose the mango leaves that are infected with Anthracnose fungal disease with the help of a multi-layer convolution neural network (MCNN). The images of unhealthy and healthy leaves of mango trees are taken from a dataset, namely, Plant Village, to determine the efficacy of the model. The simulation of the proposed model is implemented with the help of MATLAB software, and shows a higher classification accuracy of the proposed model MCNN.

1. INTRODUCTION

As we know agricultural land has become a feeding source in today's time. The economy of India is totally dependent on agricultural land. So it's very important to detect plant disease at an early age (Arsenovic et al., 2019). With the help of automated techniques, we can do the needful Plants are also affected by diseases, like other living beings namely humans, birds or animals. Almost every part of a plant like stem, leaf, root, fruit, and flower is prone to diseases. When the diseases of plants are not taken care of or not even detected, plants die gradually or in a short span of time (Ashok et al., 2020). Such diseases need to be properly diagnosed for appropriate and accurate detection and to develop an efficient treatment of identified plant diseases. Traditional methods are not efficient and no more desired for detection or treatment of any disease, so is the case with plant disease. Today Image processing is considered the best method available to diagnose plant diseases and it can be efficiently used to measure various parameters related to the anatomy of plants. Image processing can be used in agriculture through two mainstream categories: 1) Imaging Technique and 2) Image Processing Applications.

1.1 Plant Diseases Detection

It's very important to analyze the problem of plant disease. The problem arises which is related to the problems of climate change, environment, and sustainable agriculture (Baider et al., 2020). Experts confirmed that it's the environment that increases or decreases the rates of pathogen development. The situation is getting more complex day by day as diseases are transferred worldwide more easily than before. New diseases are emerging in those places where they were previously not recognized. Unfortunately, no local experts are there to detect them.

The Traditional method of disease detection in plants is ineffective and not good. The automated detection method is used which is not time-consuming to detect the plant disease. So with the help of agricultural Scientists and symptoms of disease, one can easily detect the disease in plants (Bera et al., 2019).

To detect plant disease following aspects are required to be considered:

1) **Signs or symptoms detection:** This is the traditional way to find out plant disease. Here we look for the abnormal appearance of the plant's stem, leaf, flower, fruit, etc. Unwanted spots, color anomalies, dead leaves, and twisted leaves are basic symptoms of plant diseases.
2) **Familiarity with plants:** It is the best practice if people who are familiar with a particular plant are included in the diagnosis procedure.
3) **Duration of symptoms:** It is important to see if the symptoms or abnormal signs are spreading into other plants in a particular time period and how long it takes for a plant to die after being affected by a disease.
4) **Uniform and non-uniform patterns (Abiotic and biotic)**: The diseases of plants generally fall into three categories:
   a) Virus
   b) Fungus
   c) Bacteria

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