Chapter 11
A Transfer Learning Approach for Detecting Plant Leaf Diseases With Convolutional Neural Networks

P. Valarmathi
Vellore Institute of Technology, Chennai, India

N. G. Bhuvaneswari Amma
Vellore Institute of Technology, Chennai, India

Vasu Bhasin
Vellore Institute of Technology, Chennai, India

ABSTRACT

Agriculture is an indispensable sector for the continuity of homo sapiens. In the Indian context where agriculture contributes 19.9 percent of GDP and engages almost 54.6 percent of the population, it requires great measures to be taken to avoid plant diseases. Plant diseases are difficult to track manually as that requires a lot of work and proficiency in plant diseases. It is mandatory to keep a check on at varying phases of crop development to recognize the disease at time. Digitalization as well as adopting technology is essential for agriculture and for the welfare of the farmer. This chapter concentrates on detecting plant diseases using convolutional neural network. The concept of transfer learning is used for classification. The proposed framework can identify various types of diseases efficiently.

1. INTRODUCTION

About 58% of community hinge on agriculture for their livelihood and has a decisive role in the Indian economy. India ranks second in the world in terms of agriculture

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production. Plant disease if not recognized at the correct time, may lead to huge economic issue. There are different types of diseases by various microorganisms may it be bacteria, viruses, or fungi which can damage crop to great extent and can even be fatal to human beings. Plant diseases has a detrimental impact on agriculture. Plant diseases can lead to food insecurity. Hence, it is essential to spot the disease at initial phase to bring out good crop harvest.

Plant diseases are usually identified by farmers or sometimes forestry experts but this method is inefficient. To guard them from diseases they apply pesticides beyond suitable proportion which harm ecosphere. Disease control measures are of no use and can be destructive without proper identification of the disease. One of the helpful measures in plant disease detection methods can be done with the help of image processing and neural network. Agriculture is needed sector in India as its economy depends on it. It illustrates the urgency to look after plants. The central issue is pivotal to safeguard the plant from diseases as these can affect the absolute maturation of the crop.

The proposed framework bothers with an alternate path to the advancement of disease identification, by employment of CNN. Development in machine vision gives an opportunity to strengthen plant disease identification. All crucial steps needed for executing the framework are defined all over the paper. The employment of the convolutional neural network in issue of plant disease detection has satisfactory outcomes. CNN generate ranking of visual presentation that are developed for a particular chore. CNN eradicate the need for the manual extraction for identification of disease. The CNN framework aims to look right on both ailing and healthy plants.

2. RELATED WORK

Formerly, plenty of work has been done to detect leaf diseases using machine learning and image processing. A system was proposed by Sammy et al. (2019), that was able to identify distinct varieties of apple, corn, sugarcane, grape and tomato. Hossain et al. (2019), suggested a method for recognizing the diseases with KNN. For classification, the images that were derived were used. Ch Kumari et al. (2019), proposed a method that performs computation of features like energy, coorelation mean,etc but accuracy was low. Wallelign et al. (2018) developed CNN architecture for categorization of various diseases. This framework used LeNet, for disease categorization and was able to achieve high accuracy. Jiayue et al. (2019), used YOLOv2 CNN to detect disease. YOLOv2 provides good accuracy and speed. 97% accuracy was achieved. A system was suggested by Robert G et al. (2018), using convolutional neural network for tomato leaf disease detection. This transfer learning model was able to accomplish the correctness of 95.75%. For instance,

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