# Chapter 6
# Leaf Disease Detection Using AI

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## ABSTRACT

*Plants play a significant role in everyone's life. They provide us essential elements like food, oxygen, and shelter, so plants must be supervised and nurtured properly. During cultivation, crops are prone to different kinds of diseases which can severely damage the whole yield leading to financial losses for farmers. In last 10 years, researchers have used different machine learning techniques to detect the disease on plants, but either the methods were not efficient enough to be implemented or were not able to cover the wide area in which plant diseases can be detected. So, the author has introduced a method which is efficient enough to easily detect plant disease and can be implemented in large fields. The author has used a combination of CNN and k-means clustering algorithms. By using this method, crops disease is detected by analyzing the leaves, which notifies users for action in the initial stage. Thus, the proposed method prevents whole crops from getting damaged and saves time and energy of farmers as disease will be identified way before a human eye can detect it on a large farm.*

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## INTRODUCTION

Industries are growing faster day by day and new technologies are also being developed by researchers for the ease of the workers. Nowadays, Machine learning is a very known and vast method for analyzing of data which is used in various sectors among which agricultural sector is one of them. This sector is a very vast sector which includes many important things and in all these important things, the plant's health is very much important. Plant's health could get disturbed by incomplete or wrong treatment during irrigation.

In countries such as India where 70% of the total population's income depends on agriculture, it is very important to keep the crops and plants protected from diseases in present scenario. It is done with the help of pesticides and insecticides. Pesticides and Insecticides are sprayed beforehand to keep the crops protected but regular use of these synthetic chemicals is slowly poisoning the fruit of the plant and when consumed by humans can cause many harmful effects. To overcome this problem, a method is designed in which the disease is detected in early stage and the medicine is sprayed only on the infected area. In this chapter, Author discusses about the method used to detect the disease with the use of the machine learning and its various algorithms.

The detection of the leaves and crops plays an imperative role in the betterment of the plant's health, as plant are essential part of our day to day lives. This chapter contains the methodology that is used for the leaf disease detection and also contains the information about how the models (K-means clustering and convolution neural networks) are being trained. This chapter is very helpful for the specialists present in the agricultural department, where they can observe a leaf and can easily evaluate the disease that the leaf is suffering from. With the early detection of leaf disease, they can take proper steps/ measures to cure the plant or the crop from that particular disease.

The method used in this chapter is an integration of two algorithms: K-means clustering and Convolution neural network (CNN). K-means clustering being the first is used for the color extraction of the leaf. Further, CNN is used for the comparison of the extracted color image with the images present in this dataset that is been used for training of the unsupervised model.

The steps which are used for the detection of disease in the leaves of the particular classes are followed as:

1. Image segmentation
2. Extract dominant colors
3. Applying K-means
4. Make clusters
5. Apply CNN.

This chapter is about explaining the above steps in detail and also proves that how much this model is accurate for the detection of the disease of the leaves.

The dataset that has been used in this research has 5 directories: -

1. Bacteria
2. Fungi
3. Nematodes
4. Normal