

# CROP DISEASE DETECTION USING DEEP LEARNING TECHNIQUES

## DETAILS:

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## Problem Statement

Crop disease is a formidable problem in many countries, especially agrarian ones where the agriculture plays a dominant role in growth of a country's economy. Most of the world's food and fabrics comes from agriculture, and agriculture when combined with technology brings out the finest results. Crop disease detection systems can solve multi-fold problems, saving farmer resources, preventing economic loss, early detection of diseases etc. In this project we aim to design a web/mobile application for deep learning model that can detect the crop disease with higher accuracy in real-time conditions and environment with just a photo of the leaf of the plants, we can further increase the accuracy of detection of disease, by using other sources such as the location of plant disease, the climate the crops grow in, the factors in its growth lifecycle, and age of the plant.

Currently, the plant based diseases are being detected by the prior knowledge of farmers, or experts, that have hands-on experience in dealing with crops, however this always may not work in their favor as new mutations of diseases in plants are rampant, and the disease may be under different phases that may be hard for the human eye to detect, hence we can develop a deep learning model that can accurately detect the disease, phase, and treatment of the crop with just an image, for easier accessibility we can integrate it into a mobile/web application with user-friendly interface and experience.

## Motivation

The problem is interesting because of its complex intricate nature of detecting plant diseases that are fast spreading, hard to detect, and the mutations and resistance they develop against the medications. The variations in diseases like blight, black spot, Powdery mildew, and downy mildew, have various phases of the disease, and mostly aren't detectable until too late, this causes entire losses to farmers, and the agriculture industry, which sets back huge agro-economic losses. The application of the problem in deep learning, could be harder as, we need to factor huge datasets of crops, and leaves both in the healthy and diseased states, to train the model, the limiting factors being we need multiple images in various angles, lighting, environment conditions, and disease types to have high accuracy. The implementation of such a model requires huge datasets, robust training of the model, accurate classifications of the crops, conditions and diseases in order to detect the way forward.

The variety of crops, both grown naturally and genetically, spark interest as we aren't used to understand how diseases affect crops we use, and the idea that the deep learning techniques we learn, can be used to solve this problem is a huge motivation for one to pursue this project.

## Literature Review

1. DeepCrop-Deep Learning based crop disease prediction with web application.

<https://www.sciencedirect.com/science/article/pii/S2666154323002715#:~:>

In this project, a novel deep learning-based model for crop disease detection was proposed, where they used ResNet-50 for the diseases, for higher accuracy rate, the data has been extracted through various image processing techniques, and machine learning techniques that study that data. A framework has been created using multiple deep learning models, such as resnet50, vgg etc, that evaluate the performance, as well a real

world dataset carrying 10000 images of various crops like potatoes, tomatoes, and spinach has been recorded in various phases of the lifecycle, finally a web application was created that can analyze the data from the image, However the accuracy can further be improved by implementation of hybrid deep-learning architecture, the model fails to localize the area of leaf disease identification, and there is lack of further datasets that involve multiple leaves.

The gaps can be filled by using the datasets that contain real time images of plants and leaves, throughout their lifecycle, that are classified based on their types, we can also localize the affected area of the plant, by recognizing the part through training the model, with real time environment images.

2.Solving current limitations of Deep Learning based approaches for plant disease detection.

<https://www.mdpi.com/2073-8994/11/7/939>

3.Deep Learning based approach for automated plant disease classification using vision transformer.

<https://www.nature.com/articles/s41598-022-15163-0>

## Methods

We can approach this problem by implementing a hybrid deep learning model, that involves multiple datasets, that have real time environmental images of various plants, and diseases that are classified in various sets, we can use resnet50, plantdiseasenet etc, that have the images, whilst also inputting images that are real time, and having various, areas of disease affected areas, we can evaluate various factors, like age, climate, disease types, and classification. We can train the model by inputting these factors and testing it in real time, and then we can develop a web based/mobile based application that can detect the disease by image processing and recognition techniques, from real time videos, and images of plants.

## Timetable

DATE	PROGRESS
16/02/24	Project proposal
23/02/24	Implementation of the deep learning model
29/02/24	Training Model with datasets