

# **Fertilizer Recommendation System For Disease Prediction**

## **Abstract**

The primary factor in a country's development is agriculture. Food is regarded as a fundamental human need that may be met through farming. In this research, artificial intelligence is extensively surveyed. Convolutional neural networks and computer vision are used to forecast plant diseases and suggest plant nutrients.

## **Introduction**

The early identification of disease symptoms is made possible by the detection and recognition of plant diseases using machine learning. For the purpose of diagnosing plant diseases, plant pathologists can examine digital photographs utilising digital image processing. Simply said, the use of computer vision and image processing techniques benefits farmers across all areas of agriculture. In most cases, aberrant physiological functioning of plants is what causes plant diseases. Therefore, the difference between the plants' regular physiological capabilities and abnormal physiological functionalities leads to the generation of the specific symptoms. The pathogens that typically infect plant leaves are found on the stems of the plants. Different image processing techniques can forecast these various leaf signs and diseases. These many techniques consist of several basic procedures including feature extraction, segmentation, and classification, etc. Most often, the segmentation used in the diagnosis and prediction of leaf illnesses like dividing the healthy tissues from the sick tissues in a leaf.

## **Hardware Requirement**

- PC/Laptop
- Operating System(Windows/linux)
- GPU

## **Software Requirement**

- IBM Cloud Account
- IBM Academic Initiative Account
- Internet Connection with optimum bandwidth

## **AI Techniques**

### **• Image processing**

Image processing is a technique for applying various procedures to an image in order to improve it or extract some relevant information from it. It is a kind of signal processing where the input is an image and the output can either be another image or features or characteristics related to that image. Image processing is one of the technologies that is currently expanding quickly. It is a primary subject of research in both the engineering and computer science fields.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis

## • Convolutional neural networks

Convolutional neural networks outperform other neural networks when given inputs such as images, voice, or audio, for example. There are three basic categories of layers in them:

- Constellation layer
- gathering layer
- FC (fully-connected) layer

A convolutional network's first layer is the convolutional layer. The fully-connected layer is the last layer, even though convolutional layers, further convolutional layers, or pooling layers, can come after it. The CNN becomes more complicated with each layer, detecting larger areas of the image. Early layers emphasise basic elements like colours and borders. The larger features or shapes of the object are first recognised when the visual data moves through the CNN layers, and eventually the intended object is recognised.

### *Convolutional Layer*

The convolutional layer is the core building block of a CNN, and it is where the majority of computation occurs. It requires a few components, which are input data, a filter, and a feature map. Let's assume that the input will be a color image, which is made up of a matrix of pixels in 3D. This means that the input will have three dimensions—a height, width, and depth—which correspond to RGB in an image. We also have a feature detector, also known as a kernel or a filter, which will move across the receptive fields of the image, checking if the feature is present. This process is known as a convolution.

## **YOLO**

You Only Look Once is known by the acronym YOLO. This algorithm identifies and finds different things in a picture (in real-time). The class probabilities of the discovered photos are provided by the object identification process in YOLO, which is carried out as a regression problem. Convolutional neural networks (CNN) are used by the YOLO method to recognise items instantly. The approach just needs one forward propagation through a neural network

to detect objects, as the name would imply. This indicates that a single algorithm run is used to perform prediction throughout the full image.

YOLO algorithm is important because of the following reasons:

- **Speed:** This algorithm improves the speed of detection because it can predict objects in real-time.
- **High accuracy:** YOLO is a predictive technique that provides accurate results with minimal background errors.
- **Learning capabilities:** The algorithm has excellent learning capabilities that enable it to learn the representations of objects and apply them in object detection.

YOLO algorithm works using the following three techniques:

- **Residual blocks**
- **Bounding box regression**
- **Intersection Over Union (IOU)**

## Conclusion

The various uses of artificial intelligence in the agricultural sector are summarised in the current review study. This study's primary goal was to describe the uses and available artificial intelligence solutions for helping farmers achieve the desired output. The report also discusses several literatures that provide various approaches to identifying agricultural diseases. According to the literature, artificial intelligence is an excellent instrument for a country's agronomics. Therefore, in order to raise the productivity of primary sectors, future researchers need organise a proper dataset that covers all areas of agriculture.

# Reference

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