

# Crop disease detection using Image Processing

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**Abstract:** - India is one of the developing countries which is based on agriculture productivity. As agriculture is the main production in India protection of plant is the main concern. For the protection of plant detecting the crop disease is the most crucial task to prevent serious damages. Various crops are caused by fungal, bacterial and many other viruses. Fungal diseases are the most common parasites causing the crop. Bacterial diseases can be occurred on the crop to crop. Fungal is less harmful than bacterial diseases. Viruses cause on plants which are responsible for a huge amount of loss in crop production or agriculture production. Thus, the proposed system mainly focused on reducing crop diseases occurred due to various viruses, fungal or bacterial diseases using an image processing technique. The current system works on the detection of crop diseases and recommends fungicides/bacteriocytes (fertilizers/pesticides) based on that disease. The proposed system takes crop image as an input and applying processing technique is used to detect whether a disease occurs on that crop or not. After applying processing technique output is generated in the form of the name of disease and also gives a suggestion of fungicides/bacteriocytes (fertilizers/pesticides) in required content. The classification of images as a diseased image and healthy image by using Convolutional Neural Network. Processing technique follows following method: Acquisition of particular image, pre-processing of that image, image segmentation and feature extraction according to various features, classification of an image of an image which is a part of the convolutional neural network and recommend fertilizers as an output.

**Keywords:-** Image processing, convolutional neural network (CNN), segmentation, classification.

## I. Introduction

As we know India is based on agriculture production. Natural factors are responsible for the reduction in agriculture production. Weather cannot be control by the farmers and since in day to day life farmers lost their agriculture production. To provide the better-quality products it is very important that farmer must maintain the quality and quantity of specific agriculture product. To improve agriculture productivity detection and identification of crop at early stages is very important though it is a crucial task. Detecting diseases which occurred on the crop are somewhat difficult for farmers. For this purpose, image processing is the best procedure which translates the image into its digital form. Many types of research are already done on the current issues but they all are only for a single or particular crop. Hence, the proposed system is helpful for a farmer to overcome these issues. The proposed system is developed for reducing issues related to crop diseases and also to enhance agriculture productivity. Convolutional neural network (CNN) and uses some processing technique for classification purpose. This system takes a crop image as an input through mobile camera or database and scans the image. Afterwards input image is given to the next stages for further processing. This stage is known as image procurement. In the next stage of processing the resizing of an image is done. In the segmentation stage of a system background subtraction is done by applying some filtering mechanism. Classification of an image is done with the help of Convolutional neural networks technique. For the purpose of classification deep learning method is mainly used. We can take the help of feature extraction in order to compare the attribute features between healthy and diseased image. Attributes like color extraction, shape, etc. These are the stages in which image is scan and find out the disease occurred on the crop. Based on that disease occurred on species of crop fungicides/bactericides (fertilizers/pesticides) are recommend on required content and final output is displayed. Current implementation mainly focused on various image classification algorithms.

## II. Dataset

This framework contains csv information of pictures. It required a lot of dataset. In this proposed framework dataset contains solid leaf picture of the harvest as a source of perspective which is contrasted and the sick leaf picture of yield and gives the result. Here, effectively prepared dataset is utilized. This effectively prepared dataset contains numerous plants yet the testing dataset predominantly chips away at the three harvests for example Rice, Maize, and Bajara. It will anticipate yield dependent on testing picture given to the framework. Dataset keeps up around at least 1000 than csv pictures.

## III. Convolutional Neural Network (CNN):

Convolutional neural system (CNNs or ConvNet) is a class of deep neural systems, most normally connected to dissecting visual imagery. The effective uses of a variety of multilayer perceptrons intended to require negligible preprocessing by CNN. Convolutional systems were motivated by natural processes in that the network design between neurons takes after the association of the creature visual cortex. A CNN design is shaped by a pile of unmistakable layers that change the info volume into a yield volume (for example holding the class scores) through a differentiable capacity. A couple of unmistakable kinds of layers are normally utilized. These are additionally talked about underneath. Figure [1] shows different layer of convolutional neural network (CNN).

- A) Convolutional Layer
- B) Pooling Layer
- C) ReLu Layer
- D) Fully Connected Layer

### A) Convolutional Layer:

The convolutional layer can be seen as the center building square of a CNNs. This present layer's restrictions includes of a lot of learnable channels (or pieces), which have a little open field, however reach out through the full profundity of the information volume. Amid the forward pass, each channel is convolved over the width and tallness of the info volume, figuring the dab item between the sections of the channel and the information and delivering a 2-dimensional actuation guide of that channel. Therefore, the system learns channels that enact when it distinguishes some particular sort of highlight at some spatial position in the input.

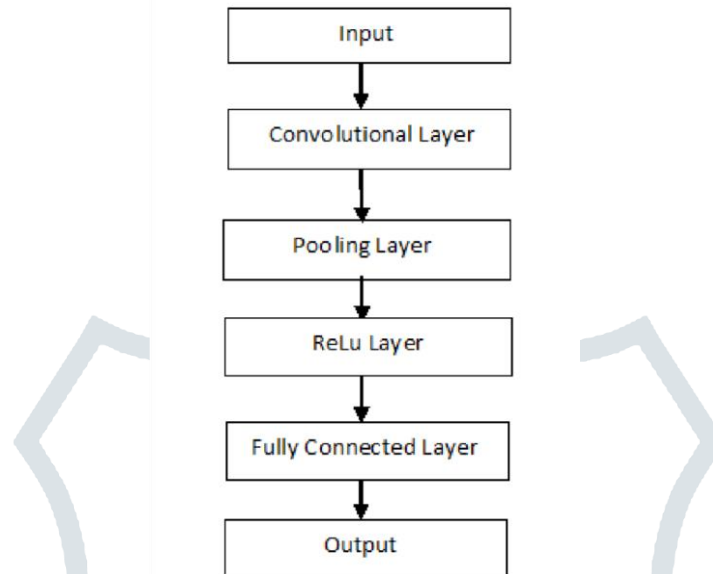


Figure-1: Convolution Neural Network Layer

### B) Pooling Layer:

Another important idea of CNNs is pooling, which is a type of undirected down-examining. There are a few numbers of non-straight capacities to actualize pooling among which max pooling is the most wellknown. It segments the information picture into a number of non-covering square shapes and, for each such sub-area, yields the maximum. Spontaneously, the careful area of an element is less imperative than its unpleasant area in respect to different highlights. This is the thought behind the utilization of pooling in convolutional neural systems. The pooling layer assists logically diminish to the pertaining size of the depiction, to diminish the number of restrictions, memory impression and amount of scheming in the system as well as will work in controlling the over fitting problem. Usually to intermittently embed a pooling layer between progressive convolutional layers in CNN engineering. The pooling task gives another type of interpretation invariance. The pooling layer works autonomously on each profundity cut of the info and resizes it spatially. Usually well-known structure is a pooling layer with channels of size  $2 \times 2$  connected with a walk of 2 down samples at each profundity cut in the contribution by 2 along both width and stature, disposing of 75% of the actuations. For this situation, each maximum task is more than 4 numbers. The profundity measurement stays unaltered.

### C) Relu Layer:

ReLU is the condensing of corrected direct unit, which applies the non-soaking actuation work  $f(x) = \max(0, x)$ . It successfully expels negative qualities from an initiation map by setting them to zero. It can develop the nonlinear properties of the choice capacity and of the general system without influencing the open fields of the convolution layer. ReLU is straight for every positive esteem, and zero for the every single negative esteem. This implies: It's shabby to process as there is no entangled math. The model can thusly set aside less opportunity to prepare or run.

It combines quicker. Linearity implies that the slant doesn't level, or "immerse," when  $x$  gets extensive. It doesn't have the disappearing angle issue endured by other initiation capacities like sigmoid or *tanh*.

It's scantily enacted. Since ReLU is zero for every negative information, it's probable for some random unit to not initiate by any stretch of the imagination.

#### D) Fully Connected Layer:-

At last, after a few convolutional and max pooling layers, the abnormal state thinking in the neural system is done by means of completely associated layers. Neurons in a completely associated layer have associations with all enactments in the past layer, as found in normal (non-convolutional) fake neural systems. Their actuations would thus be able to be registered as a relative change, with framework duplication pursued by an inclination balance (vector expansion of an educated or settled predisposition term). What completely associated layer do is that it acts as a boundary between two layers of neurons and how they are connected to each other. It is on a fundamental level equivalent to the conventional multilayer perception neural system (MLP). The flattened lattice experiences a completely associated layer to characterize the pictures.

#### IV. Literature Survey

In Paper [1], they examined the location of plant leaf illnesses utilizing the distinctive picture preparing strategies, for example, division, characterization. Picture preparing systems are connected for the ID and identification of plant leaf awfulness. It requires an immense measure of investment for usage.

In paper [3], they talked about the calculation for picture division procedure which can be used in programming acknowledgment as well as order of illness in leaves of plants. It likewise covers a review on different characterization methods that can be utilized for plant leaf malady acknowledgment and distinguishing proof. Picture division, which is an imperative aspect of sickness acknowledgment in plant leaf illness which is finished by utilizing a hereditary calculation.

In paper [4], they clarify a new cucumber ailment discovery technique that included a three way pipelined strategy: division is done on sick leaf pictures by K-implies bunching, extricating shape and shading characteristics from injury data and grouping of infected leaf pictures utilizing inadequate portrayal. An increase in the rate of detecting cucumber illness was found by using this technique as it was found that it could detect up to seven infections in cucumber which was way higher from the previous alternate strategies.

In paper [5], a method for ailment ID in which it depends on shading changes, shading histograms and a pairwise-based order framework. The execution was tried utilizing an expansive database which contains pictures of indications having a place with 82 distinctive biotic and abiotic stresses. This wide assortment of pictures utilized in the tests which made it conceivable to complete an inside and out examination concerning the principle preferences and constraints of the proposed framework.

In paper [6] this paper clarifies the strategy for identifying plant leaf illness and furthermore a methodology for cautious recognition of ailments. The point of the actualized work was to analyze the ailment of brinjal leaf utilizing picture handling and counterfeit neural system procedures. The ailments on the brinjal are the essential issue which makes a sharp decrease in the generation of brinjal. This procedure just used to distinguish brinjal leaf malady. This work utilizes the K-implies grouping calculation for division of pictures and Neural-arrange for order.

In paper [7], in this paper they clarify about the sicknesses happened on cotton plant must be distinguished at a beginning time and precisely as it can demonstrate inconvenient to the yield. Framework work shows an example acknowledgment framework utilized for distinguishing proof and characterization of three cotton plant leaf maladies, for example, Bacterial Blight, Myrothecium and Alternaria. The characterization precision is observed to be 85%.

In paper [9], in this paper they talked about that it is difficult to separate the kind of orchid leaf maladies with the assistance of exposed eyes. This paper exhibits a picture division strategy for order two unique sorts of orchid leaf ailment, for example, shady looking leaves as well as sun burnt. Images of leaves of orchid were caught through utilizing a computerized camera or high goals of the portable camera. As for the required chosen district orchid leaves are broke down by utilizing edge division procedures utilizing MATLAB. The framework has a limit of an early discovery framework for arrangement orchid infections.

In paper [10], examined a strategy in order for identifying early infection in Cercospora leaf by utilizing a half breed calculation method of layout coordinating and bolster vector machine (SVM). Confinement of this paper is that this execution was done just for the Cercospora leaf spot recognition in sugar beet. A half and half calculation are a calculation which consolidates at least two than different calculations that take care of a similar issue.

## V. Proposed System

The proposed framework dependent on five fundamental phases: - obtaining of a picture, preprocessing of a picture, division of a picture, include extraction and order of a picture. Figure [2] demonstrates the orderly stream of the proposed framework.

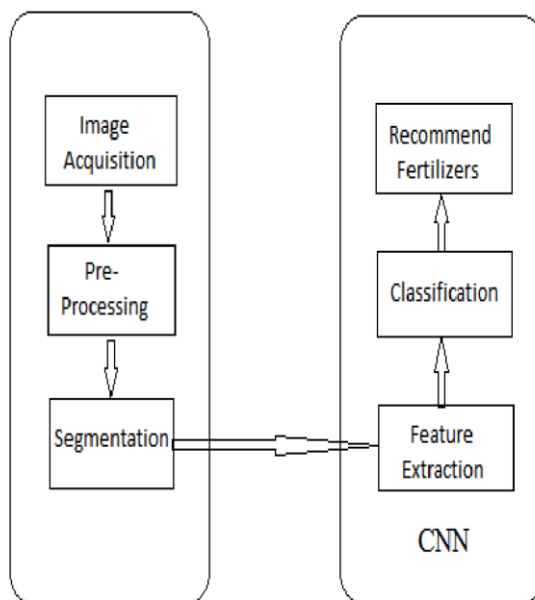


Figure-2: System Flow

### A) Image Acquisition:

In order to obtain a carefully encoded portrayal of the visual attributes of an object techniques like advance imaging otherwise to be known as computerized imaging is used. For instance, a physical scene or within structure of an article. The term is routinely acknowledged to propose or consolidate the dealing with, weight, storing, printing, and show of such pictures. A key preferred standpoint of an advanced picture, versus a simple picture, for example, a film photo, is the capacity makes duplicates and duplicates of duplicates carefully inconclusively with no loss of picture quality. The principle period of any vision structure is the image verifying stage. After the image has been gotten, distinctive procedures for taking care of can be associated with the image to play out a wide scope of vision assignments required today. However, in the event that the picture has not been obtained or accepted, at that point the planned undertakings might not going to be practicable. This is the beginning part of the system. An image will act as an input is captured through mobile camera having 5mp (mega pixel) and more resolution. In this phase, the dataset contains a healthy image for reference and diseased images for training.

### B) Image pre-processing:

Pre-preprocessing is a typical name for activities with pictures at the most reduced dimension of reflection - both information and yield are force images. The point of pre-processing is an enhancement of the picture information that stifles undesirable twists or improves some picture highlights critical for further preparing. Picture pre-preparing strategies utilize the impressive excess in images. If pre-handling plans to address some corruption in the picture, the nature of from the earlier data is important: knowledge about the idea of the debasement; truth be told, general properties of the corruption are assumed. Knowledge about the properties of the picture securing gadget, and conditions under which the picture was gotten. The idea of commotion (more often than not its ghastly qualities) is some of the time known learning about items that are looked for in the picture, which may rearrange the pre-preparing very extensively. On the off chance that information about articles isn't accessible ahead of time it very well may be assessed amid the handling. This is the second phase of a system. The output of an initial phase is given to this phase for further processing. In this phase, an image may get resize into 650 x 510for finding the diseased part from an image. An image may get converted into a particular shape for reducing processing time.

### C) Image segmentation:

Division portions an image into specific territories containing each pixel with similar characteristics. To be essential and supportive for picture examination and interpretation, the zones should determinedly relate to portrayed articles or features of premium. Huge division is the underlying advance from lowpoint picture taking care of changing a grayscale or shading picture into something like one diverse picture to anomalous state picture depiction with respect to features, articles, and scenes. The accomplishment of picture examination endless supply of division, yet an exact partitioning of an image is generally an incredibly troublesome issue. It might be seen that the utmost has successfully divided the image into the two commanding fiber types. In an edge-based division, an edge channel is associated with the image, pixels are appointed edge or non-edge dependent upon the channel yield, and pixels which are

not disconnected by an edge are apportioned to a comparative class. Locale based division estimations work iteratively by assembling pixels which are neighbors and have similar characteristics and part social occasions of pixels which are different in regard. This is the third phase of the system. The output of the second phase is given to this phase which is used to segment the image into pixel format. Due to the segmentation, an image is converted into its digital format. It is the techniques which describes the process of labeling the pixels of an image and share some properties.

#### D) Feature Extraction:

In machine-based learning, structure affirmation and in the picture getting ready, incorporate extraction starts from a basic course of action of evaluated data and produces surmised characteristics (features) wanted to edify and non-overabundance, empowering the resulting learning and theory steps and every so often inciting better human illustrations. A dimensionality decrease process can be considered as feature mining otherwise termed as highlight extraction, where an underlying arrangement of crude factors is diminished to increasingly sensible gatherings (highlights) for preparing, while still precisely and totally depicting the first informational index. Exactly when the data to a figuring is too broad to even consider being in any capacity arranged and it is suspected to be redundant (for instance a comparative estimation in the two ft and meter, or the dullness of pictures displayed as pixels), by then it will in general be changed into a decreased course of action of features. This is the fourth phase which comes under the convolutional neural networks (CNNs) technique. The outcome of segmentation i.e. filtered image is given to this phase as an input. This phase extracts some feature of an image/attribute of an image such as color extraction and shape of an image. This is done to detect and identify whether the disease occurred on crop or not.

#### E) Classification:

Unsupervised characterization is a strategy which inspects a substantial number of obscure pixels and partitions into various classed dependent on common groupings present in the picture esteems. In contrast to administered arrangement, unsupervised characterization does not require expert indicated preparing data. The classes that outcome from unsupervised order are phantom classed which dependent on characteristic groupings of the picture esteems, the personality of the ghostly class won't be at first known, must contrast grouped information with some form of reference information to decide the personality and instructive estimations of the unearthly classes. Along these lines, in the regulated methodology, to characterize helpful data classifications and after that look at their ghastrly distinctness; in the unsupervised methodology the PC decides frightfully detachable class, and after that characterizes their data esteem. It is the last phase of the system. An extracted feature of an image is given to this phase as an input to classify images into different formats. Based on convolutional neural network (CNN) characterization of the diseased image and healthy image is done. This phase scans the image and detects a spot on the image. There are various techniques used for classification in which the convolutional neural network (CNN) gives the best result.

## VI. Result Analysis

The proposed system is applying techniques on various diseases of crops which then identify and detect the diseases occurred on crops and recommend fungicides/bactericides (fertilizers) according to their diseases. Accuracy of this system is approx 95%. Figure [3] shows the detection of the disease occurred on rice crop.

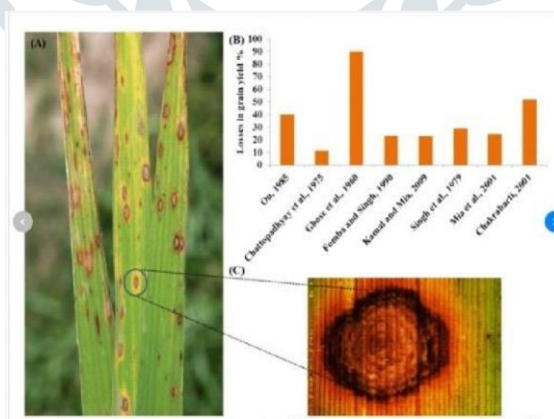


Figure-3: Detection of disease

## VII. Conclusion

This strategy center around picture preparing is connected for programmed leaf awfulness arrangement which set up on leaf picture handling. The task framework can apply with the utilized of down to earth demands, because of the pictures are caught immediately specifically from the farmland without bounty endeavors needed through the ranchers. The framework approach will offer counsel to the rancher with least endeavors. The agriculturist best requires to grab the picture of the yield leaves the utilization of portable camera and sends it to the lab module, with no extra sources of info. Research center module checks the leaf and again advances it to neural system module for getting suggestion of composts/pesticides.

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