

## Plant Leaf Disease Detection with Solution using Machine Learning

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### ABSTRACT

*Identification of plant leaf disease detection. Detection of disease and giving solution on disease. Nowadays mostly in air lots of disease are spread that disease affect the plant leaf and that leaf affects the glucose system. If the plant leaf has a disease than the fruit growth will decrease. The plant disease detection needs deep knowledge of disease and its solutions. We have use a Convolutional Neural Network with different layers to train our module and Android application as a user interface. The affected plant leaf disease will be captured and that captured image will compare with the pre-defined database or trained datasets. The comparison will show using the percentage if dataset match with captured image it shows the 100% or the 99%. The disease detection is analyzed; the final step the disease solution will be shown with the result. If the plant leaf is healthy it will show the plant leaf is healthy as an information message.*

**Keywords:-**CNN, Tensor flow, Leaf Disease.

### INTRODUCTION

In India, because of increase in pollution the plant leaf gets affected and most of the time it affect the production of food rate. The pollution affect the plant leaf with different disease and that disease names and solution can't be diagnosed and cured quickly and the rate of affect increases and production of food rate decreases. In India, the agriculture is the back bone it is a largest sector of livelihood in India. 70% of its rural households still depend primarily on agriculture for their livelihood, with 82% of farmers being small and marginal. India's climate varies and there is great diversity in ecosystem. India is the largest producer of the Banana in the world the 11 million tons a year. The production rate decreases day by day because of disease and the disease on plant leaf cannot be

detected at an early stage. This research is on a tomato and banana plant leaf. Mostly the climate affects the tomato plant leaf and banana so this research will help a farmer.

This research will help a farmer to increase the rate of food increase and get solution on proper disease on plant leaf. This android application interface is very user friendly and easy to handle no prior technology knowledge used in this system and get beneficial by it.

### LITERATURE REVIEW

Detecting Jute Plant Disease Using Image Processing and Machine Learning. Zarreen Naowal Reza, Faiza Nuzhat, Nuzhat Ashraf Mahsa, Md. Haider Al. We studied that from this paper the image analysis and

the detection of disease on plant. Identification and classification of image. This paper show the use of multi SVM classifier algorithm and using it to show the result along solution of jute plant disease[1]

Leaf Disease Detection and Recommendation of Pesticides using Convolution Neural Network. Pranali K. Kosamkar, Krushna Mantri, Nishant Gadekar, Shubhan Salmpuria. In this paper we studied the data pre-processing. The use of CNN algorithm its layers for classification image. The use of deep learning with the tensor flow technology and that technology use in android application. How both are work and the disease classified and its solution. [2]

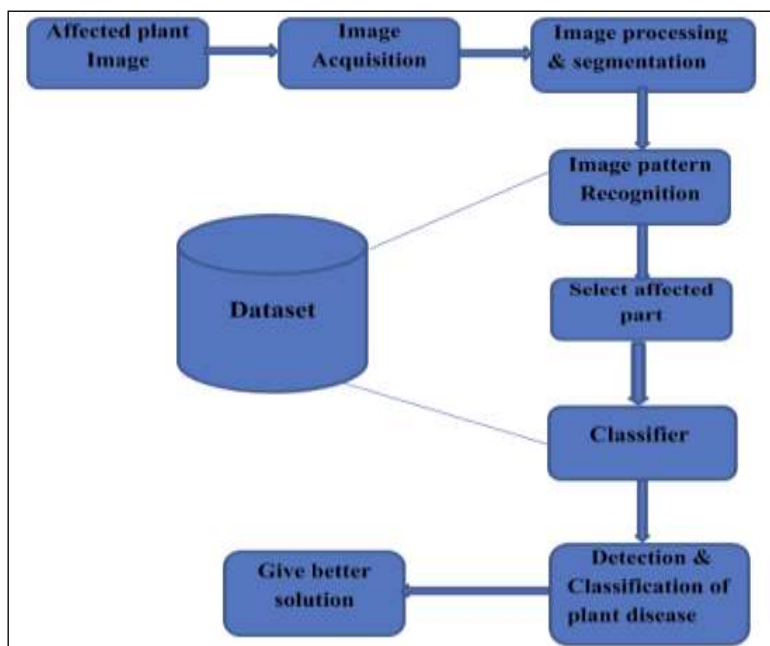
Plant Disease Detection Using Image Processing. Sachin D. Khirade, A. B. Patil. In this paper we studied that the plant

disease and it's detection is not easy. We get the image acquisition, image pre-processing, image segmentation, feature extraction. Collecting the dataset of different disease on plant and study that disease with solution. [3]

Application of Deep Learning in Object Detection. Xinyi Zhou , Wei Gong , Wen Long Fu, Fengtong Du. We learn that the deep learning in object detection task. The network of R-CNN choose network. Understanding of working on dataset of this network. Importance of deep learning. [4]

### SYSTEM OVERVIEW

The following system is easy to handle. The system is designed as client doesn't have a technical knowledge to operate it. This automated technic is based on choose the plant and capture and view the result.



*Fig.1:-System Overview*

Client will capture the image of plant leaf and that captured image is compares with the pre-trained dataset. That dataset is in a local server. That comparison shows the result in percentage if the plant leaf is

affected than it shows the result disease name and the solution on it. If the plant leaf is not affected by any disease it will show the healthy plant.

### SYSTEM IMPLEMENTATION

The propose system is developed for two particular plants that is Banana and Tomato. There is a mainly process start with the capturing the affected image. It is a first phase of image acquisition. That captured and acquisition image is goes for the image segmentation and processing. The pre-trained dataset images are compare with the captured image and the affected image is processing well and the disease will get find out and its solution. There is a training phase and second on is testing phase. In training phase we multiple number of images of affected and a healthy plant leaf are trained and do the different folders of training dataset. Testing phase the one affected image give for testing and the test done properly or not is decide. The affected image is test that image pass through the trained neural network and the classification after that we get the result and know which diseases is affected the plant leaf. We get the result after that the disease solution is recommendation is done.

### CNN ALGORITHM

CNN (Convolution Neural Network). CNN used for training purpose and we get

the training module of banana and the tomato plant leaf. The classification done we get the proper disease name and the related solution of that disease. If the plant leaf is no disease than it shows the plant is healthy.

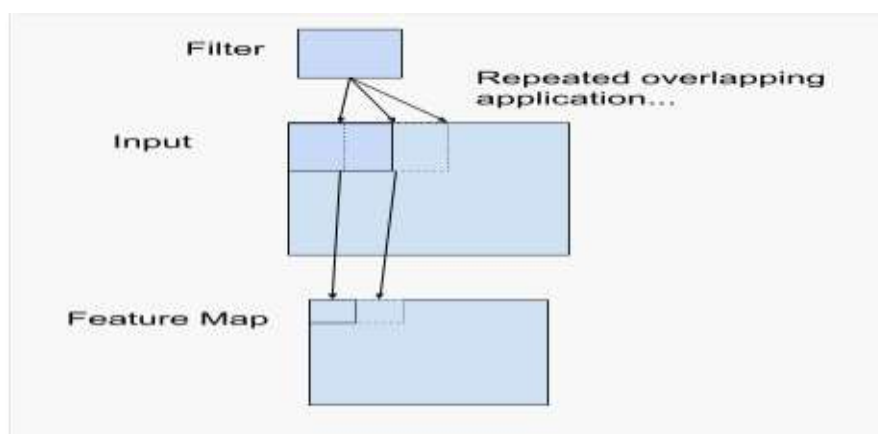


*Fig.2:-Sample image from dataset.*

### CNN WORKING

#### Convolution Layer

It is a specialized type of neural network for working with two dimensional image data, although it uses with one dimensional and three dimensional data. This layer performs an operation called as “convolution”. It involves the multiplication of the set of weight with input. The multiplication is performed between an array of input data and a two-dimensional array of weights, called a filter or a kernel.

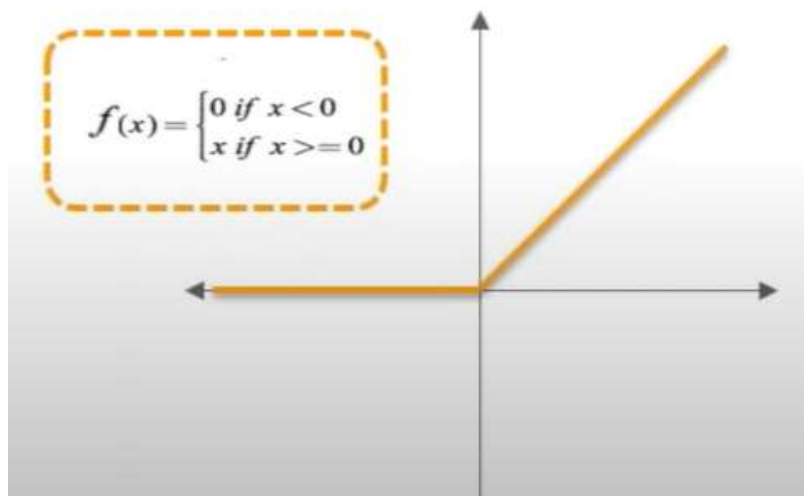


*Fig.3:-Convolution layer filter.*

#### ReLU Layer

Rectified Linear Unit (ReLU) transform function only activations a node if the input is above a certain quantity, while the

input is below zero, the output is zero, but the input rises above a certain threshold, it has a certain relationship with the dependent variable.



**Fig.4:-Function of ReLU.**

In this layer remove every negative value from the filtered images and replace it with zero. This is done to avoid the values from summing up to zero.

**Pooling Layer**

In pooling layer the shrinking the Image

stack into a smaller size. Pick a window size usually two to three. Pick a stride usually two. Walk your window across your filtered images. From each window take the maximum value.



**Fig.5:-Shrinking symbol.**

Output passing through Convolution layer, ReLU layer, pooling layer. Stacking up the layers got the 4\*4 matrix and adding one more time that three layer than got the 2\*2 matrix it shrink that image from 4\*4 to 2\*2 matrix.

**Fully Connected Layer**

This is the final layer where the actual calculation happens. Here take the shrink image and put them into a single list it is a 12 element vector. That output is same as when training the data.

Whenever new image is input the comparison is done with trained values.

The input image values vector taking higher values of sum and divide with the previous vector higher values sum the input image is classified got a higher value after compare and accurate result is show.

**Mathematical Model**

Let,  $S = \{I, F, O, F', S\}$ .

S be Closed system defined as,  $S = I, F, O, F', S$ .

To select the input from the system which is {I} and perform various actions.

Function = {F1, F2, F3, F4, F5}

Where,

- Image Acquisition

- Image Processing and Segment.
- Pattern Recognition
- Classification of plant disease
- Provide Solution

Output = {O1, O2}

1. Classification of disease of captured plant leaf.
2. Solution of disease of captured plant leaf if disease is detected on leaf.

### CONCLUSION

In this work we develop the android application achieve to find out the banana and the tomato plant leaf disease with the help of CNN model and on that disease recommend the solution of that disease. Here is the user can check itself a plant leaf is healthy or not and achieve the good food.

### FUTURE SCOPE

Here we treated two plant leaf in future we will done the more than ten plant leaf disease detection with solution.

### REFERENCES

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