International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 09 | September - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

# Plant Leaf Disease Detection Using Deep Learning And CNN

Prof. Mithuna H R, Praveenkumar K V, Rashmitha, Shwetha M, Sinchana

STUDENTS OF DEPARTMENT INFORMATION SCIENCE AND ENGINEERING

ACHARYA INSTITUTE OF TECHNOLOGY, SOLADEVANAHALLI. 560107

---***---

**Abstract -** The suggested technology aids in the detection of plant disease and provides a remedy that will be used as a defence against the disease. The information found on the internet is fascinatingly hidden, so unique plant species are identified and given new names in order to build a reliable database of data. This database then contains a variety of plant diseases that are used to assess the enterprise's accuracy and level of confidence. Then, using data from coaching tasks, we will train our classifier to produce results with the highest accuracy possible. We frequently employ a convolutional neural network called the FASTER CNN, which has various layers utilised for prediction.This project offers a method for identifying diseases from images of plant leaves using Tensor Flow, an object identification API. The model was trained to use a quicker RCNN approach. Additionally, the accuracy value is determined. Our information processing system learning strategy learns often and could be easier in plant disease investigation when given a large amount of education and an outstanding sample of datasets.

## 1. INTRODUCTION

The In India, agriculture is the main occupation. In terms of global agricultural output, India comes in second. Farmers in India grow a wide range of different crops. The production of the crops is influenced by a number of variables, including the climate, the soil, numerous diseases, etc. The current approach for identifying plant diseases relies solely on visual inspection, which requires additional labourers, properly outfitted labs, expensive equipment, etc. Inadequate disease diagnosis can also result in inadequate pesticide use, which can lead to the development of long-term pathogen resistance and lower the crop's capacity to defend itself. By looking at the area on the diseased plant's leaves, the plant disease may be identified. We are utilising image processing with a convolution neural network (FASTER R-CNN) to find plant illnesses. In order to automatically identify plant illnesses by looking at the plant leaves, this research creates a design for machine learning. Our goal is to build a system that can accept photos as input and, after careful testing, output the name of the disease. We manually collected the data for the solution we recommended, made use of a quicker R-CNN algorithm, and other essential tools for putting it into practise.

## 2.PROPOSED SYSTEM

With a combination of texture and colour feature extraction, this project proposes an image pattern classification to identify various leaf diseases. The goal of this research is to discover suitable characteristics that can detect leaf disease.These photos are used to extract the shape, colour, and texture features. Following that, a Convolution Neural Network classifier is used to categorise these images.To analyse the acceptable characteristics and discover specific characteristics for illness type identification, a combination of many features is used.

## 3.PROBLEM STATEMENT

Plant infections are often found by educated agricultural professionals visually examining plant tissue. However, with the accelerated expansion of agriculture, particularly in vast planting areas, manual detection techniques are no longer appropriate. Symptoms on plant leaves are used to optically diagnose plant diseases. How to use continuous picture capturing to precisely and quickly discover Phyton

pathogenic issues across the cultivation field in large-scale cultivations. The following were the key instances when the database's field-conditions pictures were problematic:

To design and develop an efficient and automatic system to detect diseases in banana leaf images, using image processing, in order to minimize professional interference and thus reduce the expenditure involved in the banana growing industry.

## 4.REQUIREMENT SPECIFICATION:

- Programming language: Python
- Software packages: Tensorflow, OpenCV
- Front End: HTML,CSS, Javascript
- Back end: python 3.7.9 or higher
- Operating system: Windows 7/8/10/11

## 5.HARDWARE REQUIREMENTS:

- Processor: Dual core / i3 and above
- Harddisk: 40GB.
- RAM: 512MB minimum
- Monitor: 15 VGAColor

## 6.IMPLEMENTATION

The project's ability to function is shown during implementation. The system pushes for actual operations throughout implementation. If processes are correctly carried out and the plan is followed out, every outcome of the project will be abundant.

There are 5 components in the system. They are (1) Image Acquisition (2) Image Preprocessing (3) Image Segmentation (4) Feature Extraction (5) Classification.

1. Image Acquisition: The process of gathering pictures is called image acquisition. Despite doing a thorough search on the dataset of leaves, we were unable to identify any that met our criteria.
2. Image Pre-processing: Using Python, RBG pictures may be transformed into Grayscale images as part of image preparation. A RGB picture is one that retains all of its original colours. Black and white are combined in grayscale pictures.
3. Image Segmentation: By using image segmentation, the image is divided into useful parts. It separates digital images into many sections. Simplifying or transforming the representation into a more meaningful visual is the aim.
4. Feature Extraction: The diseased area of the leaf is removed or made visible in order to make categorization simpler. To discriminate between the photos, features are retrieved.
5. Classification: The classification, for which Tensor Flow and machine learning algorithms will be utilized, is covered in the final module. A Python-friendly open source framework for numerical computing called Tensor Flow accelerates and simplifies machine learning. Dataflow graphs-structures that depict how data flows across a graph or a collection of processing nodes-can be created by developers using Tensor Flow .

## 7.Disadvantage:

Although convolutional neural networks (CNNs) have showed significant promise for detecting leaf diseases, there are a number of possible drawbacks to take into account:

- Limited Generalisation: CNN models may not generalise adequately to new and untested datasets because they were trained on a particular dataset. As a result, the model may not perform well on leaves that it has not encountered during training, producing predictions that are off.
- Overfitting: CNNs are easily prone to overfit the training data, which means that instead of generalising to new data, they learn to recognise certain properties of the training dataset. This can result in worse performance on hidden data. channels.

## 8.Advantage:

- High Accuracy: In tests, CNNs outperformed both conventional machine learning algorithms

and human specialists in identifying leaf illnesses.

- Robustness to Variability: CNNs are able to recognise in leaf pictures patterns and traits that are challenging for humans to notice, such as minor colour variations or tiny form changes brought on by illness. As a result, the method is resistant to variations in leaf image data.

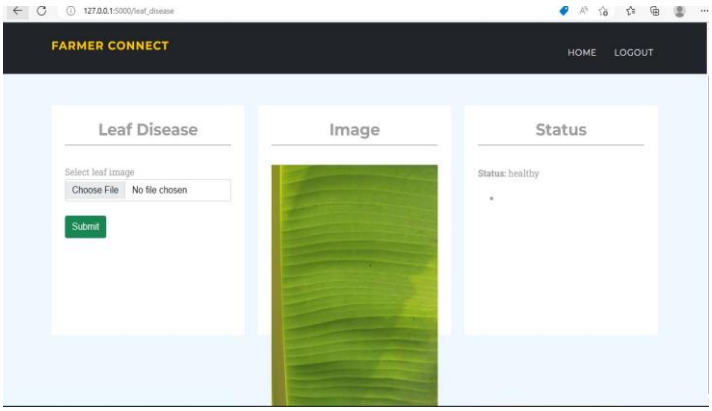
## 9. Algorithm Used:

Deep learning models known as convolutional neural networks (CNNs) are frequently employed for image identification and classification applications. Convolutional, pooling, and fully linked layers are some of the layers that make up CNNs.

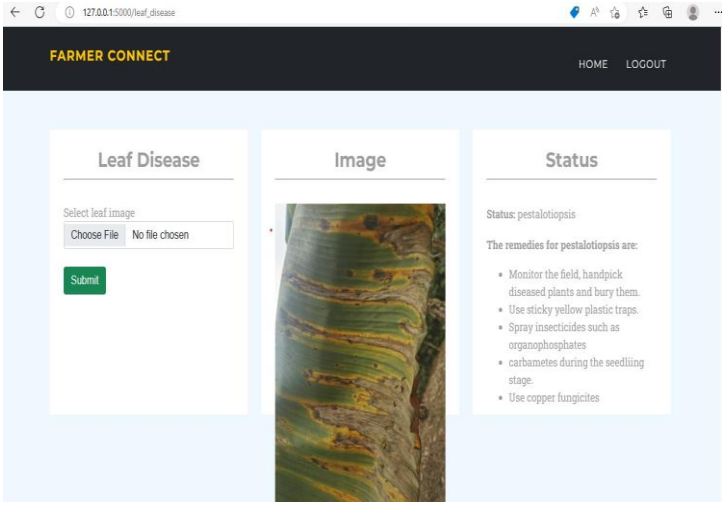
- By using a filter that scans a small portion of the entire picture at a time, the convolutional layer produces a feature map to predict the class probabilities for each feature.
- The convolutional and pooling layers' processes often alternate numerous times, and the pooling layer reduces down the amount of information the convolutional layer generated for each feature while maintaining the most crucial data.
- It flattens the outputs of earlier layers into a single vector that may be utilised as an input for the following layer through the usage of a fully linked input layer.
- Fully connected layer: To accurately forecast a label, weights are applied to the input created by the feature analysis.

## 10.SNAPSHOTS

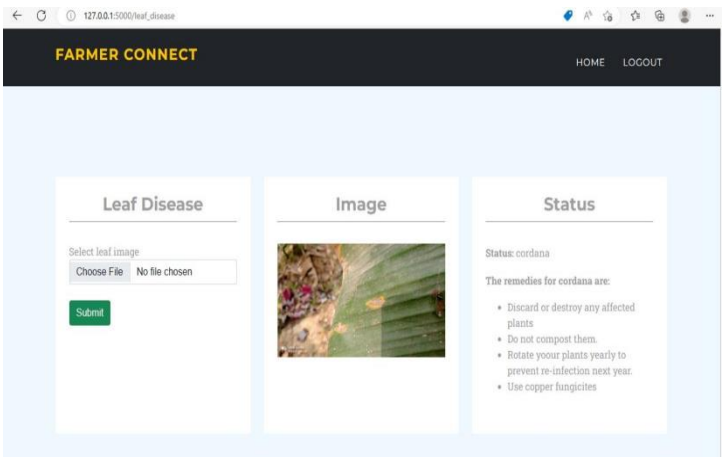
### 1. FIG 1



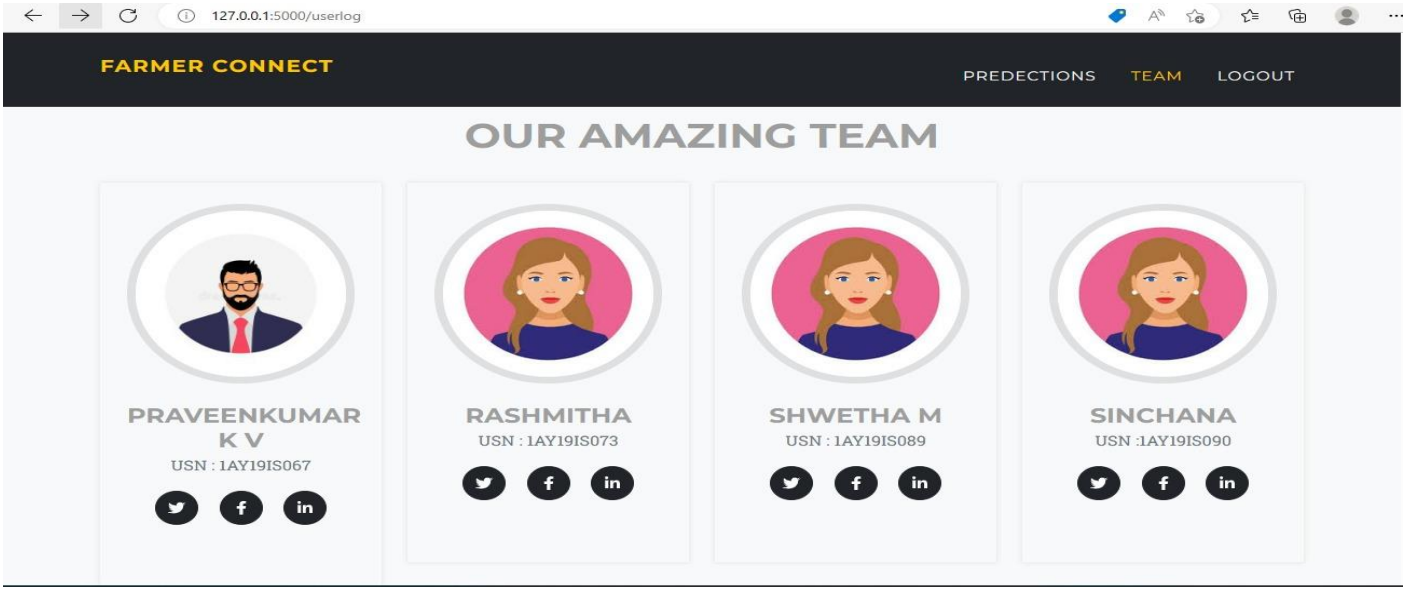

### 2. FIG 2




### 3.FIG 3



**4.FIG4**




## 11.SYSTEM DESIGN

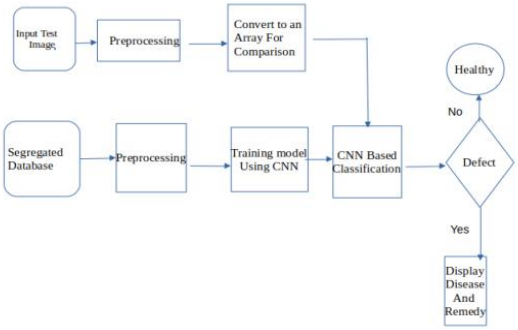



FIG 11.1 System design of leaf disease detection

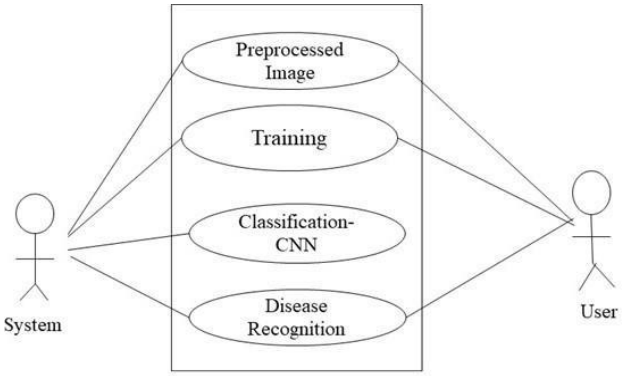



FIG 11.2 Use Case Diagram of leaf disease de

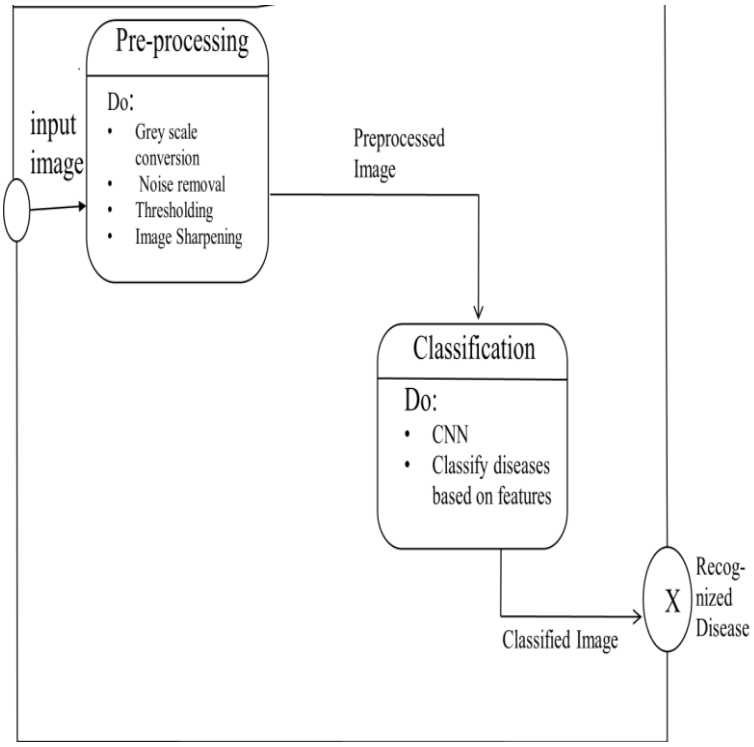



FIG 11.3 Object Diagram of leaf disease detection

## 12.CONCLUSION

1. Despite requiring greater computing power, VGG is by far the best model for this application, with accuracy rates of over 80%. The Mobile Net approach can be preferable for more basic devices with slower processors. It provides a productive experience even with reduced accuracy rates.
2. In this study, several CNN architectures are utilised to identify banana leaf illnesses using a relatively straightforward yet effective technique. This study focuses on several techniques for predicting and categorising leaf diseases. We also explore several image processing approaches in the suggested methodology. We can change the existing algorithms to categorise leaves with excellent accuracy.
3. At the current level, farmers at the lower end of the spectrum may use this system to input images of damaged leaves as input and retrieve the disease's name as output, which, when given to a retailer of pesticides, can easily be addressed with the appropriate sprays. In order to detect epidemic-like disorders in their earliest stages and easily handle them on a higher level, hence being of societal benefit, this technology may be used on a wide scale by agricultural authorities over huge parcels of land

## 13.REFERENCE

[1] P.K. Sethy, N. K. Barpanda, A. K. Rath, and S. K. Behera, ‘‘Deep feature based Rice leaf disease identification using support vector machine,’’Comput. Electron. Agricult., vol. 175, Aug. 2020, Art. no. 105527

[2] V.Singh and A. K. Misra, ‘‘Detection of plant leaf diseases using image segmentation and soft computing techniques,’’ Inf. Process. Agricult.,vol. 4, pp. 41–49, Mar. 2017.

[3] S.H. Lee, C. S. Chan, S. J. Mayo, and P. Remagnino, ‘‘How deep learningextracts and learns leaf features or plant classification 1-13, Nov 2017.

[4]S.Geetharamani and P. J. Arun, ‘‘Identification of plant leaf diseases usinga nine-layer deep convolutional neural network,’ Jun 2019.

[6] A. Krizhevsky, I. Sutskever, and G. E. Hinton, ‘‘ImageNet classification with deep convolutional neural networks,’’ in Proc. Adv. Neural Inf. Process. Syst. (NIPS), vol. 25, Dec. 2012, pp. 1097–1105.

[7] Ren, W. Liu, and G. Wu, ‘‘Feature reuse residual networks for insect pest recognition,’’ IEEE Access, vol. 7, pp. 122758–122768, 2019.

[8] V. Hoang Trong, Y. Gwang-hyun, D. Thanh Vu, and K. Jin-young, ‘‘Latefusion of multimodal deep neural networks for weeds classification,’’Comput. Electron. Agricult., vol. 175, Aug. 2020, Art. no. 105506.

[9] J. Chen, J. Chen, D. Zhang, Y. Sun, and Y. A. Nanehkaran, ‘‘Using deep transfer learning for image-based plant disease identification,’’ Comput.Electron. Agricult., vol. 173, Jun. 2020, Art. no. 105393.

[10] G. Farjon, O. Krikeb, A. B. Hillel, and V. Alchanatis, ‘‘Detection andcounting of flowers on apple trees for better chemical thinning decisions,’’Precis. Agricult., vol. 21, pp. 1–19, Aug. 2019.