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IDENTIFICATION OF LEAF DISEASE USING DEEP LEARNING MODEL

GUNA.HARI KEERTHANA,

M.TECH ,DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

ANDHRA UNIVERSITY,VISAKHAPATNAM

ANDHRA PRADESH,INDIA

Keerthanaguna1998@gmail.com

Abstract-India is an agrarian nation, with agriculture employing more than 70% of the population. Agriculture contributes to a percentage of our national revenue. Agriculturalists are losing money owing to numerous crop illnesses, and cultivators find it difficult to keep track of the crop on a regular basis when the cultivated area is large. As a result, plant disease identification is critical in the agricultural area. For the loss caused by agricultural diseases, which has a negative impact on crop quality and output, timely and precise disease identification is critical. Early detection and response can help to prevent plant loss due to disease and wasteful drug use. Image processing was previously used to detect plant disease automatically. Image processing tools as well as a machine learning mechanism are proposed for disease detection and classification. Crop disease will be detected via image processing stages such as image acquisition, image pre-processing, image feature extraction, feature classification, disease prediction, and fertilizer recommendation. Disease detection is important because it may assist farmers in providing appropriate solutions to prevent this disease. The proposed project seeks to develop a system that uses CNN to detect leaf diseases with increased accuracy on real-time leaf datasets with unstable or distorted backgrounds.

Keywords: *classification, image processing, plant leaf disease identification, convolutional neural network, deep learning.*

I. INTRODUCTION

Farmers' economic growth is determined by the quality of the yield they produce, which is directly related to the growth of the plant and the yield they will obtain. Plants are attacked by various types of disease that attack different parts of the plant's body such as the leaf, stem, seed, and fruit, among others. Machine learning appears to be a better solution to this problem. Several machine learning techniques have recently been proposed for identifying and classifying plant disease from plant images. Many crops, particularly cash crops, play a significant role in the country's industrial and agricultural economies. Six million farmers in India rely solely on agriculture for a living.

Fig:1 Disease Plant Leaves

1.1 MOTIVATION OF THE PROJECT

The agronomic requirements, though in radically different ways than those currently in use, have given rise to a plethora of new opportunities to serve. As a result, they should be tested using non-destructive methods. The leaves are a delicate part of the plant, and they are used to evaluate agricultural harvests. Classification is fluid. The texture and colour of the leaves are the most important visual properties. As a result, plant disease classification is required in evaluating agricultural produce, increasing market value, and meeting quality standards. It is also beneficial to identify and take further actions to prevent the spread of diseases. The process will be too slow. If identification and categorization are done using physical techniques, we will require the assistance of experts, who may be error prone and scarce. Labor is classified based on colour, size, and so on. If these quality "methods" are recorded into an automatic system using an appropriate program me design language, the effort will be error-free and faster.

1.2 PROBLEM DEFITION

Here, we would like to create a project that will be used to identify the most common diseases of Leaf. The term "plant disease" or "Planta disease" refers to any adverse condition or function of the plant and its system. The problem of plant disease detection entails modelling health data images of a plant with knowledge of the ones that have been attacked by bacteria. . This model is then used to determine whether a new record or data of a specific plant is likely to be attacked by plantae disease or not. Our goal is to "detect plant disease in a field with greater accuracy, assisting the plant in disease prevention at an early stage." We firmly believe that "prevention is better than cure."

1.3 OBJECTIVE OF THE PROJECT

The primary goal of the project is to develop a programme for detecting leaf disease using a CNN model classifier. Some technologies, such as machine learning, artificial intelligence, deep learning, and other fields of information technology, are on the rise. . These technologies assist us in automating the System. Automation saves a significant amount of time and effort in plant disease detection systems, allowing proper measures to be taken to make plants and crops healthier.

I. LITERATURE REVIEW

Wan Mod Fadhil et al [1] represented a way for detective work malady on the leaves of Associate in Nursing orchidaceous plant. pictures of orchidaceous plant leaflets square measure captured employing a camera. The algorithmic program employs a mixture of many methods, together with morphological process, filtering techniques, and border segmentation ways, to categorise pictures into 2 malady categories. star scorch and black leaf spot square measure 2 of the categories employed in this. The segmentation technique projected and employed in this study, however, will solely distinguish between 2 kinds of orchidaceous plant disease. different kinds of orchidaceous plant disease should be classified employing a new or totally different segmentation technique. this is often thanks to the very fact that finding sturdy border segmentation techniques necessitates an oversized variety of process technique combos.

Aditya Parikh et al. [2] specialize in malady detection and malady stage estimation for a given image of a bush leaf. The projected work employs 2 cascaded classifiers, the primary of that segments leaf from the background and employs native applied mathematics options. Then, victimization light and hue from the HSV color house, another classifier is trained to discover malady and determine its level. The developed algorithmic program is universal, because it will be applied to any malady. Cascaded classifiers, on the opposite hand, square measure smitten by a spread of conditions, like the border of the leaves being visible, the leaves being massive enough for analysis, and also the inquisitory requiring a controlled setting.

Bhumika Hindu deity et al. [3] gift a survey on the detection and classification of cotton plant disease. it's troublesome for human eyes to work out which sort of plant disease is gift on a plant leaf. As a result, the employment of machine learning and image process techniques is also useful in accurately characteristic cotton leaf diseases. the pictures used for this task were taken during a cotton field with a camera. The background removal technique is employed within the pre-processing step to get rid of the background from the image. The background-removed pictures square measure then processed any for image segmentation victimization the thresholding technique. However, this work solely describes a general and distinct approach to detective work and classifying cotton leaf diseases, similarly as segmentation and background removal techniques.

P. R. Ruthe et al. [4] gift a pattern recognition system that identifies and classifies 3 cotton leaf diseases: microorganism Blight, Alternaria, and Myrothecium. the images used for this purpose were taken within the cotton fields of Buldana and Wardha districts, similarly as within the fields of the "Central Institute of Cotton analysis Nagpur." The active contour model is employed for image segmentation, and Hu's moments square measure extracted as options for coaching the adaptative neuro-fuzzy reasoning system. Seven invariant options, on the opposite hand, square measure extracted from 3 kinds of diseased_ leaves pictures and accustomed train a neuro-fuzzy reasoning neural network. The classification of neural networks is predicated on invariant options.

Malika Sar Dogan et al [5] gift a CNN algorithmic program and Learning Vector division algorithm-based methodology for detective work and categorizing Lycopersicon esculentum plant disease. The dataset contains five hundred pictures of Lycopersicon esculentum leaves with four malady symptoms. They created a CNN model to perform automatic feature extraction and classification. However, one among the most important challenges for this study is that the leaves with totally different diseases square measure essentially an equivalent. As a results of this likeness, many leaves is also folded into the inaccurate categories.

Nefarian mod Yusuf et al [6] gift a time period edge detection technique for characteristic diseases on genus Hevea leaves (rubber leaves), similarly as its hardware implementation. There square measure 3 main diseases that have an effect on genus Hevea leaves. For image comparison, 3 diseases square measure used: veronica Leaf Spot, Corynespora Leaf Spot, and Collectotrichum plant disease. The Sobel edge discovery algorithmic program will be accustomed detect the malady. The output of the "FPGA Cyclone IV E". This result's then displayed on a monitor. MATLAB is employed to form the Sobel edge detection algorithmic program. The outcomes of each techniques square measure compared. However, the execution of the Sobel edge detection algorithmic program depends on MATLAB and FPGA hardware, with the output displayed on a VGA monitor

Indumathi.Retal [7] identify the affected area of the leaf as well as the disease that attacks the leaf. Image Processing is used to accomplish this. This system employs "K Medoid clustering" and the "Random Forest algorithm" to improve the precision of leaf disease detection. The image is pre-processed, and then the clustering method is used to identify the affected region of the leaf. Random Forest, on the other hand, is a decision tree-based algorithm. When compared to other algorithms, accuracy is low. Random forest is essentially used with text data.

Gayatri Kuricheti et al [8] develop an algorithm for detecting and preventing disease spread throughout the crop, resulting in an excellent harvest creation. A database containing various leaf images was created. These images were segmented using k-Means, and the textural analysis of the leaf images was completed using GLCM. After ranking their attributes using an information gain algorithm, the SVM classifier is used to categorise the feature extracted images. The main disadvantage of the K-mean clustering algorithm is that it requires a large number of clusters to fix. Three clusters can be ideal for extracting the infected part of the leaf. Each cluster will denote the image's background, a healthy part of the leaf, and an infected part of the leaf separately.

Chaowalit Khitthuk et al. [9] present an unsupervised neural network-based diagnosis system for plant leaf disease. Color and texture features are both used in image processing. The system is primarily composed of two processes: feature extraction and disease classification.The disease feature extraction method analyses the presence of features using a statistic-based grey level co-occurrence matrix and texture feature equations. To categorise disease types, the "unsupervised simplified fuzzy ARTMAP neural network" is used in the disease classification method. To test the method's classification efficiency, four types of photographs of grape leaf disease are used: rust, downy mildew, scab, and no disease. However, in many classification systems, unsupervised features are not as practical as traditional backpropagation networks and machine learning.

PENG JIANG et al [10] presented a collection of images of diseased apple leaves in real-world conditions. Images that are complex and laboratory in nature are used. Image annotation and data_ augmentation technologies are used to create the dataset first. Based on this, a new model for detecting apple leaf disease using deep-CNNs is proposed, which incorporates Rainbow concatenation and the Google Net Inception structure. Finally, the proposed model is trained using a dataset of 26,377 images of diseased apple leaves from the hold-out testing dataset. This model can detect common apple leaf diseases like Grey spot, Brown spot, Alternaria leaf spot, Rust, and Mosaic. However, disease detection failures are observed in these cases.

II. SYSTEM ARCHTECTURE

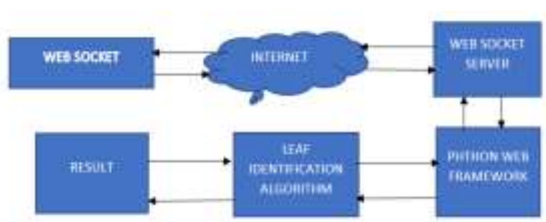

Fig: System Architecture

Web Socket: an internet Socket could be a laptop prescript that enables for full-duplex communication channels to be established over one TCP association. Send the captured image to the net socket server employing a mobile camera. we tend to used an area Server in our project.

Python: python could be a high-level understood programing language for all-purpose programming. OpenCV should be put in in Python. 'Open-source laptop vision library' was supported in 1999 by a bunch of passionate coders with the goal of incorporating Image process into a large vary of committal to writing languages. It runs on Windows and has C++, C, and Python interfaces. Linux, Android, and macintosh are supported. it's one amongst the Python libraries used for image process. It detects and identifies the Leaf and diseases on the Python internet framework by mistreatment the leaf Identification rule. It sends the result back to the see farmer by employing a info.

III. PROPOSED METHODOLOGY

Plants are at risk of a spread of disease-related disorders and seizures. There ar various causes that may be distinguished by their impact on plants, disturbances caused by environmental conditions like temperature, humidity, excess or skimpy food, light, and also the commonest, Bacterial, viral, and plant diseases are samples of infectious diseases. we tend to use the CNN rule within the projected system to find unwellness in plant leaves as a result of it achieves the best accuracy if the information is sweet.

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CONTENT DIAGRAM OF THE PROJECT

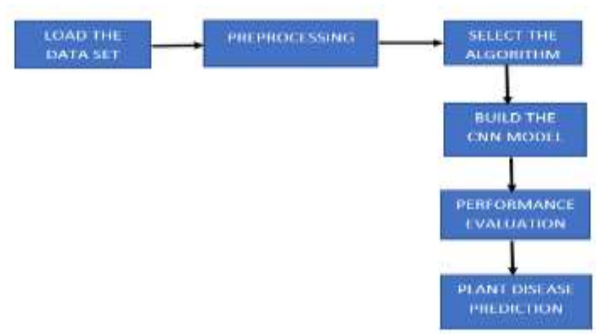

Fig: proposed System Architecture

A.DATASET

Many tasks are concerned within the diagnosing of leaf diseases, as well as image acquisition, image preprocessing, feature extraction from pictures, and classification of leaf diseases supported image options like color options, form options, and texture options. the primary stage is that the acquisition of pictures. throughout this part, pictures from the leaf dataset are uploaded. we tend to create use of the Plant Village Dataset. The Plant Village dataset contains 54303 healthy and unhealthy leaf pictures classified into thirty eight species and unwellness classes. we tend to analyzed over fifty,000 pictures of plant leaves with distributed labels from thirty eight categories so as to predict unwellness category. we tend to size the image to 256 256 pixels and use this compressed image to perform optimization and model predictions.

Leaf Category	Images
Apple	3171
Cherry	1906
Grape	4062
Peach	2657
Pepper	2475
Potato	2152
Strawberry	1565
Tomato	18170
Total	36148

Table:1 DATASET BREAKUP

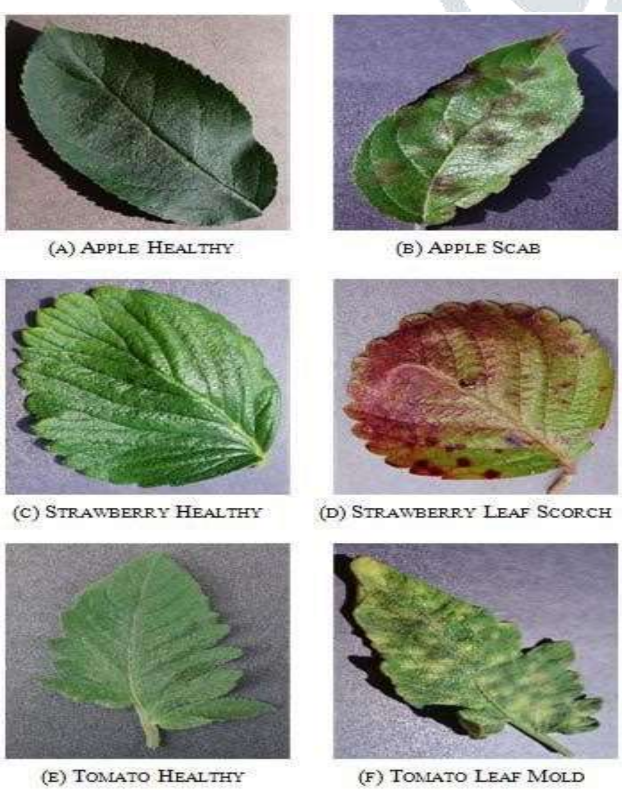

FIG3:ImagesOf Data Set

B.DATA PROCESSING

The image is then preprocessed using a variety of techniques. Image augmentation is critical in the development of an effective image classifier. Even if datasets contain hundreds to thousands of training examples, the variety may not be sufficient to build an accurate model. Image augmentation options include flipping the image vertically/horizontally, rotating the image through various angles, and scaling the image. These augmentations aid in increasing the amount of relevant data in a dataset. Each image in the Plant Village dataset is 256 x 256 pixels in size. The Keras deep-learning framework is used for data processing and image augmentation.

The following are the training augmentation options:

- Rotation - Rotate a training image at random over a range of angles.
- Brightness - Assists the model in adapting to changes in lighting by feeding images of varying brightness during training.
- Shear - Modifies the shearing angle.

C.SELECTING THE MODEL

In the third phase, features extracted from the image for the infected portion of the leaf are extracted. This is done based on specific properties of pixels in the image or their texture. Then, statistical analysis tasks are performed to classify the features that represent the given image. To compare image features, deep learning is used. Choosing a Model for Feature Extraction

S = I, F, O is the mathematical model for the Leaf Disease system.

Where,

I = Image leaf dataset set

F = Functions as a group

O=prediction of leaf disease

F1 = F2,

F2= F3.

F1 denotes data collection,

F2=denotes data preprocessing,

F3 =denotes feature selection, and

F4= denotes classification.

F5=Detection of leaf disease.

D.BUILDING THE CNN MODEL

Convolution Neural Network (CNN)Algorithm:

The CNN algorithm is divided into two layers. The first layer is the feature extraction layer, which connects each neuron's input directly to the previous layer's local ready fields and extracts local features. Once the local features are extracted, the spatial relationship between them and other features will be shown. The other layer is the feature map layer; each feature map in this layer is a plane, and the weights of the neurons in each plane are the same. The structure of the feature plan makes use of the sigmoid function. This function is known as the CNN activation function, and it causes the feature map to shift in difference. Each convolution layer in the CNN comes after a computing layer and is used to find the local average as well as the second extract; this extraction of two features is a unique structure that reduces the resolution.

CNN's algorithm is as follows:

Step 1: Choose a dataset.

Step 2: Select features based on information gain and ranking.

Step3:Use the CNN Classification Algorithm.

Step 4: Determine the fx value of each feature in the input layer.

Step 5: Determine the bias class of each feature.

Step 6: The feature map is created and sent to the forward pass input layer. Step 7: Convolution cores in a feature pattern are calculated.

Step 8: Create the sub sample layer and the feature value.

Step 9: Back propagation of the kth neuron's input deviation in the output layer.

Step 10: Finally, present the results of the selected feature and classification.

E.PERFORMANCE EVALUATION

```
[ ]  print("[INFO] Calculating model accuracy")
     scores = model.evaluate(x_test, y_test)
     print(f"Test Accuracy: {scores[1]*100}")

[INFO] Calculating model accuracy
25/25 [==============================] - 37s 1s/step - loss: 0.1382 - accuracy: 0.4769
Test Accuracy: 47.69230782985687
```

F.PLANT DISEASE DETECTION

Detection of the entire method is split into 3 stages

1.Users produce input pictures on their devices or transfer them to our net application 1st.

2.Image segmentation, image sweetening, and color house conversion area unit all a part of the segmentation pre-processing method. First, the image's digital image is increased with a filter. Then, for every image, produce associate degree array. every image name is reborn to a binary field victimization the scientific name for Binarizes Diseases.

3.CNN classifiers area unit trained to recognise diseases in numerous plant categories. Level a pair of results area unit wont to invoke a classifier that has been trained to spot numerous diseases in this plant. The leaves area unit classified as "healthy" if they're not gift.

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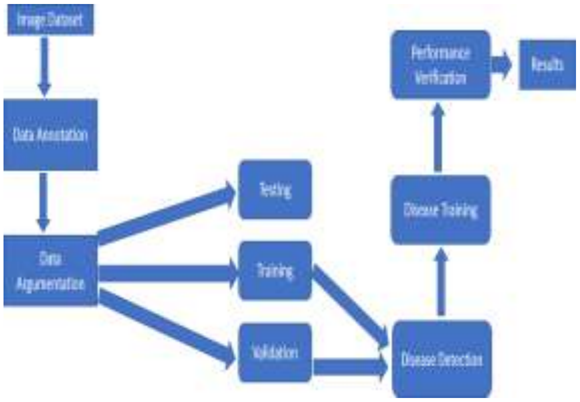
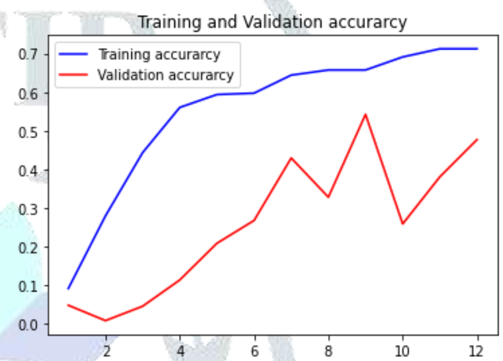


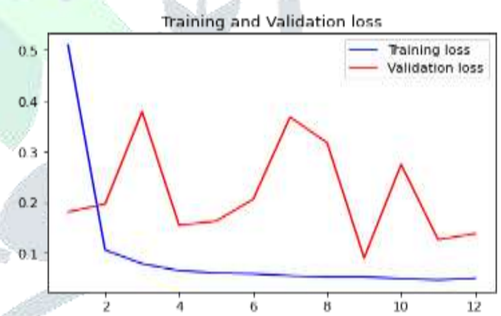
IV. EXPRERIMENT AND RESULTS

We selected solely four hundred pictures from every folder. every image is created into associate degree array. moreover, we have a tendency to processed the input data by scaling the information points from [0, 255] (the image's minimum and most RGB values) to the vary [0, 1]. The dataset was then divided into seventieth coaching pictures and half-hour testing pictures. we have a tendency to produce image generator objects that perform random rotations, movements, inversions, cultures, and elements of our image set. we have a tendency to use a "last channel" design within the normal model, however we have a tendency to additionally build backend switches that support "first channel." Then we have a tendency to begin with Conv => Relu => Pool. Our Conv layer consists of thirty six filters, every with a three x three core and believe activation (linear correction module). we have a tendency to use batch normalization, most aggregation, and a discount of twenty seventh. (0.26).Dropout may be a management technology that forestalls the correction of advanced cooperative knowledge for coaching, thereby reducing neural network readjustment. this can be a robust technique for averaging neural network models. Then we have a tendency to create 2 sets of blocks (Conv => Relu) * a pair of => Pool. After that, it's simply a series of totally connected layers (fully connected layers) => Relu.

For our model, we have a tendency to use Adam's onerous Optimizer. Our network begins with model. work generator. Our goal is to feature knowledge, train - check knowledge, and therefore the variety of epochs to coach. For this project, we have a tendency to used a price of five for epochs.

Crop protection in organic farming could also be a troublesome task. this may be enthusiastic about Associate in Nursing intensive understanding of the crop being massive more as potential pests, pathogens, and weeds. In our system, a special deep learning model supported a special subject convolution network has been developed to find plant diseases practice footage of healthy or pathological plant leaves. The above-mentioned system is upgraded to a amount of your time video entry system, permitting unattended plant care. associate intelligent system that cures notable ailments. is another feature which will be supplementary to sure systems. sickness management has been shown in studies to increase yields by up to forty eighth.





VI. CONCLUSION

Crop protection in organic farming may also be a difficult task. This may be excited about Associate in Nursing in-depth understanding of the crop as potential pests, pathogens, and weeds. A special deep learning model supported by a special subject convolution network has been developed in our system to detect plant diseases in practise footage of healthy or pathological plant leaves. The previously mentioned system has been upgraded to a time-based video entry system, allowing for unattended plant care. Another feature that will be added to certain systems is an intelligent system that cures notable ailments. In studies, sickness management has been shown in studies to increase yield by upto 47%

V. REFERENCES

[i] The first names on the list are Chouhan, Siddharth Singh, Ajay Kaul, Uday Pratap Singh, and Sanjeev religion square measured. "An organism-searching optimization -based radial basis operate neural network (BRBFNN)-based approach to plant pathology for the identification and classification of plant leaf diseases." 8852-8863 in IEEE Access, vol. 6, no. 6. (2018).

[ii] Fadzil, W.M. M. T. Nooritawati, N. Wan Mohd, MS B. Shah Rizam, R. Jailani, and N. Wan Mohd. "Detection of flower disease practise border segmentation techniques." 168-173 in 2014 IEEE Conference on Systems, Process, and Management (ICSPC 2014).

[iii] immortal Parikh, Mehul S. Raval, Chandrasinh Parmar, and Sanjay Chaudhary Parikh, Aditya, Mehul S. Raval, Chandrasinh Parmar, and Sanjay Chaudhary Parikh, Aditya, Mehul S. Raval, Chandrasinh Parmar, and Sanjay Chaudhary Parikh, Aditya, Mehul S. Raval, Chandrasinh Parmar, IEEE, 2016.] "Detection and severity estimation of malady in cotton plants practise at liberty footage." 594-601 in the 2016 IEEE International Conference on Information Science and Advanced Analytics (DSAA)

[iv] Harshad Kumar B. Prajapati, Bhumika S. Prajapati, and Vipul K. Dabhi "A study of the detection and classification of shrub sickness." The paper was published in the 2016 International Conference on Electrical, Physical Science, and Improvement Techniques (ICEEOT), with pages 2499-2506. IEEE Press, 2016.

[v] P. R. Rothe and R. V. Kshirsagar, "Cotton disease identification practice pattern recognition approaches," 2015 International Conference on Pervasive Computing, 1-6. (ICPC). IEEE, 2015.

[vi] "Plant disease detection and classification supported CNN with LVQ formula," Sardogan, Melike, Adem Tuncer, and Yunus Ozen. 382-385 among the 2018 third International Conference on engineering and Engineering (UBMK). IEEE (2018).

[vii] The seven are Yusoff, Norfarahin Mohd, Ili Shairah Abdul Halim, and Noor Ezan Abdullah. "A Preliminary Study of Real-Time Malady Identification in the Genus Hevea Leaves Using the Sobel Edge Formula on FPGA." 168-171 in IEEE Management and System Graduate Colloquium (ICSGRC), 2018. IEEE (Institute of Electrical and Electronics (2018)

[viii] Yusoff, Norfarahin Mohd, Ili Shairah Abdul Halim, and Noor Ezan Abdullah are the seven. "Using the Sobel Edge Formula on FPGA, a Preliminary Study of Real-Time Malady Identification in the Genus Hevea Leaves." IEEE Management and System Graduate Colloquium (ICSGRC), 2018, pp. 168-171. IEEE (Institute of Electrical and Electronics Engineers) is a professional organization dedicated to the advancement of electrical and electronic (2018).

[ix] "Computer Vision based 100% Turmeric disease Detection and Classification: A Step Towards Wise Agriculture," by Gayatri Kuricheti and P. Supriya. The 2019 third International Conference on Trends in Physical Science and Field Science has a total of 545-549 papers (ICOEI). IEEE International Conference on.

[x] Among the 10 are Khitthuk, Chaowalit, Arthit Srikaew, Kitti Attakitmongcol, and Prayuth Kumsawat."Co-Occurrences Matrix and AI System for Plant Disease Detection Based on Color Basic Cognitive Process." 1-4 in the International Engineering Congress of 2018 (IEECON). IEEE (Institute of Electrical and Electronics (2018).