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COMPARATIVE ANALYSIS OF MANGIFERA INDICA LEAFLET ILLNESS USING DEEP LEARNING MODELS

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ABSTRACT

Mangifera Indica (Mango) also known as The King of Fruits, One of the significant fruit crops grown in numerous nations worldwide is the mango. India is the top mango-producing nation in the world, contributing roughly 40% of the total production. Pests and diseases are thought to be responsible for 30 to 40 percent of the agricultural yield loss. Mango quality and productivity are negatively impacted by mango leaf diseases. Mango leaf disease is challenging to identify with the naked eye without assistance from a professional. To increase the quality and quantity of mango produce, disease control methods must first be taken to identify leaf diseases. Therefore, it's crucial to identify leaf infections as soon as possible. Automating disease identification is particularly advantageous since it lessens the monitoring effort required in large farms. We suggested a new framework for mango leaf disease categorization, using 439 photos from mango growing area in Mysuru, Mandya, India (257 from Mandya, 182 from Mysore). This work uses deep learning models like 6-Layered and VGG-16 that are based on CNN technology to automatically identify and categorize leaf diseases in several mango plant types. A collection of photos of both sick and healthy mango leaves has revealed the presence of four major leaf illnesses, including Mealy Bug, Pests, Cashew Leaf Miner, Low in Potassium, and Iron.

Keywords: Machine Learning, Convolutional Neural Network (CNN), Visual Geometry Group (VGG-16).

I. INTRODUCTION

Mango Scientific name Mangifera is additionally known as The King of Fruits is solitary of the vital fruit trees cultivated in special international locations across the world. India produces approximately 40% of the worldwide mango manufacturing and ranks first most of the world's mango generating international locations. It is envisioned that, pests and sicknesses ruin about 30 40% of the Mangifera crop yield. The sicknesses of mango plant consists of Cashew Leaf Miner, gall infestation, Webbers attack, mango malformation, leaf spots, Mealy Bug, Pests, Low in Potassium and Iron etc. Such sicknesses are resulting from pathogens like: virus, bacteria, parasites fungi, etc, or even negative environmental conditions. Illness in leaf impacts the photosynthesis system thereby main to plant/tree's death. The signs and symptoms and the affect leaf region decide the kind of sickness. In advance days, identity of plant sicknesses became typically accomplished via way of means of common tracking of flowers via way of means of farming experts. In case of small farms it became feasible to become aware of the sicknesses effortlessly and take instant defensive on manage measures. But within side the case of big farms, it's time ingesting and costly. Therefore seeking out an automatic, accurate, rapid and much less costly era for plant sickness identity is of fantastic importance. Image processing and system learning are maximum famous and broadly used strategies followed for plant leaflet Illness detection and classification. Deep Learning the use of Neural Networks is part of the broader own circle of relatives of system Learning. It has unfolded its hands in numerous fields presenting a large sort of application. The improvement of such laptop era can assist the farmers in order to reveal and manage Illness in Mangifera Leaflet.

II. LITERATURE SURVEY

This paper [1].The two primary image processing methods employed in this study to identify leaf illnesses are K-means clustering and SVM. [1]The precise identification of leaf disease can greatly benefit from the use of this technology. Image capture pre-processing, feature extractions, and classification are stated to be the five phases in the detection of leaf diseases[1].

This paper [2]. They used a variety of photos in this paper's work proposal to identify leaf diseases. They used the segmentation techniques such as k-means clustering to extract various characteristics[2]. The Support

Vector Machine (SVM) classifiers and the Gray Level Co-occurrence Matrix are used to identify various illnesses (GLCM).

This paper [3]. "Apple Leaves Disease Detection with Efficient Net and DenseNet [3]".The image Data Generator Class offers a quick way to create a dataset that has been randomly transformed into one that is several times larger than original[3].

In this article [4] They suggested employing a CNN-based plant classification system to classify the diverse plant species from the picture database obtained from smart agro-stations[4]. With this technique, features from various plant photos are extracted using CNN architecture. this technique has a 97.47 percent accuracy rate when evaluated using the TARBIL database[4].

III. DATASET COLLECTION AND PREPROCESSING

A. Collecting Datasets

Collecting Datasets Collecting of datasets for predicting the Mango yield is very necessary, collecting datasets in very large amount leads to better prediction of Mango leaflet sickness, so we have collected 1000 images were taken from Mysuru, Mandya mango cultivating land in India, In that 439 images are being used for Processing. We contacted farmer in the cultivating and explained the need of the datasets for predicting sickness of mango leaf, he helped us by providing us datasets of mango leaf's. The datasets that we use in our project are captured using mobile camera in the cultivating land, The farmer's helped us in capture the different types of disease's in mangifera indica tree. We have collected around1000 images were from Mysuru and Mandya's mango cultivating land in india. In that 439 images are being used for Processing,257 from Mandya, 182 from Mysuru.

The 439 Images are classified As 125 belongs to Healthy, 117 belongs to MealyBug, 81 belongs to Pests, 100 belongs to Cashew Leaf Miner and 16 to Low in Iron ,Potassium. Preparing the dataset is necessary, and image processing can increase speed model interpretation and cut down on model training time. Reducing the size of the Mango leaflet input photos will greatly speed up model training time without noticeably affecting performance if the input images are extremely large.

B. Getting Datasets

The first step in preprocessing is getting the datasets, for our project we have collected the datasets. 439 images were taken from Mysuru, Mandya mango cultivating land in india (257 from Mandya, 182 from Mysuru).

C. Importing Libraries

For Image preprocessing of datasets we have to import some of the pre-defined library needed for preprocessing. These are very much helps in many tasks, the libraries that we use in our project is Numpy, OpenCV ,Keras and pandas.

D. Importing the Datasets

The dataset we gathered for our Deep Learning project, the mango leaflet dataset, needs to be imported at this time. But first, we must establish the current directory as the working directory before importing a dataset. We employ the read() function from the Pandas package, which reads an image file and performs different actions on it, to import the dataset. With the help of this functionality, we may read an image file both locally and from a URL. Here, data set is the name of the variable where our dataset will be stored, and we gave the name of our dataset within the method. The data set will be successfully imported into our app after we run the aforementioned piece of code. There are five independent such as Healthy, Mealy Bug, Pests, Cashew Leaf Miner, Low in Potassium and Iron.

E. Pre-processing

The simplest actions on pictures are performed via image pre-processing. If entropy is a measure of information, pre-processing actually reduces the amount of information present in the image. The conversion of the RBG picture to a grayscale image is part of the processing. The other processing step eliminates picture noise and enhances edge detection accuracy (image).

F. Splitting the data set into training set and test set

For pre processing the dataset's for machine learning, we divided it into training and validation sets (80 percent for training and the remaining 20 percent for validation). One of the most important processes in data preparation is this one since it enables us to enhance the functionality of machine learning models. Let's say we evaluated our machine learning model on a completely different dataset after training it on one dataset. The links between the models are then difficult for our model to comprehend.

G. Feature Matching/classifiers.

Correlation is carried out in this section. The correlation method is employed to gauge how comparable two pictures or portions of an image are. When an image contains many objects and regions and an image name template is present, the template is utilised to locate the item in the source picture. Therefore, correlation may be used to check if the object is visible in the picture. As fit transform() has already been used in the training set, use the transform() method instead.

The below figure explains activity diagram of our project, it starts with collection of datasets, and the processing of datasets is done, after Pre-processing of image dataset we have to split the datasets into two parts Validate and Train, then we apply Convolution Algorithms, and train the model using then the prediction will be the output ,if the datasets is not available the process will end.

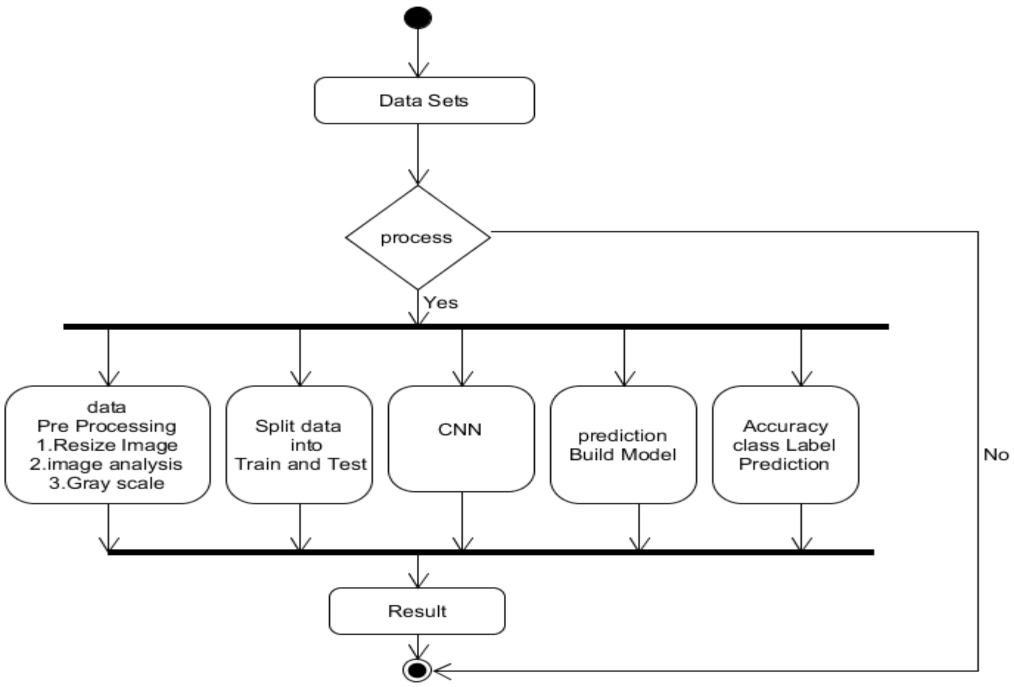

Fig. 1: Activity Diagram of the system.

IV. METHODOLOGY

The proposed system has the following steps Comparative Analysis of Mangifera Indica Leaflet Illness using Convolution method, Convolutional Nural Network (CNN) and Visual Geometry Group (VGG-16)

1. Convolutional Neural Network (CNN)

Step1: import pre-defined library

Step 2 :Data preprocessing:

Dataset will be added to the preprocessing

a) Input: Mangifera leaflet dataset

b) Process: Preprocessing will Grayscale the image.

c) Output: preprocessed dataset

d) Error handling: If the input file is not a valid one.

Step 3: Normalization:

Dividing all the values by 255 will convert it to range from 0 to 1 ,The size of the image of the mango leaflet is enormous. To minimise it, we can normalise the data to lie between 0 and 1. The calculations will be simpler and quicker since the numbers will be tiny. Since pixel values vary from 0 to 256, the range is 255 except for 0. Therefore, multiplying all of the numbers by 255 will change the range to be from 0 to 1.

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Normalization: R/totalpixels*255.

Step 4 : implementing Convolutional Neural Network

The pixels of a black-and-white "Mango leaflet" image are read as a 2D array (for example, 2x2 pixels). Each pixel has a value that ranges from 0 to 255. (There is a greyscale between those figures.) The computer may start processing the data in light of that knowledge.

Step 5:Fully Connected Layer

2.Visual Geometry Group – 16

Step1: import pre-defined library

A "Mango leaflet" picture in black and white has its pixels read as a 2D array (Ex., 2*2 pixels). From 0 to 255 are the possible values for each pixel.

Step 2 :Data preprocessing : Dataset will be added to the preprocessing

a) Input: Mangifera leaflet dataset

b) Process: Preprocessing will Grayscale the image.

c) Output: preprocessed dataset

d) Error handling: If the input file is not a valid one.

Step 3: Normalization: Normalization: R/total_pixels*255.

Step 4: implementing Visual Geometry Group

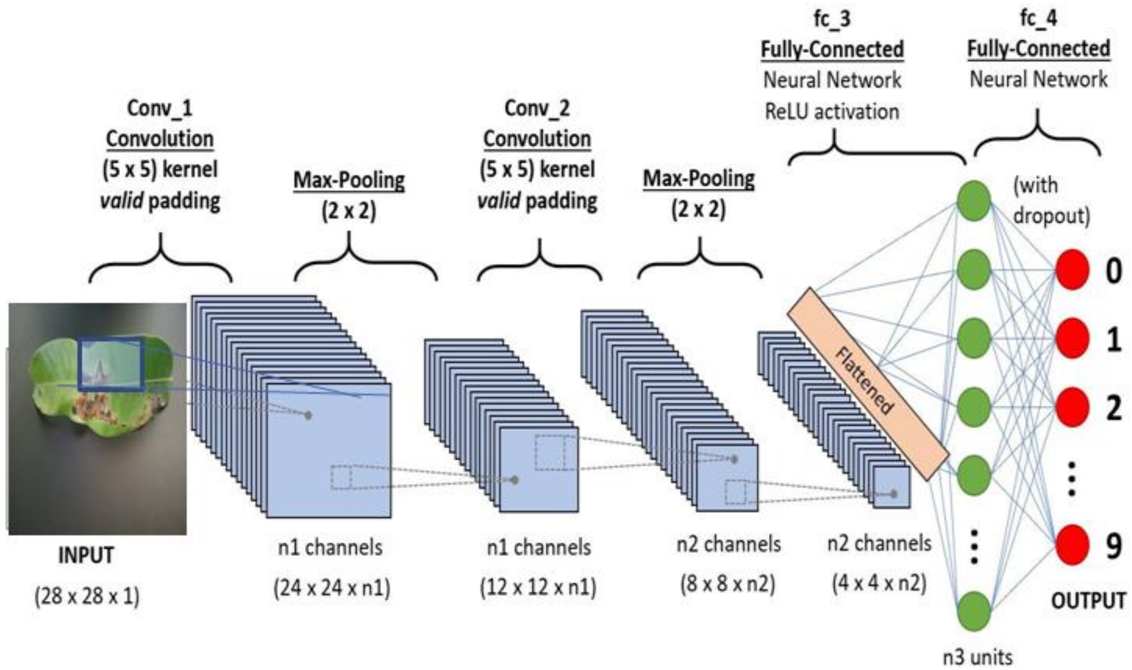

Fig. 2: Convolutional Neural Network

V. PERFORMANCE AND METRICS

CNN Model Accuracy

(a) The Graph Displays the Comparison of test and train of Model Accuracy using 25 Epoch.

(b) The Graph Displays the Comparison of test and train of Model Loss using 25 Epoch.

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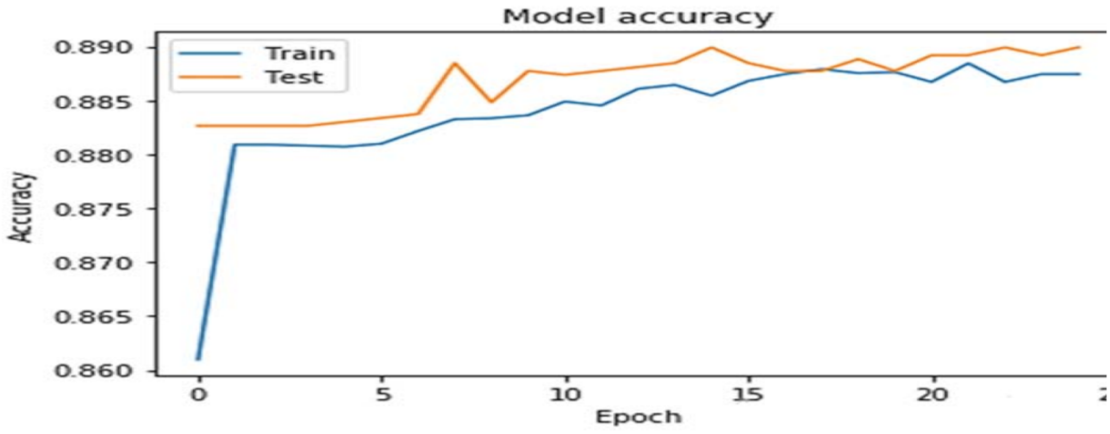
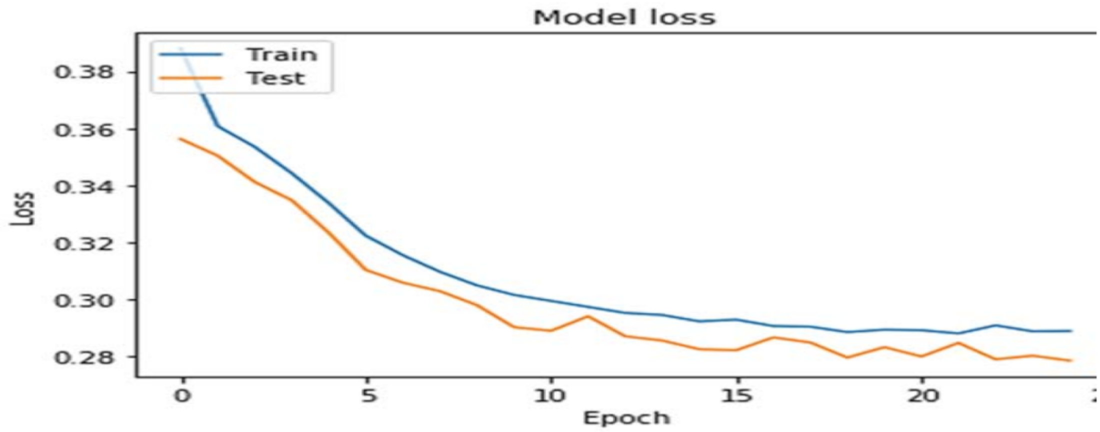


(a)



(b)

Fig. 3: Convolutional Neural Network Results

The below figure.4 shows Comparative Analysis of Mangifera Indica Leaflet Illness Using Deep Learning , this is now home page's screenshot, which has two navigation pages About and prediction Home page gives basic information about the mango yield and other blog's link along with our contact details.

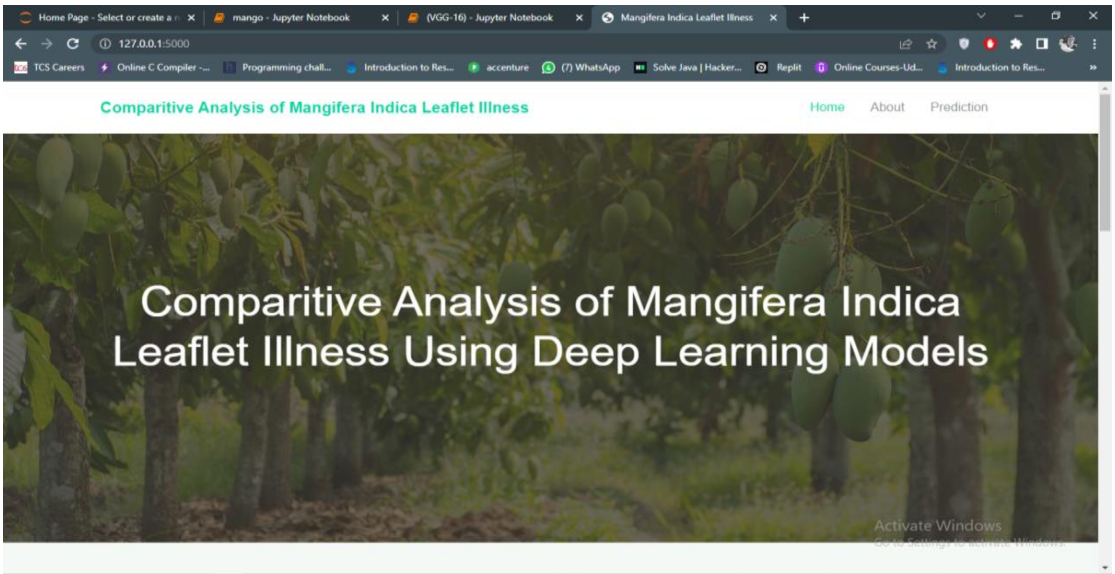


Fig. 4: Home Page

The below figure. 5 shows the after uploading the image of mango leaflet. Here the image is classified and the percentage of Accuracy or confidence is displayed.

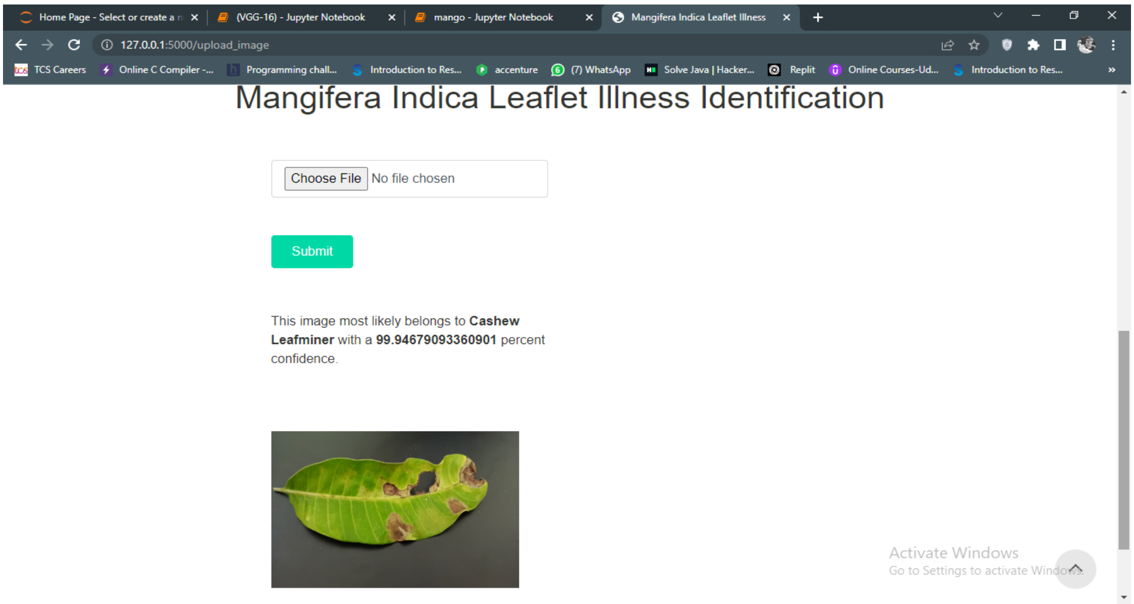


Fig. 5: Predicted Page

VI. CONCLUSION

In this project we used CNN and VGG 16 methods for the feature extraction and classification of Mango(Mangifera Indica) leaf illness. We have considered the some mango leaflet datasets in this method. This data sets used for both and training and testing purpose. It has been achieved an accuracy of 95%. Calculations are made for each performance indicator, including accuracy, recall, F1-score, and support. Additionally, the accuracy levels for training and validation are very similar. Grayscale, tiny pictures are utilised for training purposes. As a future work it is possible to implement the colour image classification for medicinal plant recognition We draw the following conclusions from the implementation phase and results: This CNN model is not generic for all leaflet illness, and we have designed a model specifically for five plant species: Mealy Bug, Pests, Cashew Leaf Miner, Low in Potassium and Iron. with a 92% accuracy is a creditable success.

VII. REFERENCES

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