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Detection of Disease in Leaf using Artificial Neural Network

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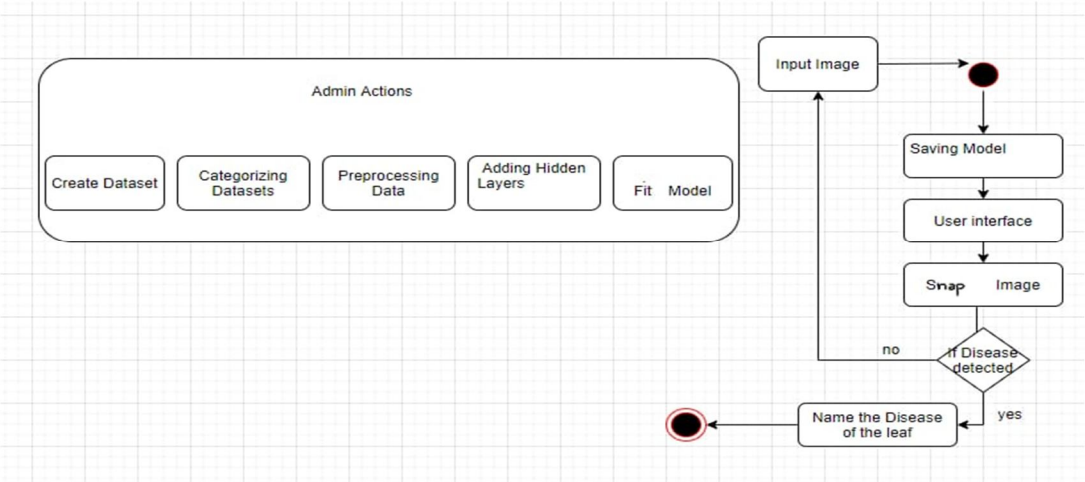
Abstract: ***Leaf spots are diseased areas on leaves. Agricultural production is negatively affected by plant diseases. We have proposed a system that can help farmers identify leaf diseases and take appropriate preventive measures to increase crop yields. We take images of diseased leaves and perform various pre-processing techniques on them, to detect the edges of the leaves. The entire region of interest is divided into blocks, and then the characteristics of each block are compared with the characteristics of the image in the database. The main purpose is to identify the disease in the leaf spot of the crop as 80-90% of the plant diseases occur in the leafspot. ANN methods are used for the classification of plant diseases. Using these methods, we can accurately identify and classify various plant diseases. We will create an end-to-end Android application. It is possible to run applications on mobile devices through the use of convolution operations, special integration, and the computational efficiency of using ANN to share parameters. This project will be of great use to the farmers as it will help them to detect the plant diseases in the early stage and enhance the production of crop.***

Keywords: Leaf spot, ANN, Android application

I. INTRODUCTION

When the crops are affected by pests, their production is affected, which is a threat to agriculture. The traditional system of detecting plant or leaf diseases involves detection by the naked eye. Not all farmers have knowledge about all the crop diseases. The proposed systems allows farmers to detect the leaf diseases at remote areas using their mobile phone. This will be advantageous to farmers as it helps them to identify the diseases at the early stage and take necessary action to protect the crop. Here the leaf disease detection is done by making use of Deep Learning Artificial Neural Network, which is used to compare the input image with the already existing images in the dataset and notify the farmer about the presence of any disease. For the user interface, an android application is created which enables the user to click images or select images from the gallery to perform leaf disease detection. The output is displayed in the application indicating the type of disease and the accuracy with which the application is confident about the detection. ANN's working is similar to that of the human brain. Just like how the human brain is made up of a large number of neurons that are connected to each other and process information, an artificial neural network consists of artificial neurons that are interconnected according to a specific pattern that process information similar to the human brain. They are able to learn from past data and act accordingly. ANN algorithm is widely used for image processing. A neural network is made up of several layers. Every neural consists of an input layer, some hidden layers and an output layer. As the number of hidden layers increases, the accuracy of the project increases. In our project we have chosen 3 hidden layers.

II. METHODOLOGY



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The Detection of Disease in Leaf using Artificial Neural Network application is a system which includes the admin and the user interface.

1) *Administrator Module:* It handles the application logic of the system. The admin has functionalities that the administrator can use, such as extracting functions from images stored in the system. This module includes collecting images of disease-causing plants, classifying the data set in csv format, dumping the data set to Google Drive, and logging in to Google Colab. Google Colab is a Google Research product. Colab allows anyone to write and run any Python code through a browser. Once the admin logs in to google colab, the graphical processing unit is activated and a session is created in the google colab. Then the csv files are imported. After importing the csv files, the train and test data are segregated using target attributes. After the segregation, the whole dataset is converted to float and reshaping of the data is done. Hidden layers are also added in this module. As the hidden layers increase, the efficiency of the result also increases.
2) *User Module:* The user interface of the system is managed in this module. The model involves an Android application. User can run the android app to get the result whether the input leaf is diseased, and it also displays the leaf disease. Therefore, in this module, users can use the images in the gallery, or they can immediately capture the images and detect leaf diseases. The final result is obtained in this model.

III. RESULTS

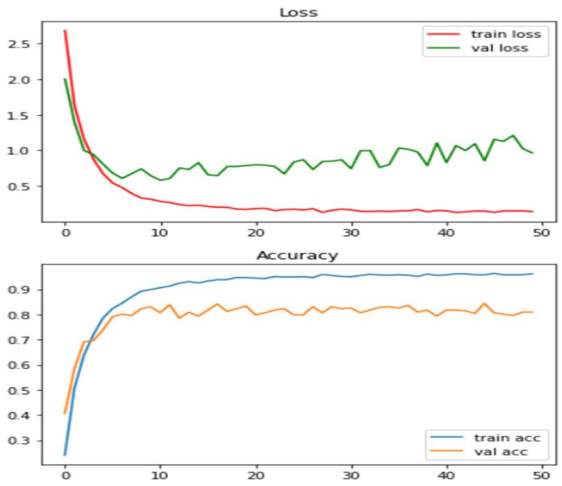

Fig 1: Graph on Loss and Accuracy

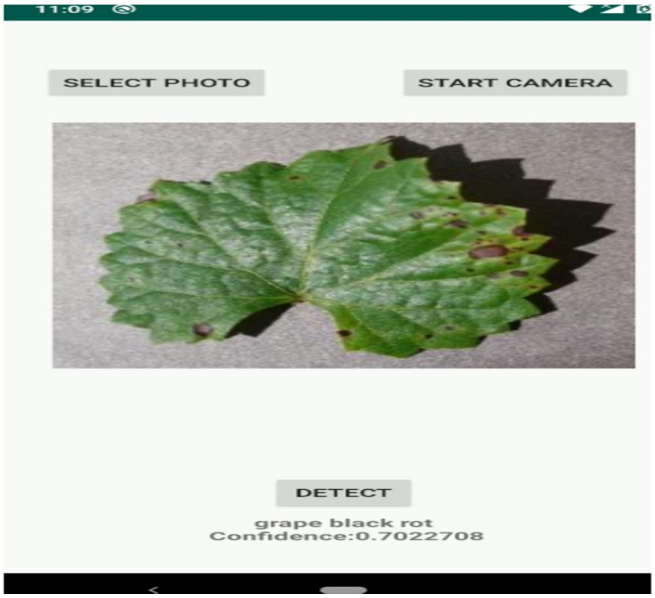

Fig 2: Android Application

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IV. CONCLUSION

We proposed a system to detect the leaf diseases using artificial neural network. In this project, we are able to detect 38 diseases from 14 species. These 14 species include apple, blueberry, cherry, corn, grape, orange, peach, bell peppers, potato, raspberry, soybean, squash, strawberry and tomato. We created a plant disease dataset, in which we collected 400 images of each disease. So, the database contained more than 15000 images. These images we exported into google colab and were trained using ANN models. For the front end an android application was created which allowed the farmers to click images of diseased leaves or select images of the diseased leaves from gallery to detect the presence of any disease. The accuracy of the project varied from 91% to 98%. The average accuracy was 96.3%. This project will be of great use to the farmers as it will help them to detect the plant diseases in the early stage and enhance the production of crop.

V. FUTURE SCOPE

Since we have implemented the project using two modules, the working and efficiency of the modules can be improved to further increase the accuracy. The comparison of the input image with the images stored in the database can be improved in terms of speed. Further this project can be improved in terms of the number of diseases that can be detected and the android application could be extended in terms of functionality to tell the remedies for respective leaf diseases.

VI. ACKNOWLEDGMENT

This project is accomplished based on the knowledge gained during the pandemic infused lockdown by the authors under the guidance of Mr. Challa Pamuleti. The authors do not claim any right to the algorithms, codes, data, formulas used, approach as their property. They only used their intellect to compile the results and obtain the optimal values for accuracy and also formatting it in the IEEE format.

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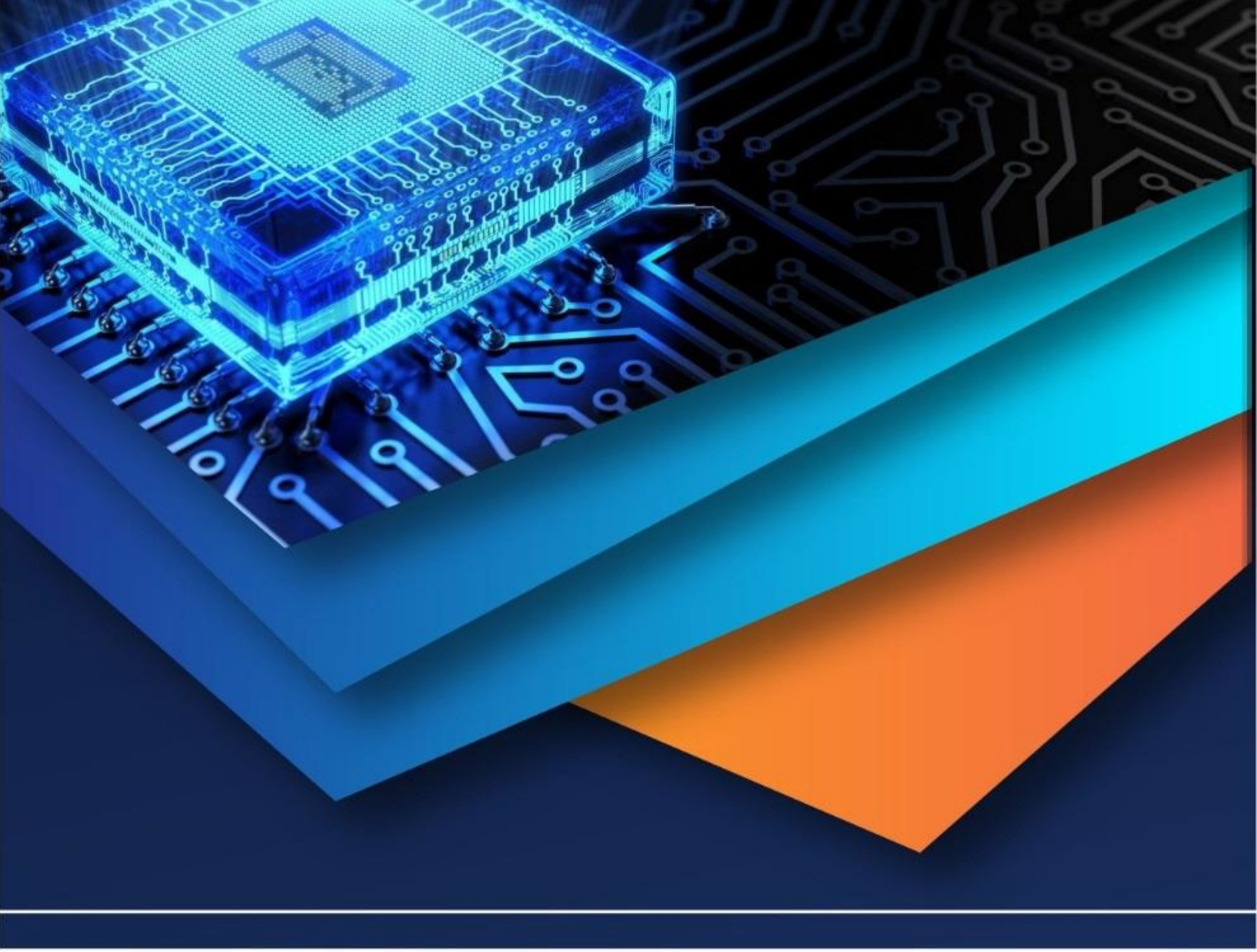

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