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PLANT DOC-Diseases Detecting Mobile Application

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ABSTRACT: Agriculture has played a key role within the development of human civilization. If there is disease in agro products, total economy will get affected. As illnesses are unavoidable, recognizing them assumes significant part, however their quick distinguishing proof remaining parts troublesome in numerous pieces of the world because of the absence of the important framework. The combination of accelerating global smartphone penetration and up to date advances in computer vision made possible by deep learning has paved the way for smartphone-assisted disease diagnosis. Here,CNN(convolutional neural network) models were developed to perform plant diseases detection and diagnosis using a public dataset of 54,304 images of diseased and healthy plant leaves collected under controlled conditions, through deep learning methodologies with mobile application along with various features like calculating the amount of fertilizers needed for plant per the land used and cultivation tips to be provided from pre seedling stage to the harvesting stage and in addition to this community tab where the users can rise their questions there and interact with each other with all these features daily weather forecasting which shows the day to day weather which would be useful for the cultivation of the cropswere developed. As the result of disease detection, the mobile application will suggest cures for that disease.

KEYWORDS: smartphone, diseases, deep learning, mobile application

I.INTRODUCTION

Agriculture is the backbone of the economy. The agricultural productivity is dependent on various factors. Advancement in agricultural sector is two to four times more effective in raising the revenue among the poorest people compared to any other sectors. prevention methods aren't followed in early stage of cultivation, it can cause failure and downfall of the economy in any country. For accurate advice on plant diseases, finding farm specialists in rural areas is a very difficult task and Various efforts have been developed to prevent crop loss due to diseases. Independent of the approach, identifying a disease correctly when it first appears may be a crucial step for efficient disease management. Disease identification has been supported by agricultural extension organizations or other institutions, like local plant clinics. leveraging the increasing Internet penetration worldwide, Smartphones in particular offer very novel approaches to help identify diseases because of their computing power, highresolution displays, and extensive built-in sets of accessories, such as advanced HD cameras. It is widely estimated that there will be between 5 and 6 billion smartphones on the globe in 2020.In this project, a Android based is application is developed to help farmers by Identification the plants disease using machine leaning algorithm to train a model and climate, humidity condition of the land and Cultivation tips and fertilizer calculator and cures or pesticides for the disease. We also developed a community space for clarification of the doubt by the experts.

II.METHODOLOGY

This Project is android based application with features that helps farmer in planting. The following features are Plant Disease Detection , Climatic Condition Community or Discussion form
Fertilizer Calculator , List of Pests and Diseases

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Plant disease detection

The whole idea of developing the plant disease identification model using deep CNN is further explained in depth. In the subsections below, the full process is divided into several required steps, along with collecting images using deep neural networks for the classification process

- Dataset

Appropriate datasets are required in the least stages of visual perception research, ranging from training phase to evaluating the performance of recognition algorithms. All the pictures collected for the dataset were downloaded from the web, searched by disease and plant name on various sources in several languages. Thirteen classes represented plant diseases which might be visually determined from leaves. In order to differentiate healthy leaves from diseased ones, another class was added within the dataset. It contains only images of healthy leaves. An extra class within the dataset with background images was beneficial to urge more accurate classification. Thus, deep neural network might be trained to differentiate the leaves from the encompassing. The background images were taken from the dataset.In this stage, all copied pictures taken from various sources were taken out by created python script applying the looking at methodology. The content eliminated the copies by contrasting the pictures' metadata: name, size, and the date. After the automated removal, images were assessed by human for iteration. Next step was to enrich the dataset with augmented images.[1]

•Image Pre-processing and Labeling

Images downloaded from the web were in various formats alongside different resolutions and quality. In order to urge better feature extraction, final images intended to be used as dataset for deep neural network classifier were pre-processed so as to realize consistency. Furthermore, procedure of image pre-processing involved cropping of all the pictures manually, making the square round the leaves, so as to spotlight the region of interest (plant leaves). During the phase of collecting the images for the dataset, images with smaller resolution and dimension less than **256*256 pixels** were not considered as valid images for the dataset. Pictures where the region of interest was in higher resolution were marked as eligible candidates for the dataset. In that way, it had been ensured that images contain all the needed information for feature learning. Images used for the dataset were image resized to 256*256 to scale back the time of coaching, which was automatically computed by written script in Python, using the OpenCV framework. [2]

•Augmentation Process

The principle reason for applying expansion is to expand the dataset and acquaint slight mutilation with the pictures which helps in diminishing over fitting during the preparation stage. In machine learning, overfitting appears when a statistical model describes random noise or error rather than underlying the process. The image augmentation contained one among several transformation techniques including transformation, perspective transformation, and straightforward image rotations.For the expansion cycle, straightforward picture pivots were applied, just as revolutions on the diverse hub by different degrees.Transformations applied in augmentation process,first row represents resulting images obtained by applying transformation on the single image**,** the second row represents images obtained from perspective transformation against the input image and the last row visualization the simple rotation of the input image. The process of augmentation was chosen to suit the needs; the leaves during a natural environment could vary in visual perspective. [3]

•Neural Network Training

Training the deep convolutional neural network for creating a picture classification model from a dataset. For the aim of this analysis, this framework was used, at the side of the set of weights learned on a really giant dataset, ImageNet. Caffe framework is appropriate for each analysis experiments and trade preparation. The core of framework is developed in Python and provides program line, Python, and MATLAB interfaces. CaffeNet may be a deep CNN that has multiple layers that increasingly cipher options from input pictures. Specifically, the network contains eight learning layers and 5 convolutional and 3 totally connected layers. CaffeNet design is taken into account a place to begin, however changed and adjusted to support our fifteen classes (classes). Last layer was altered and also the output of the softmax layer was parameterized to the necessities of bestowed study. The convolutional layer is that the essential building block of the convolutional neural network. Each convolutional layer hasimaps of equal size,iand , and a kernel of size , and is shifted over the bound region of the input image [4]

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•Performed Tests

The common approach in mensuration performance of artificial neural networks is rending information into the coaching set and therefore the check set so coaching a neural network on the coaching set and mistreatment the check set for prediction. Thus, since the first outcomes for the testing set and our model foretold outcomes are better then known, the accuracy of our prediction will be calculatedThe cross validation procedure was continual once each thousand coaching iteration. Overall calculable results of the check is diagrammatically pictured as top-1, to check if the highest category (the one having the best probability) is that the same because the target label.[5]

•Fine-Tuning

Fine-tuning seeks to extend the effectiveness or potency of a method or operate by creating little modifications to boost or optimize the end result. The classification operate within the original CaffeNet model is softmax classifier that computes chance of one, categories of the ImageNet dataset. Fine-tuned learning experiments need a touch of learning, however they're still a lot of quicker than learning from scratch. to start out the fine-tuning procedure, this softmax classifier was removed, as mentioned and illustrated in Section three.4 and therefore the new one was initialized with random values. The new softmax classifier was trained from scratch exploitation the back-propagation algorithmic program with information from the dataset. This dataset has fifteen totally different classes. Overfitting was affectediby exploitation lower initial learning rates for the fine-tuned hidden layers. [6]

Climate Condition

Current temperature, sunset timing, humidity are included in the Climate Condition. The data is obtained from the OpenWeatherMap site. OpenWeatherMap Provide Api (Application Program Interface) in JSON(JavaScript Object Notation) format for the Climatic Condition in order. The data is gathered for the api by post request. In the application, the collected data is collected.

Community Tab

A Chat is included in the Group Room. It's a Firebase Console Connector. The user details and the message information stored in the firestoreis located. Authentication is also performed for security purposes and the fireauth performs the authentication and the active users are also stored in the database.

Cultivation Tips

Tips for cultivation are stored in the online database and the research is done in the app. By determining the date of cultivation begins, the cultivation tip is given. It involves the seeding, processing and harvesting process. The day-to-day procedures are suggested in the application.

Fertilizer Calculator:

The volume of fertilizers to be used in crops is determined by the fertilizer calculator. The formula is defined in the code and the amount of fertilizer to be used will be indicated by the app according to the formula.

Software used

The IDE's (Integrated Development Environment) used are VS Code and Android Studio. The programming languages used is Dart and Python. Framework used is Flutter and the Database used is Firebase.

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III. WORKING

Plant Disease detection

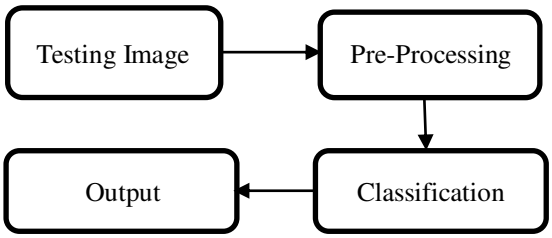

Figure. 1

The dataset is split up into 80% of training images and 20% of testing images. The image is pre-processed to the pixel size of 256*256 and the trained model is given the testing images. The model will categorize the picture and display the outcome.

Internal Blocks of CNN

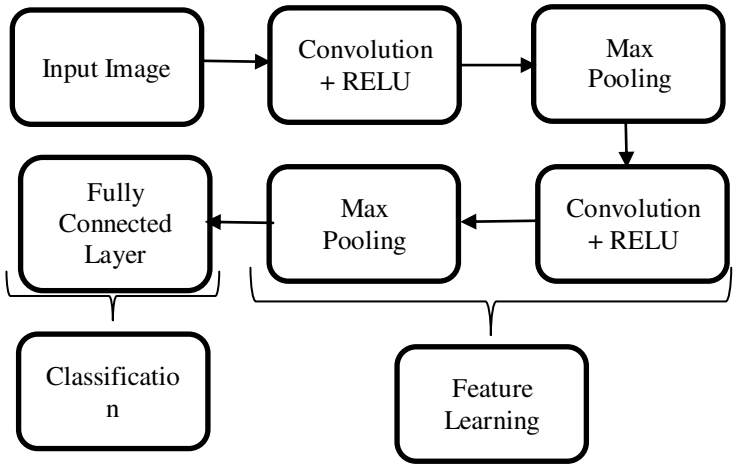

Figure.2

- **Convolution** is the first layer to extract features from the input image and it learns the relationship between features using **kernel or filters** with input images.
- **ReLU Layer:** ReLU Layer: ReLU represents the Rectified Linear Unit for a non-straight activity. we utilize this on the grounds that to acquaint the non-linearity with CNN.
- **Pooling Layer:** it is used to reduce the number of parameters by downsampling and retain only the valuable information to process further.

- There are types of Pooling:
  - Max Pooling
  - Average and Sum pooling.
- **Flattening:**

Flatten the entire matrix into a vector like a vertical one. so, that it will be passed to the input layer.

- **Fully Connected Layer:**

Pass our flatten vector into input Layer. we combined these features to create a model. Finally, The activation of function softmax to classify the output is done.

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IV. EXPRIMENTAL RESULTS

In Figure.3 it shows the first page of the mobile app. It is made with a simple quote and design.

Figure: 3 First pageof Application

The second page is the sign in page where it is simply done by entering the username and their mobile number.Here it doesn't require sign up procedures because it is made simple safe authentication

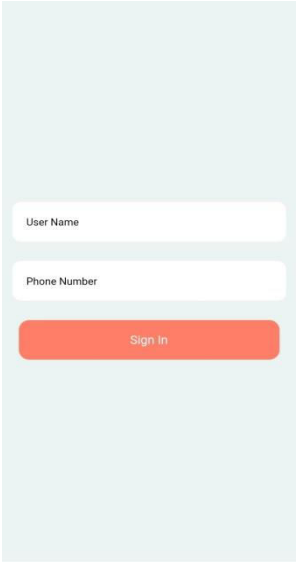

Figure 4. Sign In Page

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After this the authentication process happens where the users are verified for not a robot and the OTP (One Time Password) is received. This is shown in Figure 5and 6.

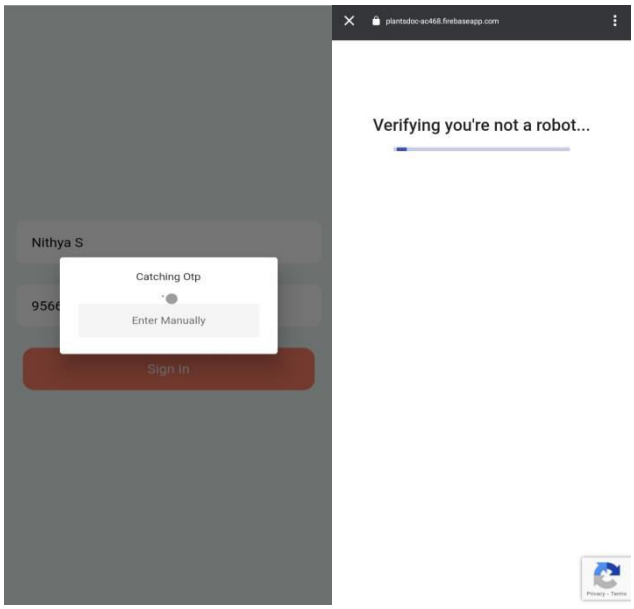

Figure 5 **Figure 6**

The next page is the homepage. Where all the features are present. We can that he homepage has the daily day to day weather forecasting which shows the temperature and humidity. This is shown in figure 7.

Figure 7. Home page

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The next page is the fertilizer calculator .Here user can calculate the amount of fertilizer can be used for the crops according to the size of the cultivation land. This is shown in figure 8.

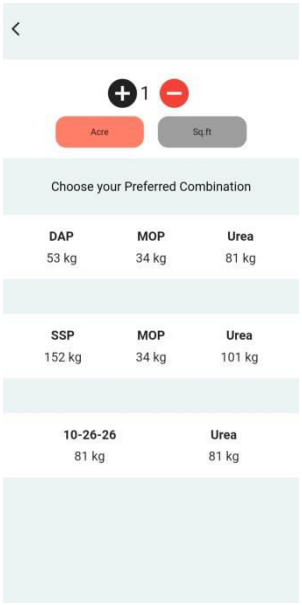

Figure 8. Fertilizer Calculator

The next figure shows the page where we can scan the crop or upload images of the crops from the mobile phone gallery. This is shown in figure 9.

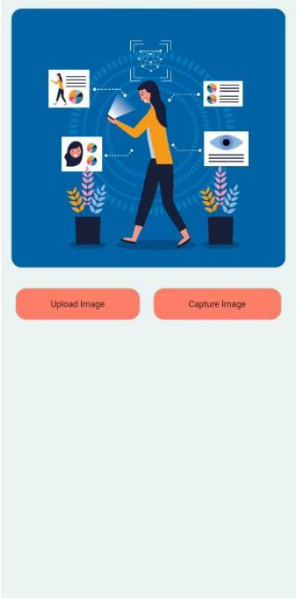

Figure 9. Scanning page

The next figure shows the community tab where the users can arise questions and answers to other users questions. This is shown in figures 10,11and12.

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Figure 10

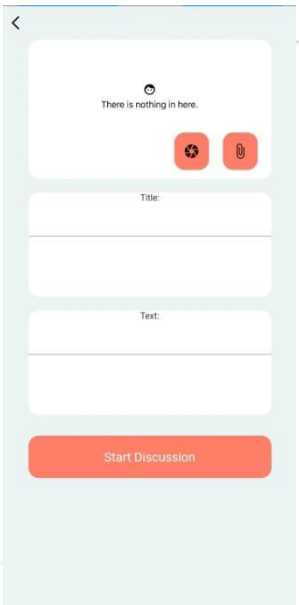

Figure 11

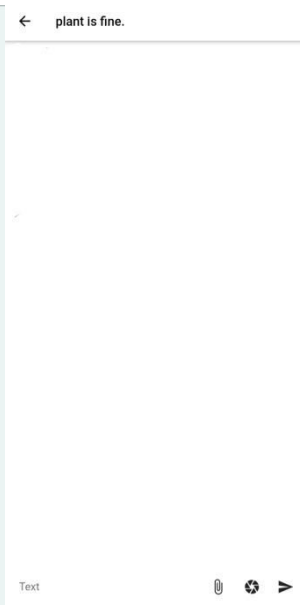

Figure 12

V. CONCLUSION

Diseases in plants are one of the major threat to farmers .The objective is to identify and detect diseases or abnormalities which occur in plants. This is done by the implementation of Deep Learning algorithm like Convolutional Neural Network (CNN) which is implied in an application to create an mobile app and is included with many feature. Using this machine learning algorithm the database which have been collected will be trained using AI and then implemented in mobile app. This will serve help to farmers in the rural areas where they are incapable of approaching help and gaining knowledge about the diseases that has affected their crop by digitally scanning and detecting the crop.

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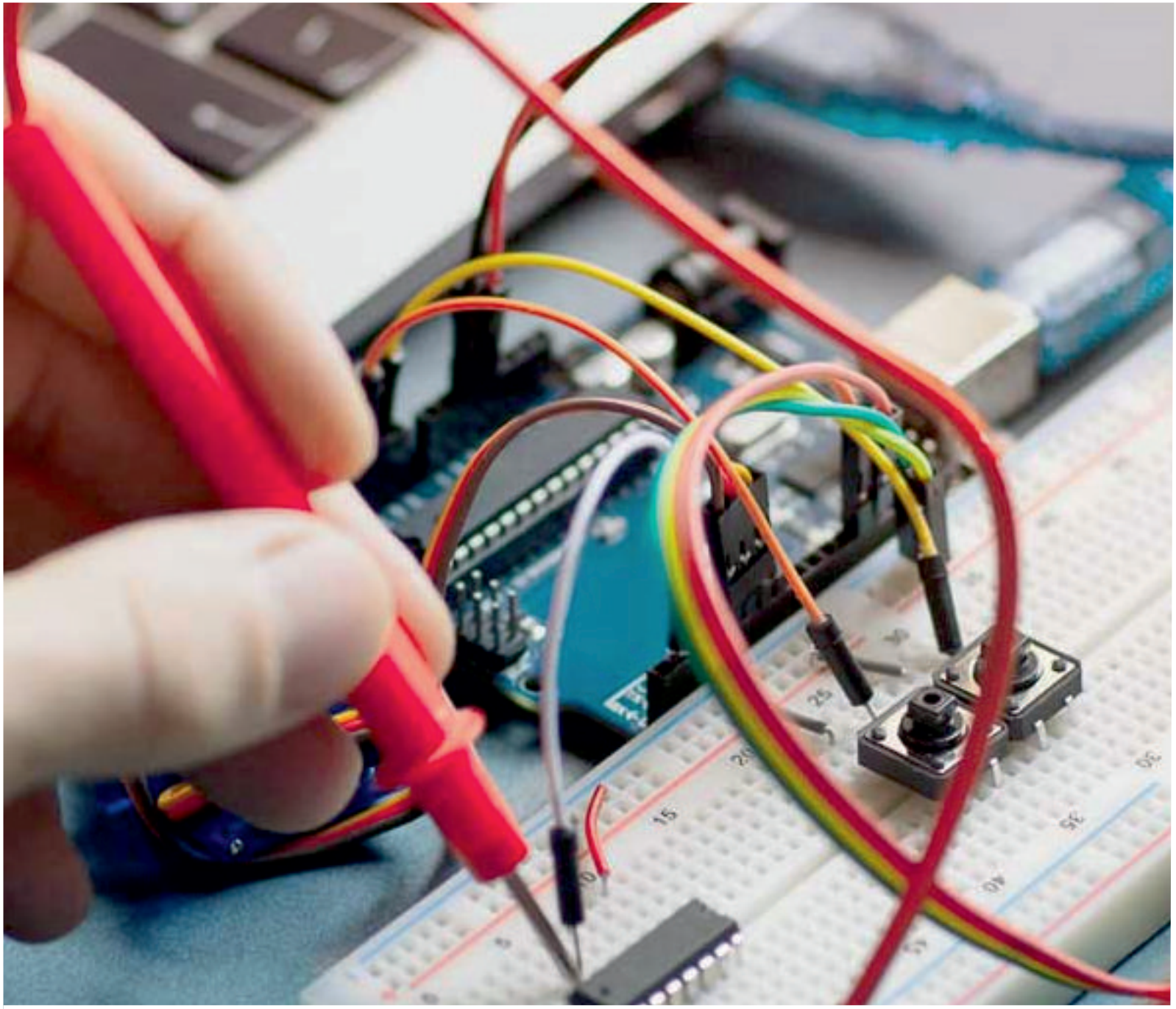

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