International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 08 | Aug 2021 www.irjet.net p-ISSN: 2395-0072

A Farmer's Guide to Detect Plant Leaf Diseases using Deep Learning Application

Nareddy Rishi Kiran Reddy[1], Vanama Yashwanth, Allu Nagaraju[3]

[1, 2, 3]B. Tech Student, Department of Computer Science and Engineering, Sreenidhi Institute of Science and Technology, Hyderabad, Telangana, India

---

Abstract - *When plants and crops are affected by pests it affects the economy of the country. Usually, farmers observe the plants with bare eyes to check and identify disease. But this method can be time consuming, expensive, and inaccurate. Automatic detection using image processing provides faster and accurate results. This project is associated with an approach for plant leaf disease recognition application, which is based on classification of leaf image, using deep convolutional networks. The development in computer vision provides the possibility in increasing and to enhance the detection of plant leaf diseases. All the needed steps for using the disease recognition model are explained in the project including deep learning framework to perform the CNN training. This project is an approach in identifying and detecting plant leaf diseases with the help of the deep convolutional neural network which is trained for the database containing plant leaves that were gathered for different plant diseases. The developed model has great simplicity. Diseases and healthy leaves are in accordance to other classes, which enables the model to differentiate among different diseased and healthy leaves by using deep CNN. Every data is stored in the Firebase Database.*

Keywords: Deep Learning, Image Processing, Convolutional Neural Networks, Firebase Database, plant disease.

1.INTRODUCTION

This project deals with the detection of diseases associated with the plant leaves using the deep CNN model integrated into an android application. We have created different classes of diseases along with a healthy leaf class also and every input will be checked against all these classes and the result will be given as output. When an image is given as input, which is either taken at the moment within the app or chosen from the device images, it goes through different deep layers of the CNN for every edge of the image to be processed. The CNN model is trained against a huge dataset with different plant leaf images and diseases associated with them, if any. When the processed image comes as output at the end of the CNN processing, it is checked against the disease classes and then the verdict is given, whether it is infected or is healthy. The android application also offers features such as a login page for users and every user data is stored in a database where we can take insights and make historical data assessments. This helps the application track the existing users and their usage data can help us enhance the overall model accuracy and application performance. To ease the understanding for the illiterates, this application also offers voice output which reads out the result of the model. This model gives 94% accuracy which is a lot better than the naked eye determination of the disease.

1.1 Deep Learning

Deep learning is one among the various classes of machine learning algorithms that uses mutli layers to get greater level insights from the provided data. For instance, in image-processing the lower level layers can detect and identify the edges, where as the higher layers helps to detect the data relevant to a human which includes letters or digits or faces etc. Most modern deep learning models use Convolutional Neural-Networks (CNN). In deep-learning, every level extracts and convert the input into a brief and suitable presentation. For an image identification app, the input can be a pixel matrix and the presentational layer can include abstraction of pixels, detect and encipher the edges. The another layer can devise and encipher the edges. The next layer is able to encipher the nose and the eyes. The last layer can also detect images containing a face. This process is able to get to work on which areas to be placed adequately on what level by deciding of its own.

1.2 Convolutional Neural Networks

The Convolutional Neural-Network consists of the network which can use a math procedure known as Convolution. It is the special form for linear operation. In deep- learning, a Convolutional Neural-Network (CNN) is one among the classes of deep neural- network. They are mostly used for analysis for the visual imagery. They can also be called as space-invariant artificial neural-networks which works with the shared weights architecture. They are also used in processing systems, analysis, classification, recognition and image classification. The Convolutional Neural-Network contains the input layer, output layer, and other multi-hidden layers. The hidden-layers of the CNN usually include a set of convolutional-layers that are developed with the multiplication/other dot product. It can be represented as either cross-correlation or sliding dot product. This has much importance for the value of indices in matrix, and has influence on how weight can be specified at specific index points.

1.3 Firebase Database

Building functional apps by securing connection to the database via client-side app is allowed by the Firebase-Realtime database. The Information can be preserved locally, to provide the user a more responsive and effective experience. If the device reconnects, the Realtime-Database can sync with the local data for the changes that occurred. The Realtime-Database has expression-based, flexible rules language, known as Firebase Realtime-Database Security Rules, which declare on how the information must dependent andwhen records may be written/read. If the project is included with Firebase-Authentication, we can also outline who can have ability to access to what kind of data, and how can they use it. The Realtime Database is No-SQL based database and provides various optimality andfunctional features in comparison to the relational-database. The Realtime-Database API is made to best accept operations that need to be done quickly. Thus, It allows to make a real- time experience that provides the user reducing the lacking of responsiveness. Hence, it is alsoessential for considering on how the user can have access to the stored data.

2. EXPERIMENT ANALYSIS

Fig. 2.1. User interface

Upon opening the app, the above interface appears. The user has to provide a name and phonenumber in the specified fields. The user then clicks on the continue button to use the app.

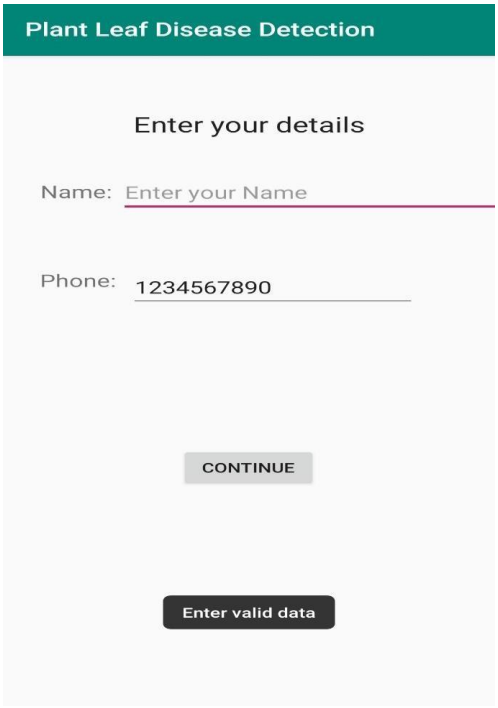

Fig. 2.2. Invalid data

The user has to provide a name and phone number. If either of them is invalid, the user will beprompted to give valid data. Given data is invalid if either of the fields is empty or if the phonenumber isn't of 10 digits.

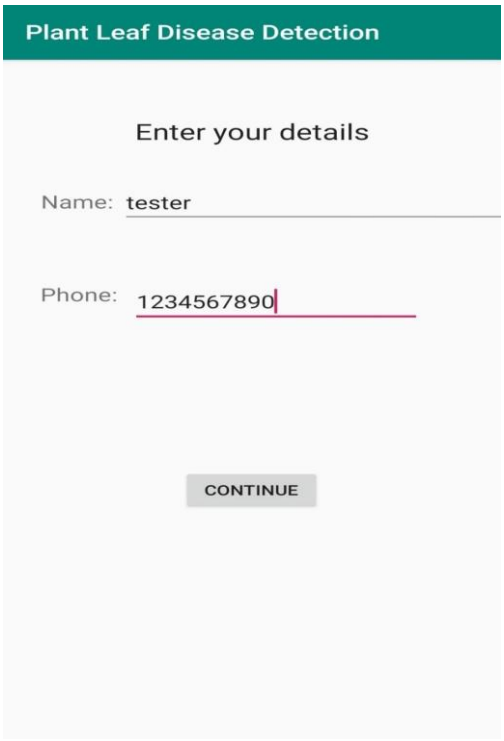

Fig. 2.3. Valid user data

The user enters data, then clicks the continue button. Upon validating the data, the user cancontinue using the app.

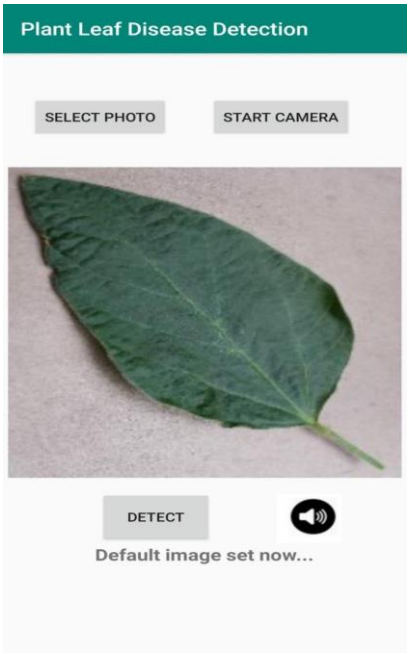

Fig. 2.4. Disease detection interface

The Above interface provides options for the user such as

- Using images from gallery
- Using images from camera

The interface also has a button which calls the detection algorithm.A button for the text to speech conversion is also available.

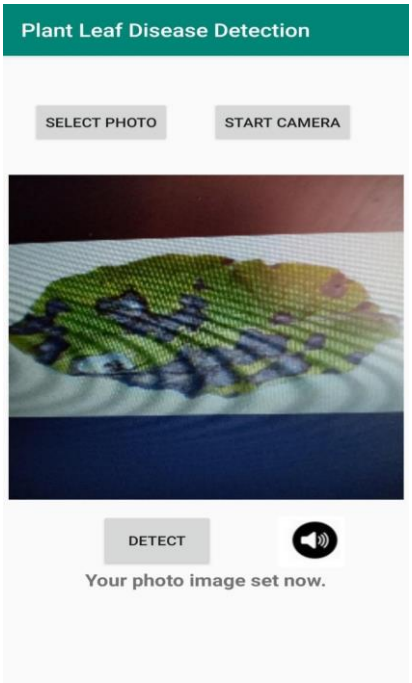

Fig. 2.5. Upload an image

The user can either use gallery or camera to upload the image to the app.
The image is resized and then is passed to the image viewer which displays the image on theinterface.
The User can now use the app to detect the disease by clicking on the detect button.

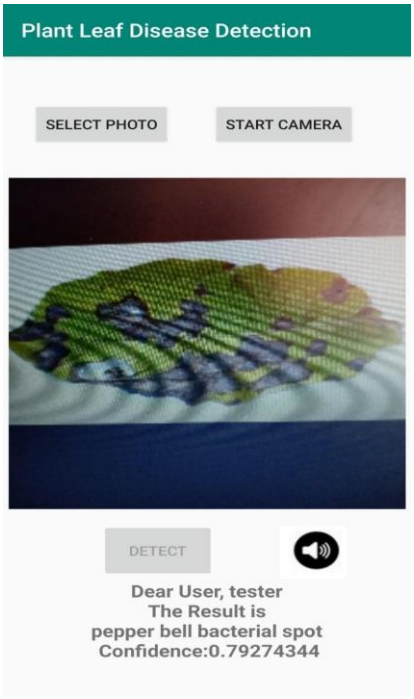

Fig. 2.6. Detecting the disease

On clicking the detect button, the result is displayed at the button of the interface which includes

- The result of detection.
- The confidence of detection.

The User can click on the speak button to have an audio output of the result. The uploaded image, the result and the user data are uploaded to the database.

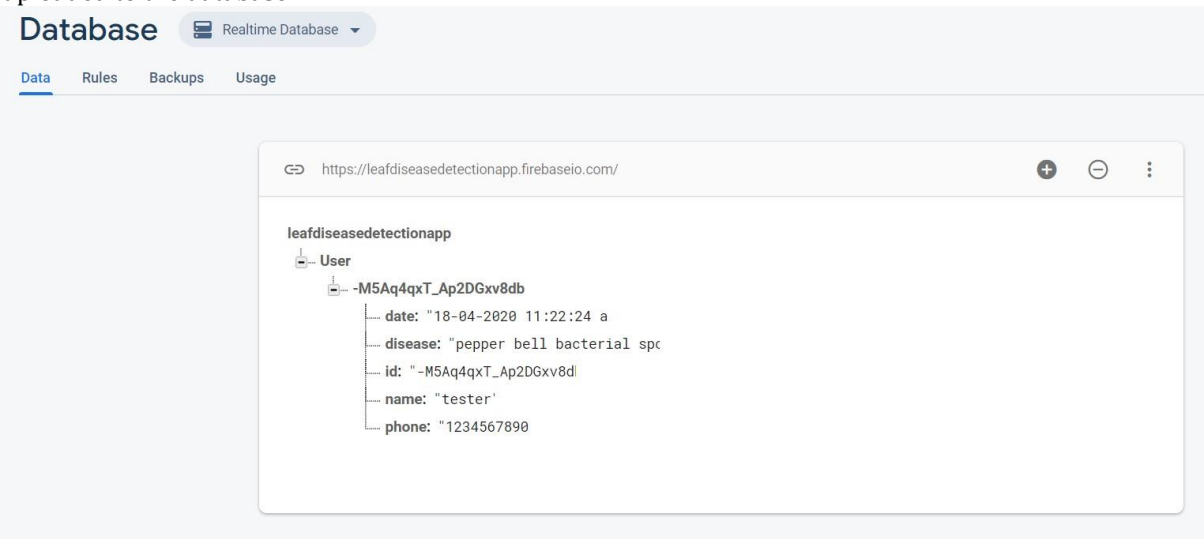

Fig. 2.7. Firebase database

The User data and detected result are stored in the database for future references. Thesereferences include the very important information such as:

- Date of usage
- Disease detected
- Id of the user
- Name of the user
- Phone number of the user

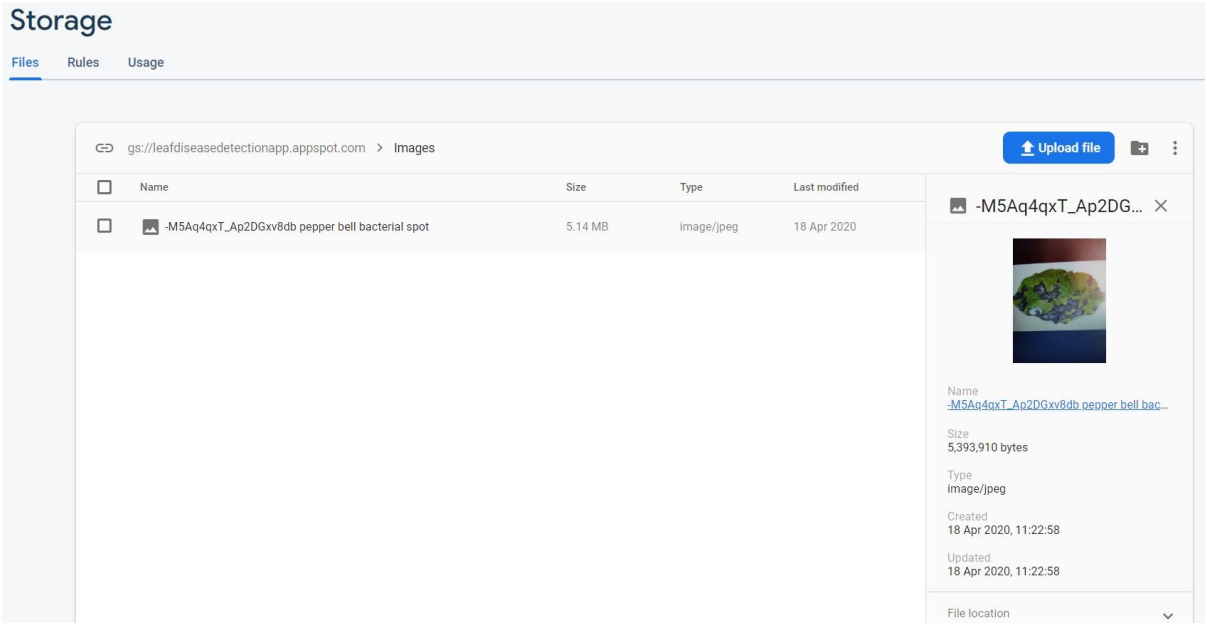

Fig. 2.8. Firebase storage

3. CONCLUSION

Plant diseases are to be dealt quickly and efficiently. In order to do so, detection of disease plays a very important role. This project can efficiently analyze and give proper result to the user. This helps to take necessary actions in time. The interface is easy to understand and use.The Disease is detected based on pre-trained model which can be improved on later stages. TheCNN model is efficient to detect the disease. The User has the ease of choosing the image from gallery or take a photo using the camera. The displayed result can be spoken out in the app using the specified button in it. This improves the experience of the project. The data is then stored in the Firebase database and can be accessed for analysis and can help to form statistical data.

4. FUTURE ENHANCEMENT

As the plants and trees are very important for the survival of the ecosystem, it is also important that we do our best to protect them. Our app is intended for that purpose and in future we look forward to develop the application further. This will help the farmers and also every other responsible person to detect the plant diseases quickly and take necessary precautions.

REFERENCES

[1] https://www.frontiersin.org/articles/10.3389/fpls.2019.00941/full
[2] https://developer.android.com/docs
[3] https://firebase.google.com/docs/database/android/start
[4] https://colab.research.google.com
[5] https://tfhub.dev/google/tf2-preview/mobilenet_v2/feature_vector/4
[6] https://www.tutorialspoint.com/android