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Aloe Vera Plant Diseases Detection

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***Abstract*: A mobile application which can capture image of household medicinal plants and give results on the percent of damage occurred to the plants, this application is built with the help of deep learning CNN algorithm for the analysis part showing the result on the app and along with that the client side is built with Kotlin language and this is processed on Android Studio. In this application the user will be able to access the images from the gallery also and the previous information of the plant and also the commonly caused diseases/pests to the plants. Aloe vera is a natural product that is nowadays frequently used in the field of cosmetology. Though there are various indications for its use, controlled trials are needed to determine its real efficacy. The aloe vera plant, its properties, mechanism of action and clinical uses are briefly reviewed in this article. The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe "the plant of immortality." Today, the Aloe vera plant has been used for various purposes in dermatology.**

***Keywords*: Aloe vera, CNN algorithm, Kaggle data set, Google colab, Data mining.**

1. Introduction

Pests and diseases can completely wipe out your houseplants. Pests and diseases can affect not only the flower and leaves, but the stems and roots as well. It's much easier to prevent these things than to eliminate them after they happen.

Buy only clean and healthy plants. This reduces the risk of pests and diseases affecting not only your new plants but your existing ones.

Here are some cultural problems to watch out for:

Plants with variegated leaves will become green if the plant isn't in good light. The flowers on flowering plants become dry and fall off pretty quick if the compost is too dried out or it doesn't have enough light. Healthy leaves will curl at the edges and fall off the plant if it's in a draft. Lower leaves on the plant will become crispy if the compost is too dry or the temperature in the room is too hot.

If you see a white powdery coating on your clay pots, it usually indicates that the plant was fed too much or that your water contains a lot of chalk. Leaves develop holes in the centre or along the edge because people or pets brush by them when they go by.

Flower buds will fall off before blooming if the compost or air is too dry, or if the plant doesn't have enough light. Leaves will wilt if the compost is too dry or if the compost is overwatered. They may also temporarily wilt on a hot day.

If the compost is too wet, the leaves will wilt and decay quickly. Brown spots and blemishes will occur on the leaves of the plant for a lot of reasons.

2. Literature Survey

[1] There are lots of techniques to detect the different types of diseases in plants in their early stages. Conventional methods of plant disease detection in naked eye observation methods and it is non-effective for large crops. Using digital image processing and machine learning, disease detection in plants is efficient, less time consuming and accurate. This technique saves time, efforts, labours and use of pesticides. I hope this approach will become a little contribution for agriculture fields.

[2] Leaf Diseases Detection of Medicinal Plants based on Image Processing and Machine Learning Processes: In this paper, an automated leaf detection system is proposed. To detect the healthy and diseased leaf image region-based thresholding technique is used. Again, to detect the particular diseased area of a diseased leaf colour-based region thresholding method was used. For feature selection from the input images both HOG and LBP feature selection technique is used. To classify the category healthy and diseased leaf with subclasses, leaf name, and disease name the two-class, and multi-class SVM classifier is used. A detailed performance analysis was done between main classes and subclasses by using different classifiers. Finally, a graphical user interface is created for all users

Plant Disease Detection Using Machine Learning: The objective of this algorithm is to recognize abnormalities that occur on plants in their greenhouses or natural environment. The image captured is usually taken with a plain background to eliminate occlusion. The algorithm was contrasted with other machine learning models for accuracy. Using a Random Forest classifier, the model was trained using 160 images of papaya leaves. The model could classify with approximate 70 percent accuracy. The accuracy can be increased when trained with vast number of images and by using other local features together with the global features such as SIFT (Scale Invariant Feature Transform), SURF (Speed Up Robust Features) and DENSE along with BOVW (Bag of Visual Word) The graph and table below gives the comparison of machine learning algorithms.

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3. Method

A. Deep Learning Convolutional Neural Network (CNN) Model

CNN may be a prevalent demonstrate within the field of profound learning. The convolutional neural network model is composed of input layer, convolution layer, pooling layer, full connection layer and output layer. CNN is more productive since it diminishes the number of parameters which makes distinctive from other profound learning models.

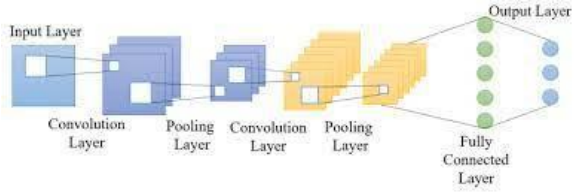


Fig. 1. Convolutional Neural Network

B. Proposed System

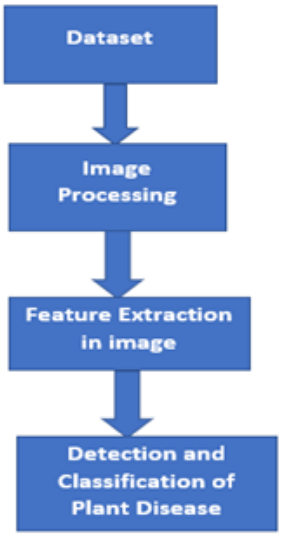


Fig. 2. Block diagram of the ML model

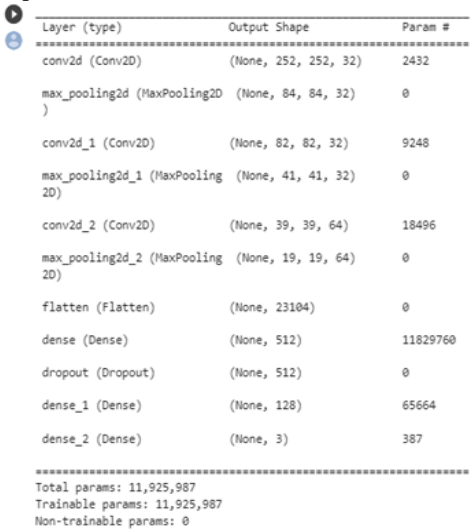
1) Dataset collection

We collected Dataset of aloe vera plant. Dataset contains total more than 3000 image samples of healthy leaf, rot and rust.

2) Building CNN Model

Main steps in our model:

1. Convolution Operation: Convolution is the primary layer to extricate highlights from the input picture and it learns the relationship between highlights utilizing bit or channels with input pictures. 32 features to be extricated from input pictures.
2. ReLU Layer (Rectified Linear Unit): ReLU stands for the Rectified Linear Unit for a non-linear operation. The yield is $f(x) = \max(0, x)$. we utilize this since to present the non-linearity to CNN. This will fire up neurons.
3. Pooling Layer (Max Pooling): it is utilized to diminish the number of parameters by down sampling and hold as it were the important data to handle advance.
4. Flatten layer 4D cluster to 1D cluster.
5. Fully Connected Layer: we pass our straighten vector into input Layer. SoftMax activation for probability outputs.



```
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 252, 252, 32)      2432

max_pooling2d (MaxPooling2D  (None, 84, 84, 32)        0
)

conv2d_1 (Conv2D)            (None, 82, 82, 32)        9248

max_pooling2d_1 (MaxPooling  (None, 41, 41, 32)        0
2D)

conv2d_2 (Conv2D)            (None, 39, 39, 64)        18496

max_pooling2d_2 (MaxPooling  (None, 19, 19, 64)        0
2D)

flatten (Flatten)            (None, 23104)             0

dense (Dense)                (None, 512)               11829760

dropout (Dropout)            (None, 512)               0

dense_1 (Dense)              (None, 128)               65664

dense_2 (Dense)              (None, 3)                 387

=================================================================
Total params: 11,925,987
Trainable params: 11,925,987
Non-trainable params: 0
```

Fig. 3.

3) Training CNN with parameters

For calculating accuracy train CNN with parameters.

4) Pass Image to model and predict disease

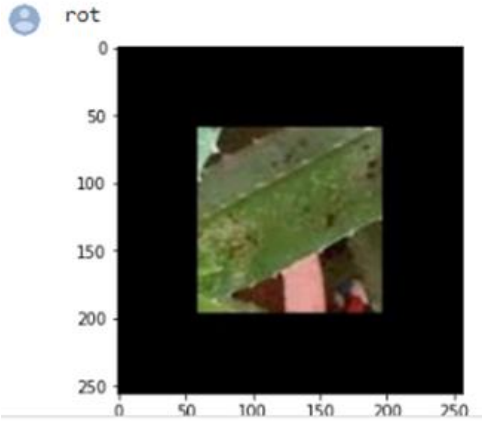


Fig. 4.

5) Deploying the Model to Android Application

To deploy the model to an android application, the TensorFlow model is being converted into TFLite Model.

6) Create mobile application

Send images from android app to model for disease prediction. For creating mobile application Kotlin and android studio is used. TFLite model file is placed in project folder. Mobile app contains features such as Dashboard from where user can access camera to click images of aloe vera plant, can import images from gallery, information about plant and Result of input images.

4. Result and Conclusion

The flow of result is shown in figure 5.

For result prediction user has to click image of aloe vera plant from camera or user can import image from gallery and click on button to predict result. Model will test it and user will get disease type and solution to cure disease.

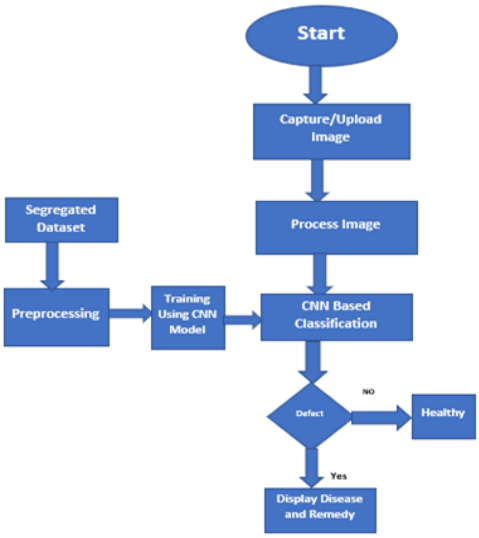


Fig. 5. Flow diagram

The figure 6, shows the result.

Fig. 6. Result

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