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Implementation of Farmer Friendly Application

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***Abstract*: Plant disease is an ongoing challenge for smallholder farmers, which threatens income and food security. The recent revolution in smartphone penetration and computer vision models has created an opportunity for image classification in agriculture. The project focuses on providing the data relating to the pesticide /insecticide and therefore the quantity of pesticide/insecticide to be used for associate degree unhealthy crop. The user, is that the farmer clicks an image of the crop and uploads it to the server via the humanoid application. When uploading the image, the farmer gets associate degree distinctive ID displayed on his application screen. The farmer must create note of that ID since that ID must be utilized by the farmer later to retrieve the message when a minute. The uploaded image is then processed by Convolutional Neural Networks. Convolutional Neural Networks (CNNs) are considered state-of-the-art in image recognition and offer the ability to provide a prompt and definite diagnosis. Then the result consisting of the malady name and therefore the affected space is retrieved. This result's then uploaded into the message table within the server. Currently the Farmer are going to be ready to retrieve the whole info during a respectable format by coming into the distinctive ID he had received within the application.**

***Keywords*: Deep learning, transfer learning, digital image processing, image classification, CNN, VGG16 architecture, android, fertilization management.**

1. Introduction

An Image is two dimensional signal. Image processing is unique technique to perform some operations on a picture, so as to induce a best image or to extract some helpful info from it. Advent of latest technologies like Digital image processing and Image classification technology has several applications within the biological field. Regarding seventy-eight percent of the farmers are not financially good and marginal within the country and that they are poor in resources. Therefore, they're not in a very position to use optimum amount of inputs in their crops that are essential for increasing the productivity. Most of farmers might not understand the number of plant food needed for crops and so it's going to result in unbalanced use of plant food and that they may additionally not understand that pesticide/insecticide to be used for the unhealthy crop. Hence the yield gets affected.

A user friendly application installs in phone and facilitate farmer to solve the matter of a farmer to find an illness. The farmer clicks the image of the crop and sends it to admin panel. The image is processed by the Image processing techniques and therefore the illness is detected. The main points of the illness and therefore the space affected alongside the number of pesticide/insecticide are sent to the farmer and therefore the farmer will see the main points in his application. This might prove advantages in observance giant fields of crops, and so whole algorithm will find the symptoms of diseases as shortly as they seem on plant leaves.

2. Methodology

The methodology is defined so as to implement the following method of sending data to farmer after receiving image and description of crop from him has the subsequent steps:

- Upload Image
- Image Preprocessing
- Pre-train Architecture (VGG16)
- Feature Extraction
- CNN Classification
- Message Retrieval

Fig. 1. Methodology

The android app for farmers developed using ionic angular framework. The app has different stages like storing pictures within the DB, accessing pictures from DB, change data into the DB and extracting information from the DB. The farmer uploads the image in query section and the ID is sent to him. The image is received from the server. The image can be accessed by Python through the uniform resource locator (URL) of the image from the server. The Graphic User Interface of Python has an interface that consists of a button known as image choose. After clicking Image choose the image would either be fetched from server or can be manually selected.

The image is pre-processed and analyzed using the CNN Classification algorithm so the options of the chosen classification, using train model with 99 % accuracy the illness is detected if chemical needed for it to send as data to the farmer by changing it within the information. The data is later retrieved by the farmer by the ID that was generated before.

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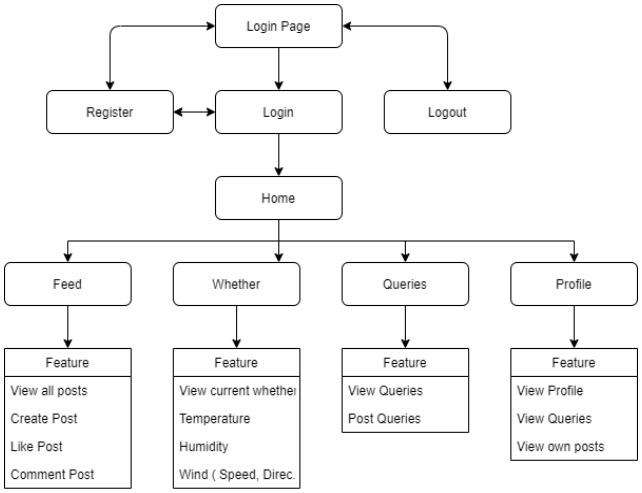

Fig. 2. Implementation

3. Modeling and Analysis

This project contained several challenging elements which required careful management. One of which, being that both python and image classification were unfamiliar to the researcher. All programming tasks were carried out on the free cloud service Google Colab which offers GPU. The only cost incurred throughout this study was model deployment on Render. For programming support, the online python, Machine learning and Deep Learning documentation was reviewed. The performance of a pre-trained VGG16 model in detecting crop disease is investigated. The developed model is deployed as a web application and is capable of recognizing plant diseases out of healthy leaf tissue. A dataset containing 8,685 leaf images; captured in a controlled environment, is established for training and validating the model. Validation results show that the proposed method can achieve an accuracy of 99%.

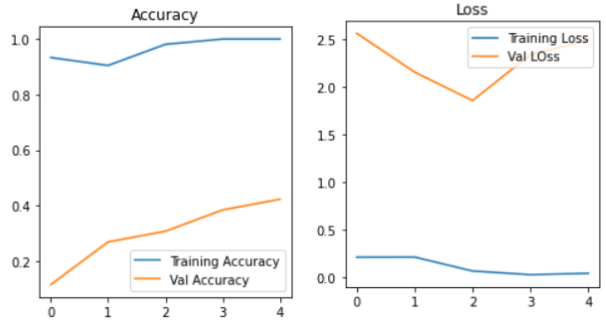

Fig. 3. Accuracy and Loss graphs

4. Result and Discussion

In this study, we evaluated an array of visualization methods to interpret the representation of plant diseases that the CNN has diagnosed. The experimental results show that some simple approaches, such as naive visualization of the hidden layer output, are insufficient for plant disease visualization, whereas proper exposure of leaf have potential practical applications. Feature extraction can be used to extract the visual features that are used to classify a particular disease. Our task is similar to domain-specific fine-grained visual categorization, which occasionally makes the problem more challenging. This is somewhat related to the datasets of natural images (e.g., iNaturalist dataset) that contain categories with a similar appearance. It is important to further understand what the deep networks learn for such fine-grained categorization tasks.

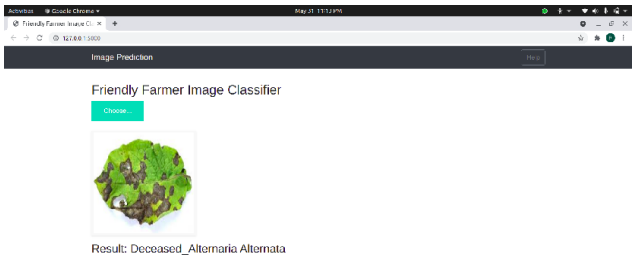

Fig. 4. Friendly farmer image classifier

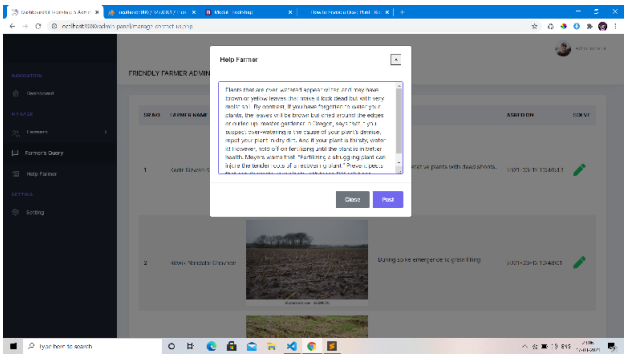

Fig. 5. Help farmer

After identification of disease, experts evaluate result and analyze to give best possible approach to eliminate the disease and help the farmer within a very short period of time.

5. Conclusion

An application of detecting the plant sickness and providing the mandatory suggestions for the disease has been enforced. Therefore, the projected objective was enforced on different types of crops. The experimental results indicate the projected approach will acknowledge the diseases with a less computational process and less effort. By this methodology, the plant diseases are often known at the initial stage itself and therefore the persecutor management tools are often accustomed solve persecutor issues whereas minimizing risks to plants and crops so as to boost sickness identification rate at varied stages, the training samples are often increase with the optimum options given as input condition for sickness identification and fertilization management of the crops. As a part of Future improvement the whole method delineate during this project are often automatic so the result is often delivered in very short period of time.

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