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AgroGuide Plants Diseases Detection Using Image Processing

Aditya Mali[1], Pranav Charate[2], Siddhant Keste[3], Shreyash Gaikwad[4], Priyanka Chougule[5]
Students, Department of Computer Engineering[1, 2, 3, 4]
Faculty, Department of Computer Engineering[5]
Sharad Institute of Technology, Polytechnic, Yadrav, Maharashtra, India

Abstract: *When plants and crops are suffering from pests and diseases it affects the agricultural production and overall development of the country. Often, farmers or specialists monitor plants for healthiness and diagnose diseases. Diagnosis of plant diseases is key to preventing crop losses and agricultural product value. Plant Disease studies refer to studies of the visible patterns observed in a plant. It requires tremendous amount of work, expertise in the plant diseases, and this method is often time processing, expensive and inaccurate. Automatic identification of diseases using image processing algorithms provide fast and accurate results. This paper tells how the techniques and methods used earlier by various researchers in this field. Accuracy of their models and comparative summary is shown below. Also this paper tell how by using this technique farmer can detect plant diseases in his early phase that causes he can control it and grow their production. In that paper we describe various feature that we implement in our application.*

Keywords: Artificial Intelligence, Machine Learning, Deep Learning, Convolutional Neural Networks, Image Processing, Image Classification, Pest Detection, Plant Diseases, Farmers, Image Datasets, InceptionV3.

I. INTRODUCTION

One of the important pillars of Indian economy is Agriculture. Employment of about 50% of working countries is provided by the Indian agricultural sector. India is known to be the largest producer of pulses, rice, wheat, spices and spice products in whole world.

The economic growth of a farmer depends on the level of production they produce, which depends on the growth of the crop and the yield they receive. Therefore, in the agricultural sector, the presence of plant diseases plays a major role. Crops are very popular with diseases that affect plant growth which also affect the environment of the farmer. Initially, the method used to monitor plants for disease was traditional blinding which was a time-consuming process that required experts to manually inspect plant fields. There are many cases where farmers do not have complete information about plants and the disease that can affect plants. Unlike other machine learning methods, Convolutional Neural Networks is a complex neural feed network.

For early detection of plant disease, the use of an automatic diagnostic tool is beneficial. Symptoms of plant diseases appear on different parts of the plant such as leaves, etc. Diagnosing plant diseases using leaf pictures is a tedious task. Therefore, it is necessary to develop computational methods that will make the process of diagnosing and classifying diseases using leaf images automatically. Therefore we have put forth an effort to make an android application which will detect plant diseases using images captured on same phones and will provide them with necessary information to tackle the disease problem.

Various studies have been conducted under the field of plant-based disease diagnostic and diagnostic methods, traditional machine learning method random forest, neural artificial network, vector support machine (SVM), abstract brain, K method, Convolutional neural networks etc. . The whole informal forest, the learning method of separation, retreating and other activities that work on building a forest of logging trees during training. Unlike decision-making trees, Random Forests overcome the corruption of over-entry of their training data set and manage both numerical and category data.

Unlike other machine learning methods, Convolutional Neural Networks is a complex neural feed network. CNNs are used for image classification and image processing because of their high accuracy and popularity. It was proposed by computer

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scientist Yann LeCun in the late 90's, when he was inspired by the human concept of cognition. CNN follows a hierarchical model that works to build a network, as it should, and eventually produces a fully connected layer where all neurons are connected to each other and output is processed.

Also in our android application we add some other feature which makes farmer life easy. Feature like daily market price of various vegetables of different states, weather dictation feature which tell daily weather report, News feature that shows current news to farmer also we include fertilizer calculator which tells amount of fertilizer needed to farm etc. This all feature describe below in detail.

II. Literature Review

CNNs have been widely used in plant diseases image analysis, image recognition, and other fields. In the area of plant diseases picture classification, CNNs have already shown impressive results, such as potato fungus diseases image classification, apple fruit diseases image classification and corn diseases classification.

In article [1], authors used AlexNet and GoogLeNet CNN algorithms in the identification of 38 different plant diseases from PlantVillage dataset [4]. They used training from scratch approach on AlexNet and transfer approach on GoogLeNet and got overall accuracy of 85.53% (in case of AlexNet) to 99.34% (in case of GoogLeNet).

In article [2], authors used CNN image classification algorithm. They tested it on various diseases of tomato [4] like Septoria leaf spot, lead mold, and target spot. Their model achieved an overall accuracy of 88%.

A NASNet-based deep CNN architecture was used in [3] to identify leaf diseases in plants, and an accuracy rate of 93.82% was achieved. S. Sladojevic et al. [5] designed a DL architecture to identify 13 different plant diseases. They used the Caffe DL framework to perform CNN training.

Rice and maize-leaf diseases were identified by J. Chen in [4]. They applied transfer learning the deep CNN in the identification of plant diseases. In their approach, they replaced the last convolutional layer of VGG19 with two inception layers and one global average pooling layer. These extended layers was used for high-dimensional feature extraction and classifying.

A. Ramcharan et al. [6] applied transfer learning to train a deep convolutional neural network to identify three diseases and two types of pest damage of the Cassava Plants. Their best trained model accuracies were 98% for brown leaf spot, 96% for red mite damage, 95% for green mite damage, 98% for cassava brown streak disease, and 96% for cassava mosaic disease. The best model achieved an overall accuracy of 93.

In article [7], authors considered three main families of detectors: Faster Region-based Convolutional Neural Network (Faster R-CNN), Region-based Fully Convolutional Network (R-FCN), and Single Shot Multibox Detector (SSD). They combined each of these with “deep feature extractors” such as VGG-Net and Residual Network (ResNet). Their comparative results between three models shown that, plain networks perform better than deeper networks, such as the case of Faster R-CNN with VGG-16 with a mean AP of 83%, compared with ResNet-50 that achieves 75.37%. In contrast, SSD with ResNet-50 performed at 82.53% and R-FCN with ResNet-50 as feature extractor achieved a mean AP of 85.98%, which is slightly better than Faster R-CNN overall and is comparable in some classes.

Table 1: Summary of related work on plant-disease detection

Authors	CNN Algorithm Used	Results (Accuracy)
S. P. Mohanty et al. [1]	AlexNet and GoogLeNet	85.53% in AlexNet 99.34% in GoogLeNet
P. Srivastava et al. [2]	CNN	88%
A. Adedoja et al. [3]	NASNet	93.82%
J. Chen et al. [4]	INC VGGN	92% accuracy
S. Sladojevic et al. [5]	Fine-tuned CNN architecture	96.3%
A. Ramcharan et al. [6]	Inception V3 based on GoogLeNet	93%
A. Fuentes et al. [7]	Faster R-CNN	83%

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III. METHODOLOGY

Image classification is not about selecting best algorithm and feeding large amount of data only. To make your model best among others, there are some steps involved in image processing for detection of plant diseases like image acquisition, image pre-processing, image segmentation, feature extraction and classification. Let's see about them one by one:

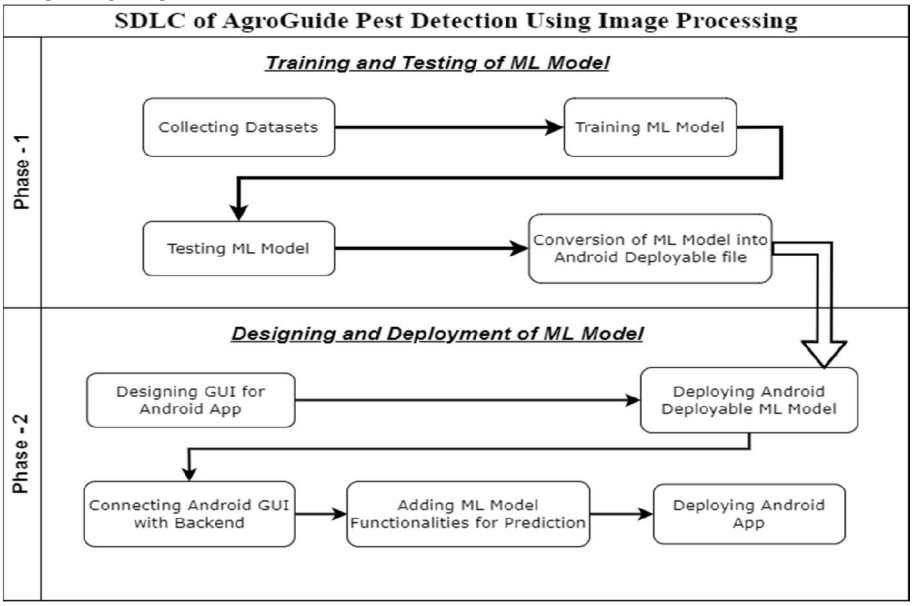

Figure 1.1

According to figure 1.1 our application is divided in to two phase. In phase-1 we develop testing and training of ML model in it we firstly collect the dataset of various plants in image format. We collect all images of different plants with the help of farmer, internet, also by clicking images by own on a farm. So we finally collect all the images and make proper dataset according to various plant images

Then the next step is to train our ML model. By passing image dataset we train our ML model that is it can detect the diseases on plant. After training of ML model it is time to test that ML model generate proper output or not. So we test our ML model and result is it works properly

We train our ML model in python but we cant use as it is in android so for that reason we need to convert ML model into android deployable file so we can use it in our application. Here the work of phase-1 is complected now to move to the next phase that is phase-2

In phase-2 we design UI of our app according to various feature. We create a UI in such a way that it feels user so attractive and interactive. After that we deploy our ML model in android and also do linking of GUI with ML model. Then we add functionalities for prediction of ML model that is how it can work. Here our model works perfectly. Similar way we add other features by using APIs we create news, whether detecting, market price of product etc. feature. Here we simply connect GUI with API.

IV. MODULES

4.1 Weather

While farmers must make many day-to-day decisions related to weather conditions most people know that the weather has a significant impact on the agriculture industry. Indeed, crops need the basics of moisture, warmth, and sun to thrive. But what's less obvious is how the details of weather information can drive a grower's business decisions, helping them to plan efficiently, minimize costs and maximize yields and profits as a result.

So for that reason we introduce weather detestation feature in our application. Our whether detection feature shows min temperature, max temperature, sunrise, sunset, wind speed, wind pressure, humidity etc. which help farmer to manage the farm properly.

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For this we use OpenWeather map's Current Weather API. This API provides the world's most sophisticated weather intelligence forecast for every longitude and latitude point on Earth with Superior Accuracy.
AccuWeather provides the world's most sophisticated weather intelligence.

4.2 News

News is a vital instrument used for inducing knowledge of agricultural innovations to farmer. Although its public relation role focuses on creating awareness of the new invention, it equally plays a significant role in educating farmers for improved efficiency. News are very important in our day to day life through that we can understand the surrounding condition.

So by understanding the importance of news we provide news feature in our application that causes farmer can get the news of various sector. Which help us to understand various thins in sociative. Here we use NewsAPI's News API has been the integral element allowing us to offer relevant and timely political news to our users – allowing them to take immediate action to contact their representatives using generated call scripts based on the articles they read. News API is a simple HTTP REST API for searching and retrieving live articles from all over the web.

4.3 Daily Market Price

According to various state the daily vegetable prices are continually change. In various places there are various product price so it is important to understand farmer what is the market rate of his product so that he get high cost for his product and he not cheated from brokers.

So for that reason, we develop daily market price feature in our application. Which shows daily market price of product of various state. It is most important which make farmer economically stronger. Here we use Open Government Data Platform of India's Daily price of commodities from various markets API This is the Open Government Data Portal designed, developed and hosted by the National Informatics Centre (NIC), a premier ICT organization of the Government of India under the aegis of the Ministry of Electronics & Information Technology.

The Objective of Open Government Data Platform India is to facilitate the access to Government owned shareable data and information in both human readable and machine readable forms in a proactive and periodically updatable manner, within the framework of various related policies, Acts and Rules of Government of India, thereby promoting wider accessibility and application of government owned data and unlocking the potential of data for national development.

4.4 To Do List

To-do lists offer a way to increase productivity, stopping you from forgetting things, helps prioritise tasks, manage tasks effectively, use time wisely and improve time management as well as workflow. With the help of this, farmer can mange his daily work properly and also he complete his task within a time.

4.5 Fertilizer Calculator

Fertilizers provide crops with essential nutrients like nitrogen, so that the crops grow bigger, faster, and produce more food. But high amount of fertilizer damage the crops so it is necessary to give right amount of fertilizer to the crop. And farmer cannot predict what amount of fertilizer they need to their farm.

By understanding this problem we make fertilizer calculator so that shows what amount of fertilizer need to the farm by simply giving input as farm area.

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V. RESULTS

Fig. 2.1- Startup Animation

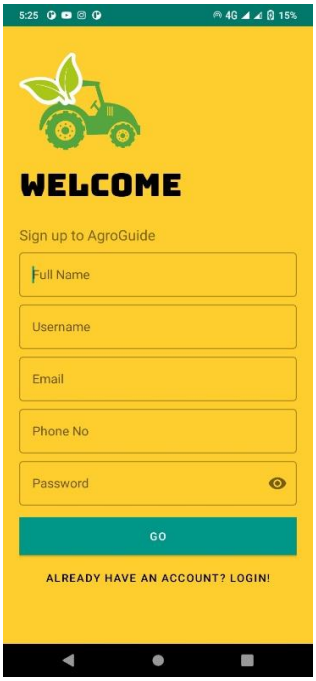

Fig. 2.2- Login Screen

Fig. 2.3- Registration Screen

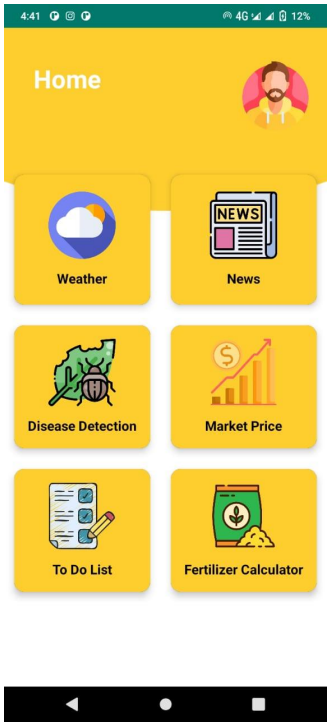

Fig. 2.4- Dashboard

Fig. 2.5- News Screen

Fig. 2.6- Market Prices Screen

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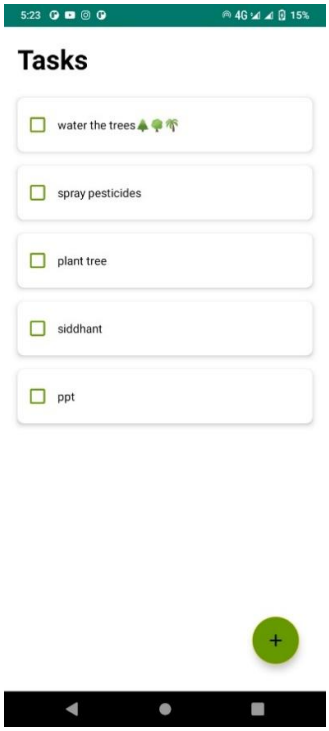

Fig. 2.7- Tasks Screen

Fig. 2.8- Weather Screen

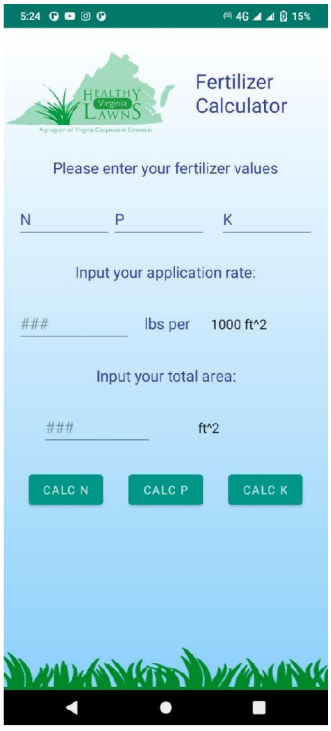

Fig. 2.9- Fertilizer Calculator

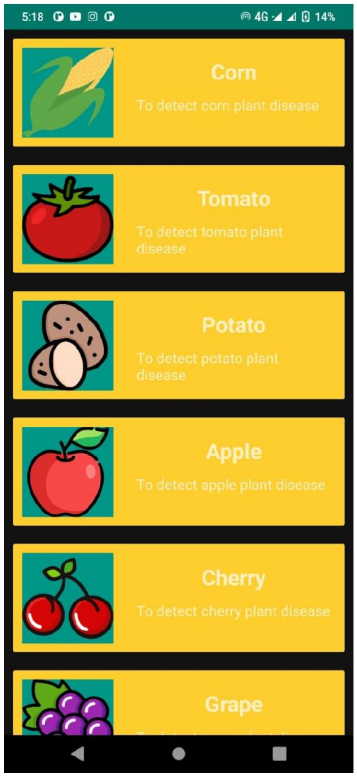

Fig. 2.10- Crop Selection

Fig. 2.11- Detected Disease

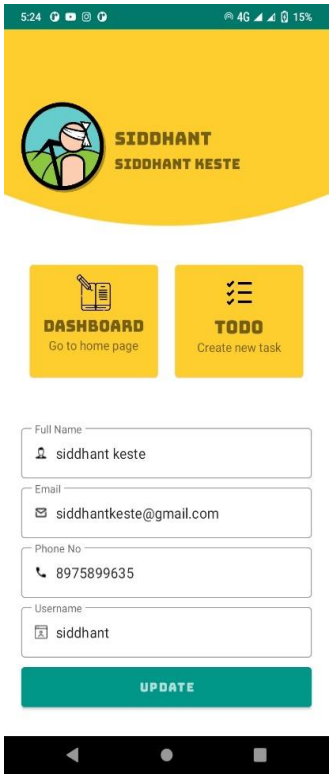

Fig. 2.12- User Profile Screen

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V. Conclusion

Mobile apps are potential digital tools which can be effectively utilized to reach agricultural information to a large number of farmers within a short period of time. They can be used to enhance farm income and productivity through providing correct information, better input and farm management, easy marketing and linkage with government agency for policy support to farmer etc. In this whole project we make the app that makes the farmer life easy and increase his crop production and make him economically stronger. We build it using various Modern technique. This app specially design to make farmer work easy.

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