

Integrated Agricultural Software Using Machine Learning And Web Scraping

Project Presentation

By

Sahil (2016IPG-089)

Sanjit Prasad (2016IPG-091)

Shashank Swarup Sharma (2016IPG-097)

Mentors

Prof. Joydip Dhar

Dr. Prasenjit Chanak

September, 2019

Introduction

- ▶ Agriculture is currently suffering from a lot of problems such as lack of knowledge about plant diseases, limited knowledge of fertilizers and frequent changes in weather.
- ▶ It is expected that by 2050, the Indian population will be 1.6 billion, for that we need 333 million tons of cereal.
- ▶ As we can not increase the agricultural land, so somehow we have to increase the productivity of crops to fulfill the requirement. Hence there is a need to introduce modernized technology to increase farming efficiency.
- ▶ This project is intended to bring a glow to people who depend on agriculture.

Motivation

- ▶ Agriculture accounted for 23% of GDP. About 70% of Indian population is engaged in agricultural activity.
- ▶ Several Agricultural Apps have been developed for this purpose, however they provide limited functionality and do not provide a one-step solution to all the agricultural problems.
- ▶ Hence, there is a need to come up with an Integrated Agricultural App which could provide all features to the farmers.
- ▶ Therefore we focus on the development of an Integrated Agricultural App, which is dynamic and has an easy to use interface. Our App will have all the necessary functionalities needed by a farmer in his daily routine.

Literature Review

- ▶ The development of an Integrated Mobile Application for agricultural purposes has been suggested by the research paper[1]. Their App contains information like Crop Information, Mandi Bhav, Forums and Weather forecast.
- ▶ An overview of different mobile-apps currently available in “Google Play Store”, for agriculture has been presented in the research paper[2]. They also suggested an Android application namely Kissan Sevak which includes Market Price, News and Weather Forecast and Crop Information.
- ▶ The challenges faced by the farmers in the management of farming has been studied in this research paper[3]. They suggested that mobile Apps can bring a revolutionary change in the field of agriculture.

Area of Improvement

- In Figure 1, we have compared various existing Apps on Google Play, regarding which modules they have, and which are missing.

<u>App Name</u>	<u>RSS Feed</u>	<u>Mandi Prices</u>	<u>Crop Info.</u>	<u>Weather Info.</u>	<u>Crop Disease Detection</u>	<u>Nearby Agri Store</u>	<u>Portal</u>
Plantics	✗	✗	✗	✗	✓	✗	✓
Krishi hub	✗	✓	✓	✗	✗	✗	✓
Kishan network	✗	✗	✓	✓	✗	✗	✗
IFFCO kisan	✗	✓	✓	✓	✗	✗	✓
Apni kheti	✗	✓	✗	✓	✗	✗	✗
My agri guru	✗	✓	✓	✓	✗	✗	✗
Farm bee	✗	✓	✗	✓	✗	✗	✓
Agro base	✗	✗	✓	✗	✗	✗	✗
Agrio	✗	✗	✗	✗	✓	✗	✗
Kisan Yojna	✓	✗	✗	✗	✗	✗	✗
Our App	✓	✓	✓	✓	✓	✓	✓

Figure: 1

Problem Statement

- ▶ The problem is to provide an android application consisting of all functionalities that a farmer requires in their daily life.
- ▶ Objective
 - ▶ Our objective is to develop an Android App which includes seven modules as stated in Figure 1.

Methodology Used

- ▶ Neural Networks
 - ▶ Crop Disease Detection
- ▶ Web Scraping Using Python and RESTful API
 - ▶ RSS Feed
 - ▶ Mandi Price
 - ▶ Crop Disease, Pest, Insect Information
- ▶ Application Program Interface(API)
 - ▶ Google Map API for Nearby Agri Store
 - ▶ Open Weather API for Weather Information and Forecast
- ▶ Other Modules
 - ▶ Portal For Farmer Queries

Activities Completed

Our Application has the following functionalities:

- ▶ Crop Disease, Pest and Insect Information
- ▶ Plant Disease Detection
- ▶ Nearby Agri Store
- ▶ Mandi Price
- ▶ RSS news feed
- ▶ Portal
- ▶ Weather Information and Forecast

Results

- ▶ Dataset
 - ▶ We have used public dataset provided by PlantVillage. This dataset consists of images of diseased and healthy crops. We used a subset of this dataset comprising of 3 crops and 15 total disease classes. It has a total of 7620 images. We have taken 3 major crops for disease detection namely Rice, Potato and Tomato.
- ▶ Transfer Learning Using VGG16
 - ▶ Transfer learning is a machine learning concept in which we use the knowledge gained from solving one problem in solving some other problem. We would be using VGG16, which is a convolutional network for extracting features from input images.
- ▶ Artificial Neural Network and Prediction
 - ▶ The features extracted by VGG16, are fed into an artificial neural network which predicts the disease along with the plant name.

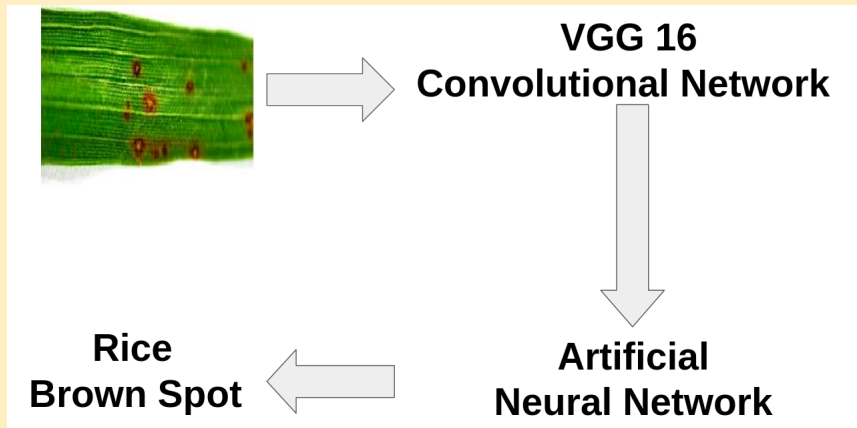


Figure: 2 Complete Architecture of Model Used

Cont'd

- ▶ We have trained our model with the following 2 optimization techniques:
 - ▶ Adam
 - ▶ Adagrad
- ▶ Figure 3 and 4 represents accuracy curves for Adagrad and Adam respectively.

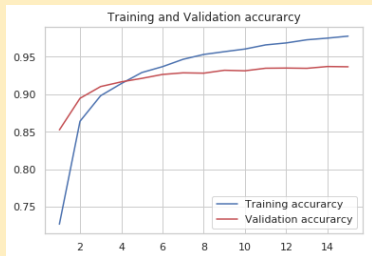


Figure: 3

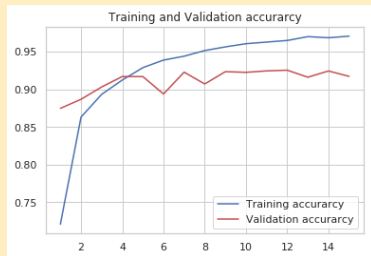


Figure: 4

- Figure 5 and 6 represents loss curves for Adagrad and Adam respectively.

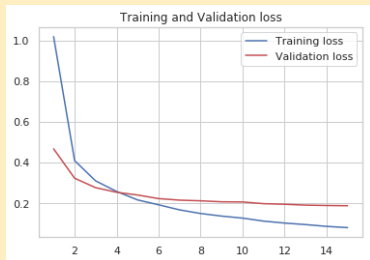


Figure: 5

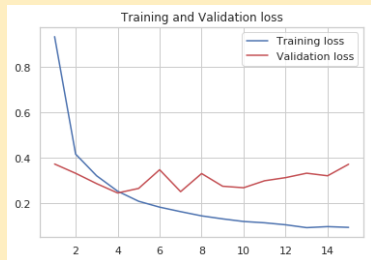


Figure: 6

- Figure 7 represents a 5X5 Confusion Matrix for 5 classes.

Rice (Brown Spot)	299	39	0	0	2
Rice (Leaf Smut)	52	300	0	0	2
Tomato (Bacterial Spot)	0	0	1665	2	14
Tomato (Early Blight)	0	0	14	674	12
Tomato (Late Blight)	0	0	25	54	1353
-	Rice(Brown Spot)	Rice (Leaf Smut)	Tomato (Bacterial Spot)	Tomato (Early Blight)	Tomato (Late Blight)

Figure: 7

Cont'd

- We have made the ROC curve for each class. AUC is also calculated for each class. Figure 8 represents the ROC curves for only 5 classes for clarity.

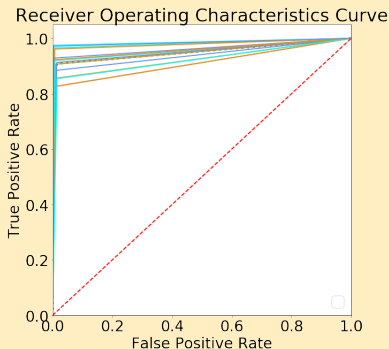


Figure: 8

- Figure 9 represents the area under the ROC curve plotted for all the 15 classes to be predicted.

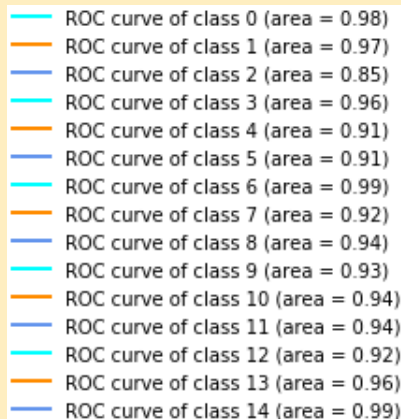


Figure: 9

- Figure 10 and Figure 11 shows the Disease Detection and Portal module respectively.

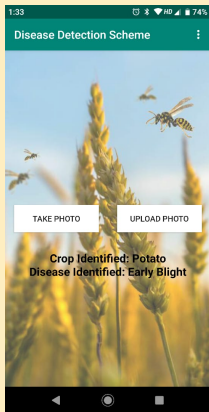


Figure: 10

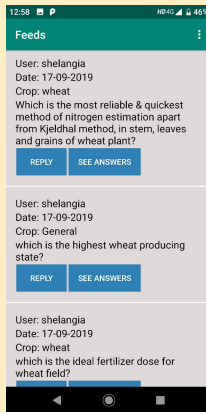


Figure: 11

- ▶ Figure 12 and 13 represents Weather Information and Forecast and Nearby Agri Store Module respectively.



Figure: 12



Figure: 13

- Figure 14 and 15 represents News and Mandi Price Module respectively.



Figure: 14



Figure: 15

- Figure 16, 17, 18 represents Crop Information Module .

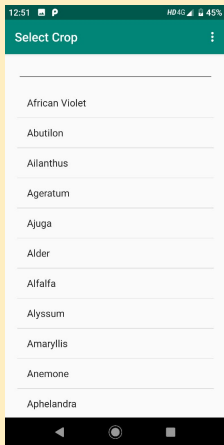


Figure: 16

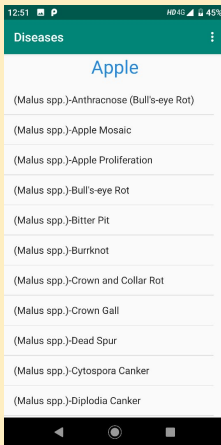


Figure: 17





Figure: 18

Future Scope

- ▶ Regional language support
- ▶ Need to extend the functionality of existing disease detection module
- ▶ Projects must be scalable to serve large number of users

REFERENCES

-  S. Giri, C. Yogaraja, V. Satish, N. Prasad, and M. Sushith, "Integrated Android Application for Effective Farming", *Asian Journal of Applied Science and Technology*, vol. 1, issue 2, pp. 214-215, 2017.
-  H.P. Patel and D. Patel, "Survey Of Android Apps For Agriculture Sector", *International Journal of Information Sciences and Techniques*, vol. 6, issue 1, pp. 61-67, 2016.
-  S. Sharma, D.K. Sharma, and S. Spriti, "Overview of Mobile Android Agriculture Applications", *International Research Journal of Engineering and Technology*, vol. 5, issue 8, pp. 225-231, 2018.

Thank You