GOVERNMENT COLLEGE OF ENGINEERING
(Formerly IRTT)
ERODE-638 316

BONAFIDE CERTIFICATE

Certified that this project titled **"FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASE PREDICTION USING AI"** is the bonafide work of **"KOKILA DEVI T (731119205017),NIVEDHA G(731119205029),PAVITHRA K(731119205030), PAVITHRA S(731119205031), THANUJA SHRI K(731119205044)"** who carried out the project work under my supervision.

SIGNATURE OF HOD

Dr.P.KALYANI,M.E.,Ph.D.,
HEAD OF THE DEPARTMENT
DEPARTMENT OF IT,
GOVERNMENT COLLEGE OF
ENGINEERING, ERODE – 638316

SIGNATURE OF SPOC

Dr.G.GOWRISON, M.E.,Ph.D.,
ASSISTANT PROFESSOR(SR)
DEPARTMENT OF ECE,
GOVERNMENT COLLEGE OF
ENGINEERING,ERODE - 638316

SIGNATURE OF FACULTY MENTOR

Dr.M.N.SUDHA,M.E.,Ph.D.,
ASSISTANT PROFESSOR(SR)
DEPARTMENT OF IT,
GOVERNMENT COLLEGE OF
ENGINEERING, ERODE – 638316

SIGNATURE OF FACULTY EVALUATOR

Dr.P.THANGAVEL,M.E.,Ph.D.,
ASSISTANT PROFESSOR(SR)
DEPARTMENT OF IT,
GOVERNMENT COLLEGE OF
ENGINEERING, ERODE - 638316

INDEX PAGE

Fertilizers Recommendation System for Disease Prediction Using AI

1 INTRODUCTION

1.1 Project Overview

Agriculture is the main aspect of country development. Food is considered as the basic need of human being which can be satisfied through farming. This project Presents an extensive survey of Artificial Intelligence ,by using the convolutional neural network and computer vision predict the plant disease and recommend the fertilizers for the plant.

1.2 Purpose

Detection and recognition of plant diseases using AI are very efficient in providing symptoms of identifying diseases at its earliest . Plant pathologists can analyze the digital images using digital image processing for diagnosis of plant diseases. Generally the plant disease are caused by the abnormal physiological functionalities of plants. Therefore the characteristic symptom are generated based on the differentiation between the normal physiological functionalities and abnormal physiological functionalities. The dataset is collected based on the plant disease. The collected dataset is trained and tested with deep learning neural network named Convolutional Neural Network(CNN). And also this project recommend the fertilizers based on the collected dataset and the disease.

2 LITERATURE SURVEY

2.1 Existing Problem

It is very important to recommend the fertilizers correctly based on the plant disease with a good accuracy. It should be easily for the farmers to communicate with the dealers or the fertilzer recommenders.

2.2 References

Aakanksha Rastogi, Ritika Arora, Shanu Sharma “advances in image processing for Leaf Disease Detection and Grading using Computer Vision Technology &Fuzzy Logic” International conference on signal processing and integrated network SPIN, pp 500-505.

Ms.pooja pawar, Dr.varsha turkar, Prof.pravin patil presents “algorithm for detecting crop disease early and exactly, this system is developed using image processing techniques and artificial neural network”.

H.G. Wang, G. L. Li, Z. H. Ma, and X. L. Li. “Application of neural networks to image recognition of plant diseases”, International Conference on Systems and Informatics, 2012.

Jayamala K. Patil1 and Raj Kumar, “Advances in image processing for detection of plant diseases”, Journal of Advanced Bioinformatics Applications and Research, ISSN 0976-2604Vol 2, Issue 2, pp 135-141,June-2011.

Shiva reddy proposed an IoT based system for leaf disease detection and fertilizer recommendation which is based on Machine Learning techniques yields less 80 percentage accuracies.

2.3 Problem Statement Definition

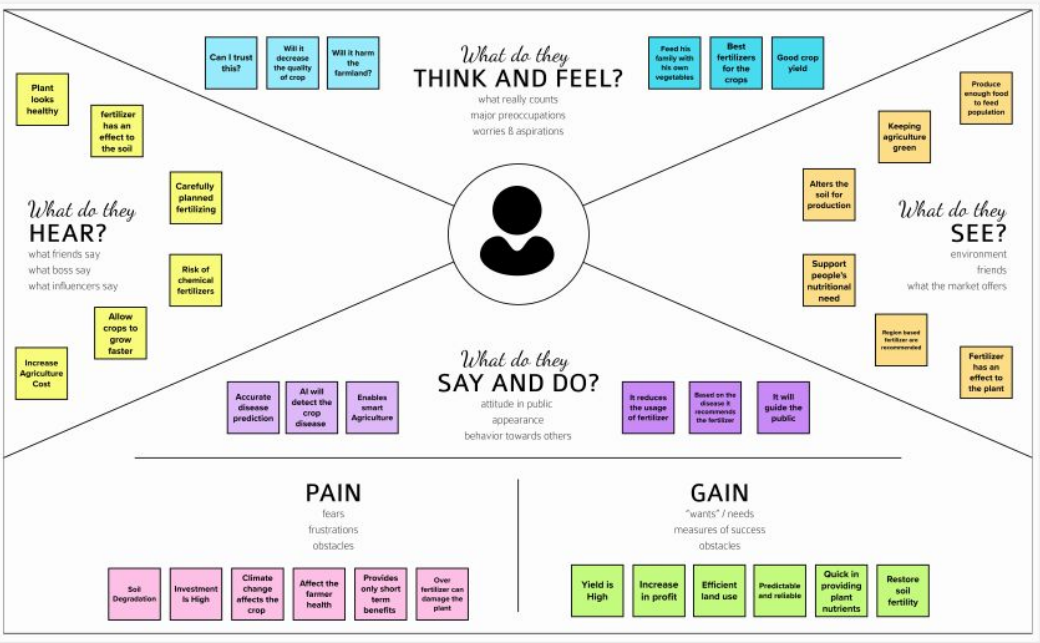
Agriculture is the most important Sector in today’s life. Most of the plants are affected by a wide variety of bacterial and fungal diseases. In agricultural aspects , if the plant is affected by leaf disease then it reduces the growth and productiveness. Generally the plant diseases are caused by the abnormal physiological functionalities of plants.

3 IDEATION & PROPOSED SOLUTION

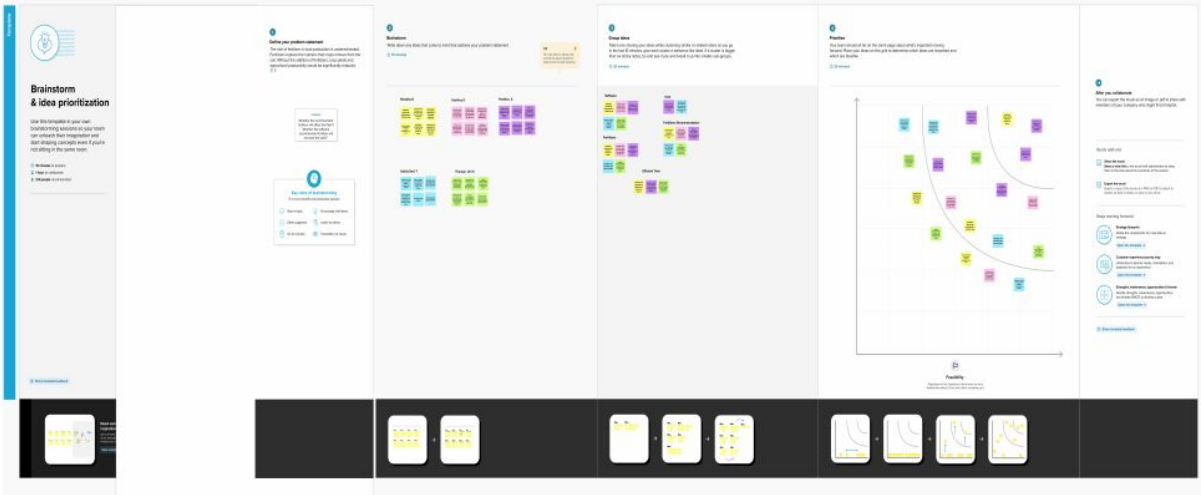
3.1 Empathy Map Canvas

Empathy Map Canvas

Fertilizers Recommendation System For Disease Prediction



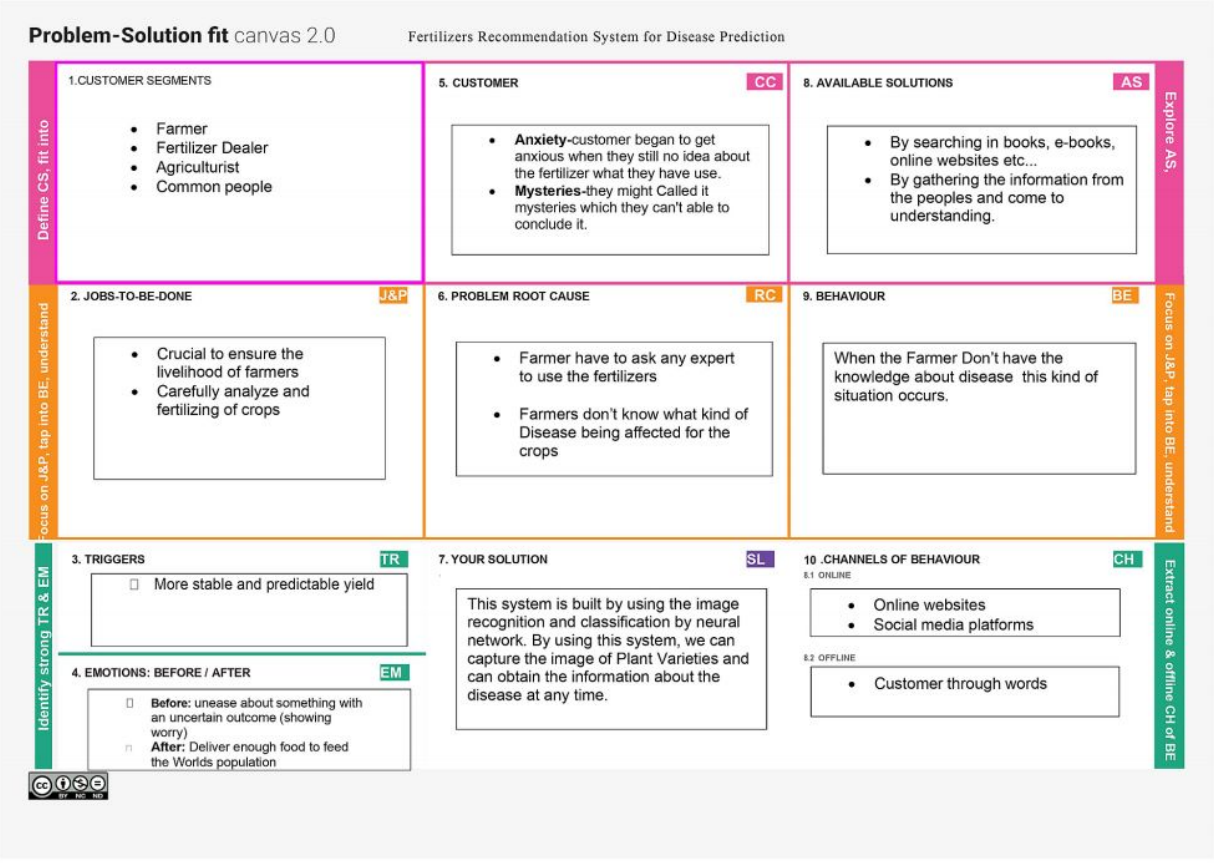
3.2 Ideation & Brainstorming



3.3 Proposed Solution

The proposed solution is to develop a prediction model using IBM AI service. Under AI, there are various deep learning techniques are available. Using Convolutional Neural Network(CNN), different diseases are identified and it recommend the fertilizers based on the predicted disease. An application is also built in an easy way for the farmers to communicate with the dealers or fertilizer retailers.

3.4 Problem Solution Fit



4 REQUIREMENT ANALYSIS

4.1 Functional Requirements

User Registration: Registration through form,
Registration through Gmail,
Registration through Linkedln.

User Conformation: Conformation via Email,
Conformation via OTP.

User Profile: Log in ,
Access the profile

Image Processing: Capture the image of the plant disease
Analyze the plant disease that is send by user

Prediction: Compare the image with the trained data in the model and predict the model

Recommend: Based on the predicted disease the software recommend fertilizers.

4.2 Non-Functional Requirements

Usability: Fertilizers recommendation are created and saved then these recommended fertilizers are used by the farmers.

Security: The software keeps the users information more securely.

Reliability: Creating the interactive dashboard which is easy to understand and useful for the users.

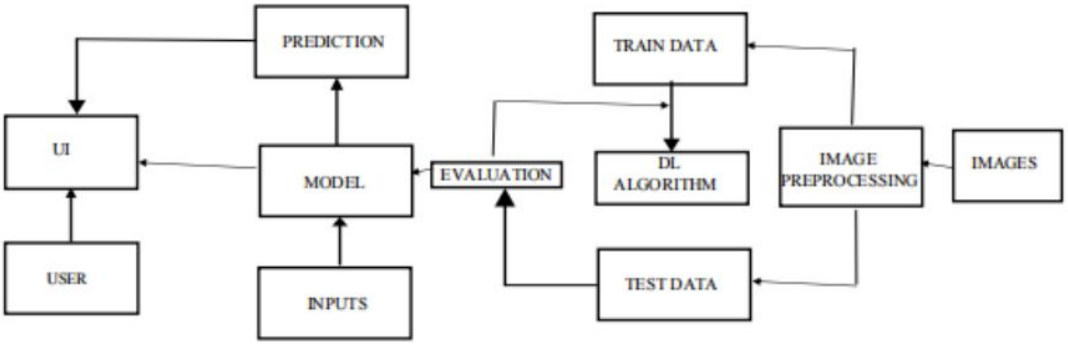
Availability: Software application is available for every user and they can easily access them.

Scalability: The proposed precision agriculture structure allows the implementation of a flexible methodology that can be adopted to different types of crops.

5 PROJECT DESIGN

5.1 Data Flow Diagram

A data flow diagram (DFD) is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.



5.2 Solution & Technical Architecture

Solution Architecture

A solution architecture (SA) is an architectural description of specific solution. SAs combine guidance from different enterprise architecture viewpoints (business, information and technical), as well as from the enterprise solution architecture (ESA).

Technical Architecture

Technology architecture deals with the deployment of application components on technology components. A standard set of predefined technology components is provided in order to represent servers, network, workstations, and so on

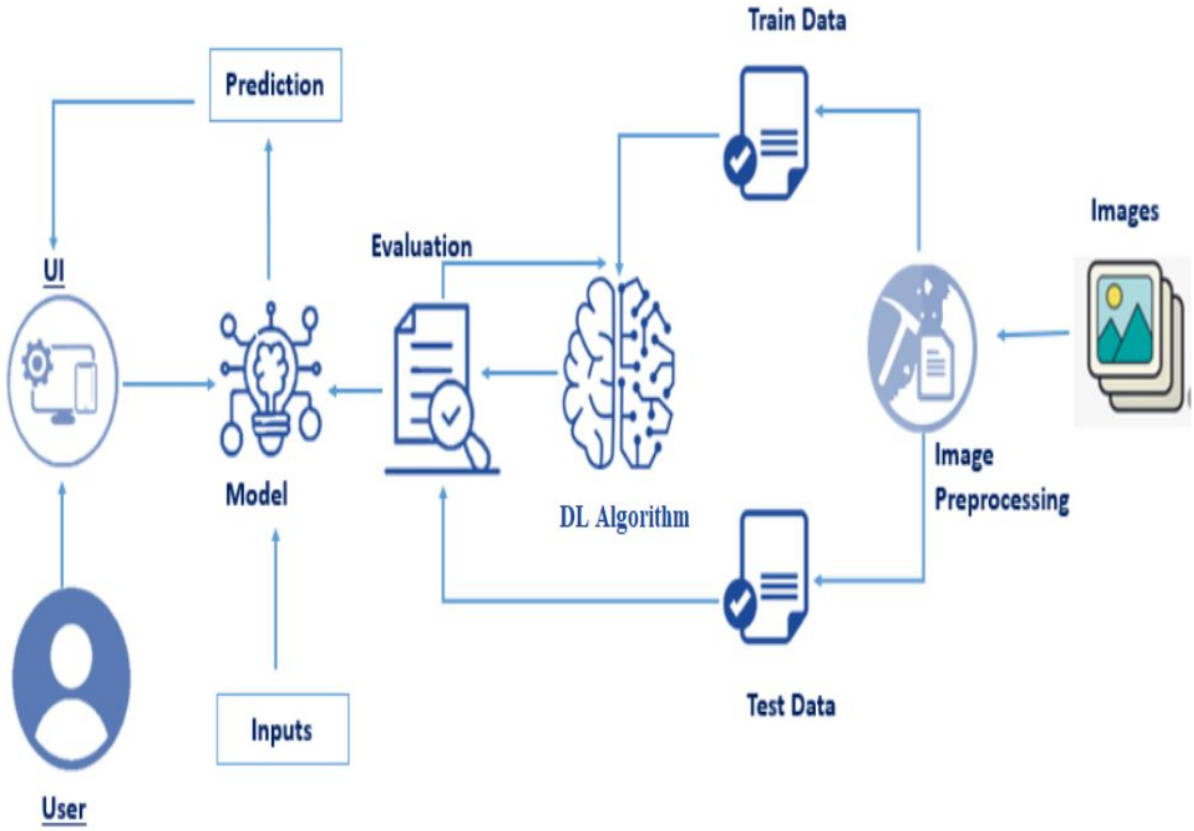


Image send by an user to the software and it is processed by image preprocessing. The image is compared with the trained and tested data by using the deep learning algorithm. The model analysis the given image and predict the output.

5.3 User Stories

User type	Functional Requirement(Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	-USN 1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		-USN 2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		-USN 3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		-USN 4	As a user, I can register for the application through Gmail	I can able to go through the cart	Medium	Sprint -1
	Login	-USN 5	As a user, I can log into the application by entering email & password	I can reset my password If I have forgotten my password	High	Sprint -1
	My account	-USN 6	As a user ,I can view my personal information	I can edit my profile photo and email.i can logout of the application from my account	High	Sprint-2

User type	Functional Requirement(Epic)	User Story Number	User Story/ Task	Acceptancecriteria	Priority	Release
Customer(Web user)	Registration	-USN 7	As a user ,I can register for the application by entering my email ,password and confirming my password	I can upload a profile photo and add my name to the account	Medium	Sprint -1
Customer Care Executive	Communication	-USN 8	As a user, i can provide support systems for companies that often communicate with the customers	I can maintain strong relationships with customer and client ,so I can ease their queries and increase productivity	High	Sprint- 2
Administrator	Chief Executive	-USN 9	As an administrator ,I can modify the list of products .so I can adjust our offerings overtime	Add or remove products.modify product images.select a category for the products.modify category taxonomy	High	Sprint -1

6 PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-1	Download the Dataset		Download the dataset for further Processing	8	High	Pavithra.S Kokila Devi T Pavithra K
	Image Preprocessing		Process and Format the images before they used by model training and inference	2	High	Pavithra.S Kokila Devi T Nivedha G

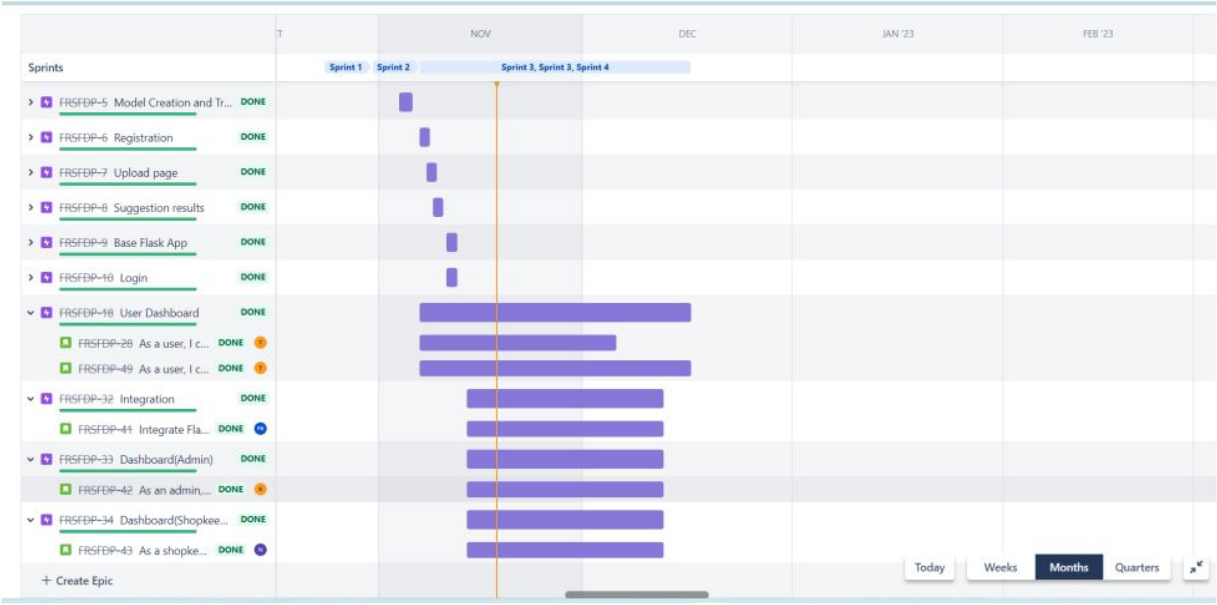
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-2	Model Creation and Training (Fruits)		Create a model which can classify diseased vegetable plants from given images and train onIBM Cloud	8	High	Pavithra S Kokila Devi T Nivedha G Pavithra K Thanuja Shri K
	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images	2	High	Pavithra S Kokila Devi T Nivedha G Pavithra K Thanuja Shri K
Sprint-3	Registration	USN-1	As a user, I can register by entering my email, password, and confirming my password or via OAuth API	3	Medium	Pavithra S Kokila Devi T Nivedha G
	Upload page	USN-2	As a user, I will be redirected to a page where I can upload my pictures of crops	4	High	Nivedha G Pavithra K Thanuja Shri K
	Suggestion results	USN-3	As a user, I can view the results and then obtain the suggestions provided by the ML model	4	High	Pavithra S Kokila Devi T Nivedha G
	Base Flask App		A base Flask web app must be created as an interface for the ML model	2	High	Kokila Devi T Nivedha G Pavithra K
	Login	USN-4	As a user/admin/shopkeeper, I can log into the application by entering email & password	2	High	Nivedha G Pavithra K Thanuja Shri K
	User Dashboard	USN-5	As a user, I can view the previous results and history	3	Medium	Pavithra S Kokila Devi T Nivedha G
Sprint-4	Integration		Integrate Flask, CNN model with Cloudant DB	5	Medium	Nivedha G Pavithra K Thanuja Shri K
	Dashboard (Admin)	USN-6	As an admin, I can view other user details and uploads for other purposes	5	Medium	Kokila Devi T Nivedha G Pavithra K
	Dashboard (Shopkeeper)	USN-7	As a shopkeeper, I can enter fertilizer productsand then update the details if any	2	Low	Pavithra S Kokila Devi T Nivedha G

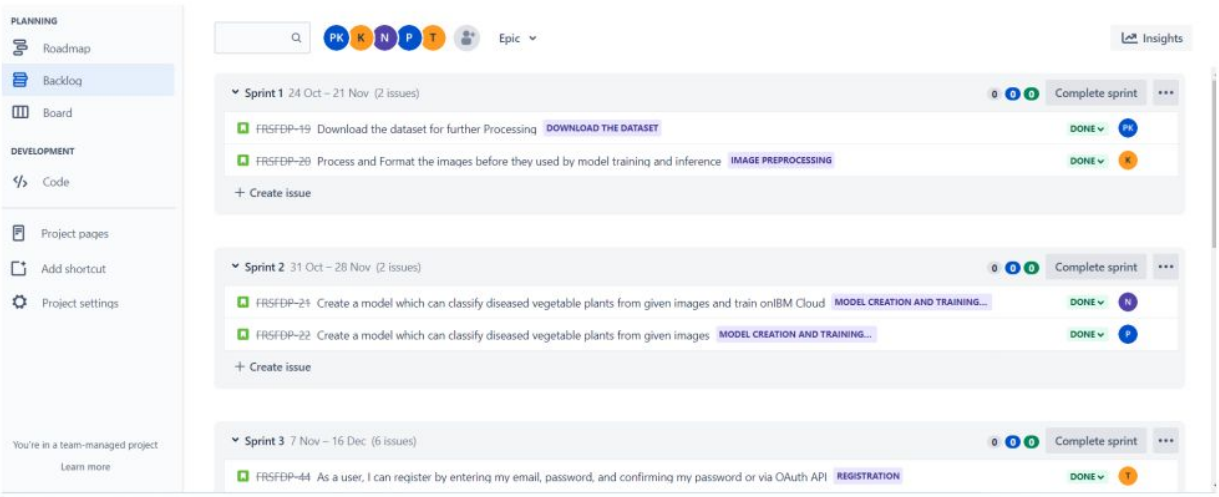
6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint-2	10	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	18	6 Days	07 Nov 2022	12 Nov 2022	18	12 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	12	19 Nov 2022

6.3 Reports from JIRA

Creation of Sprint 1,2,3,4:





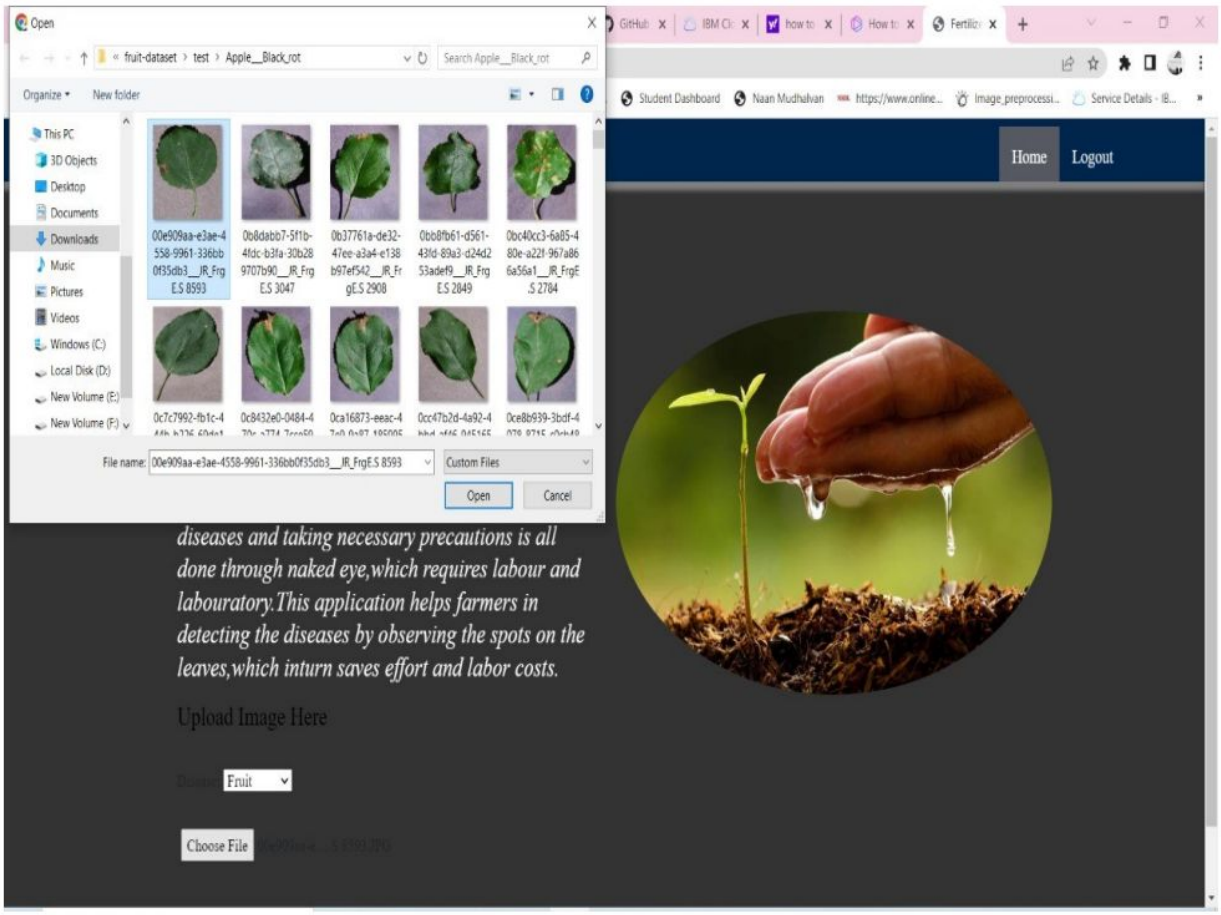
7 CODING & SOLUTIONING

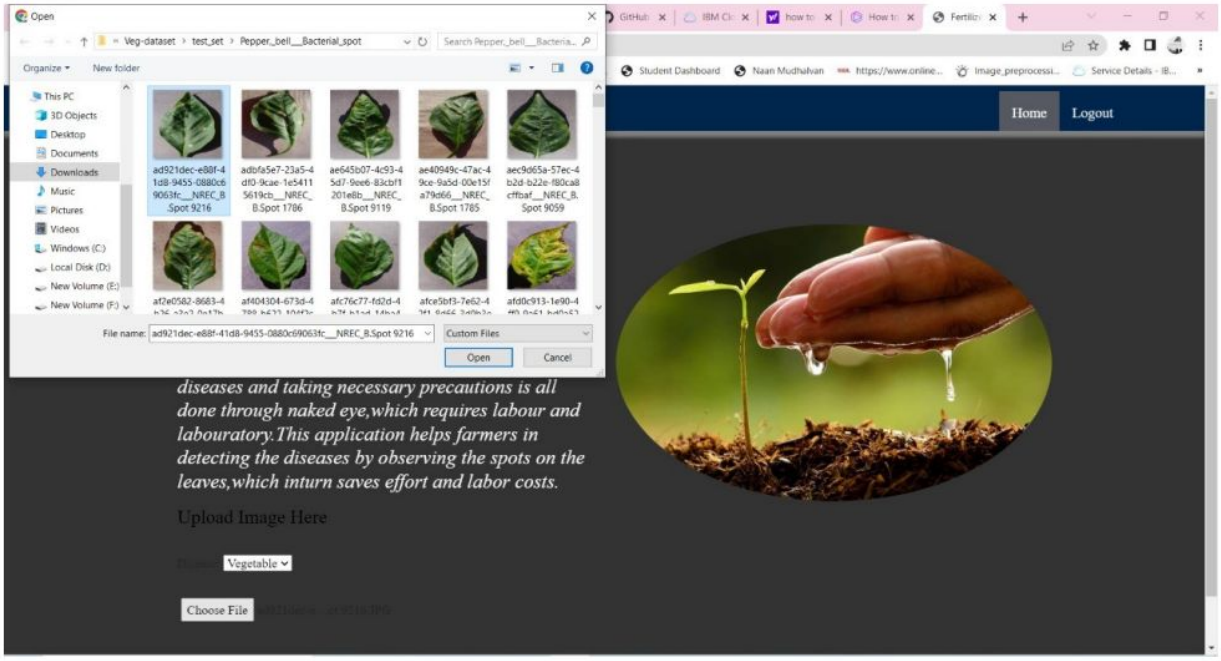
7.1 Feature 1

- New user can able to register in our website.
- Verified user can able to login our website.
- Verified user cannot be able to login with invalid credentials.

7.2 Feature 2

- User can view the index page of the Fertilizers Recommendation System for Disease Prediction using Artificial Intelligence.
- User can choose the image file (Fruit/Veg) in the index page.





8 TESTING

8.1 Test Cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
LoginPage_TC_001	Functional	Login Page	Verify user is able to see the Login/Signup popup when user clicked on My	Running on http://127.0.0.1:5000	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	file:///C:/Users/LENOVO/Downloads/login.html	User should navigate to user account homepage	Working as expected	Pass	Steps are clear and simple	N	Nil	Kokila Devi T
LoginPage_TC_002	UI	Login Page	Verify the UI elements in Login/Signup popup	Running on http://127.0.0.1:5000	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button	Username: chalam@gmail password: Testing123	Application should show below UI elements: a.email text box b.password text box c.Login button with white colour	Working as expected	Pass	Good Look and feel to the user	N	Nil	Kokila Devi T
LoginPage_TC_003	UI	Register page	For New User Registration	Running on http://127.0.0.1:5000 connect with flask app	1.Enter URL and click go 2.Enter User Valid username 3.Enter Valid email in Email text box 4.Enter valid password in password text box 5.Click on Register button user already exists click on login	file:///C:/Users/LENOVO/Downloads/register.html	User should navigate to user account homepage	Working as expected	Pass	Easy and simple user - Friendly UI.	N	Nil	Pavithra S
LoginPage_TC_004	Functional	Home page	User can Select the Plant Disease(Fruit/Veg) image	Running on http://127.0.0.1:5000 connect with flask app	1.After Navigation into Home Page 2.Click on the Dropdown button to select(Fruit/Veg)	Select from the dropdown menu	User can select any one among the option	Working as expected	Pass	Clear information was given.	N	Nil	Pavithra K
LoginPage_TC_005	Functional	Home page	User can choose the image from the Dataset	Running on http://127.0.0.1:5000 connect with flask app	1.click on the choose file 2.import the image from the image files 3.click on open	choose image from the file	User can choose suitable image file	Working as expected	Pass	Clear information was given.	N	Nil	Nivedha G
LoginPage_TC_006	Functional	Home page	User can get the result from the recommendation system	Running on http://127.0.0.1:5000 connect with flask app and import H5 file	1.Click on the Predict button 2.Navigate to Predict Page 3.Result will be displayed on the Interface	Plant Disease will get Predicted.	User can get the result from the recommendation system	Working as expected	Pass	Clear information was given.	N	Nil	Thanuja Shri K

8.2 User Acceptance Testing

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	19
Duplicate	2	0	2	0	4
External	2	0	0	0	2
Fixed	10	3	2	1	16
Not Reproduced	0	1	0	0	1
Skipped	0	0	1	1	2
Won't Fix	0	0	0	0	0
Totals	24	8	7	5	44

3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	43	0	0	43
Security	5	0	0	5
Outsource Shipping	4	0	0	4
Exception Reporting	10	0	0	10
Final Report Output	6	0	0	6
Version Control	2	0	0	2

9 RESULTS

9.1 Performance Metrics

```
!apt install unzip

[2] !unzip -u "/content/drive/MyDrive/dataset AI/Fertilizers_Recommendation_ System_For_Disease_ Prediction.zip"

[3] from tensorflow.keras.preprocessing.image import ImageDataGenerator

[4] train_datagen=ImageDataGenerator(rescale=1./255,horizontal_flip=True,vertical_flip=True,zoom_range=0.2)

[5] test_datagen=ImageDataGenerator(rescale=1./255)

[6] x_train = train_datagen.flow_from_directory(r"Dataset Plant Disease/fruit-dataset/fruit-dataset/train",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
    x_test = test_datagen.flow_from_directory(r"Dataset Plant Disease/fruit-dataset/fruit-dataset/test",target_size = (128,128), batch_size = 32, class_mode = 'categorical')

    Found 5384 images belonging to 6 classes.
    Found 1686 images belonging to 6 classes.

    y_train = train_datagen.flow_from_directory(r"Dataset Plant Disease/Veg-dataset/Veg-dataset/train_set",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
    y_test = test_datagen.flow_from_directory(r"Dataset Plant Disease/Veg-dataset/Veg-dataset/test_set",target_size = (128,128), batch_size = 32, class_mode = 'categorical')

    Found 11386 images belonging to 9 classes.
    Found 3416 images belonging to 9 classes.
```

Fruit Accuracy:

```
Fruit Disease Training

[8] from keras.models import Sequential
    from keras.layers import Dense
    from keras.layers import Convolution2D
    from keras.layers import MaxPooling2D
    from keras.layers import Flatten

    model=Sequential()
    model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
    model.add(MaxPooling2D(pool_size=(2,2)))
    model.add(Flatten())
    model.add(Dense(units=40,kernel_initializer='uniform',activation='relu'))
    model.add(Dense(units=70,kernel_initializer='random_uniform',activation='relu'))
    model.add(Dense(units=6,kernel_initializer='random_uniform',activation='softmax'))
    model.compile(loss='categorical_crossentropy',optimizer="adam",metrics=["accuracy"])
    model.fit(x_train,steps_per_epoch=168,epochs=3,validation_data=x_test,validation_steps=52)

    Epoch 1/3
    168/168 [==============================] - 91s 532ms/step - loss: 0.8614 - accuracy: 0.6896 - val_loss: 0.4704 - val_accuracy: 0.8389
    Epoch 2/3
    168/168 [==============================] - 89s 527ms/step - loss: 0.4671 - accuracy: 0.8311 - val_loss: 0.4301 - val_accuracy: 0.8516
    Epoch 3/3
    168/168 [==============================] - 88s 520ms/step - loss: 0.4038 - accuracy: 0.8599 - val_loss: 0.3894 - val_accuracy: 0.8624
    <keras.callbacks.History at 0x7fa54c96cb10>
```

Fruit Summary:

```
Epoch 2/3
[9] 168/168 [==============================] - 89s 527ms/step - loss: 0.4671 - accuracy: 0.8311 - val_loss: 0.4301 - val_accuracy: 0.8516
Epoch 3/3
168/168 [==============================] - 88s 520ms/step - loss: 0.4038 - accuracy: 0.8599 - val_loss: 0.3894 - val_accuracy: 0.8624
<keras.callbacks.History at 0x7fa54c96cb10>

model.save(r'fruit.h5')
model.summary()

Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 126, 126, 32)      896

 max_pooling2d (MaxPooling2D  (None, 63, 63, 32)       0
 )

 flatten (Flatten)           (None, 127008)            0

 dense (Dense)               (None, 40)                5080360

 dense_1 (Dense)             (None, 70)                2870

 dense_2 (Dense)             (None, 6)                 426

=================================================================
Total params: 5,084,552
Trainable params: 5,084,552
Non-trainable params: 0
_________________________________________________________________
```

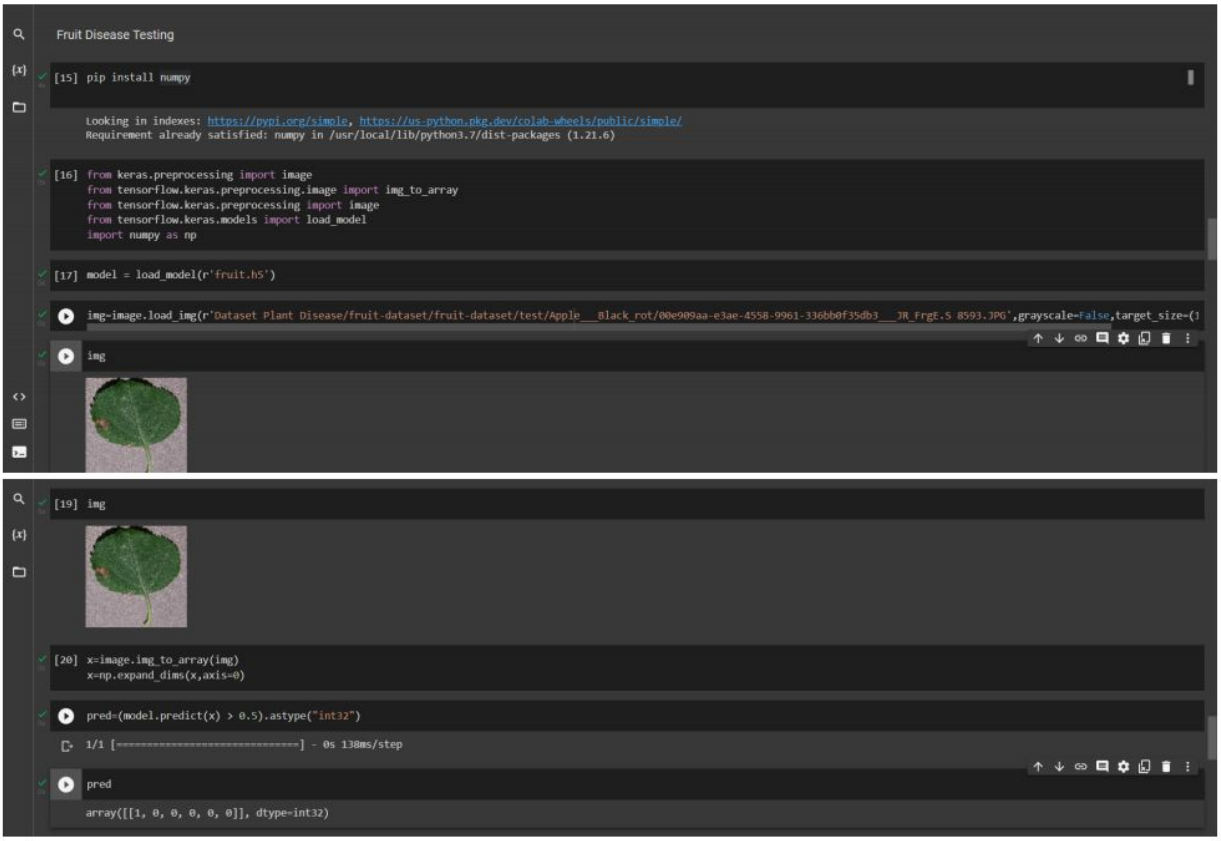
Vegetable Accuracy:

```
Vegetable Disease Training

[11] model.add(Dense(units=300,kernel_initializer='uniform',activation='relu'))
     model.add(Dense(units=150,kernel_initializer='uniform',activation='relu'))
     model.add(Dense(units=75,kernel_initializer='uniform',activation='relu'))
     model.add(Dense(units=9,kernel_initializer='uniform',activation='softmax'))
     model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=["accuracy"])

     model.fit(y_train,steps_per_epoch=89,epochs=20,validation_data=y_test,validation_steps=27)

     Epoch 1/20
     89/89 [==============================] - 48s 532ms/step - loss: 2.0566 - accuracy: 0.2121 - val_loss: 1.8996 - val_accuracy: 0.2512
     Epoch 2/20
     89/89 [==============================] - 48s 543ms/step - loss: 1.7093 - accuracy: 0.3599 - val_loss: 1.6067 - val_accuracy: 0.4062
     Epoch 3/20
     89/89 [==============================] - 45s 506ms/step - loss: 1.5223 - accuracy: 0.4101 - val_loss: 1.4450 - val_accuracy: 0.4491
     Epoch 4/20
     89/89 [==============================] - 45s 510ms/step - loss: 1.3285 - accuracy: 0.4877 - val_loss: 1.5214 - val_accuracy: 0.4549
     Epoch 5/20
     89/89 [==============================] - 47s 532ms/step - loss: 1.2557 - accuracy: 0.5060 - val_loss: 1.3176 - val_accuracy: 0.5255
     Epoch 6/20
     89/89 [==============================] - 45s 506ms/step - loss: 1.1536 - accuracy: 0.5520 - val_loss: 1.1184 - val_accuracy: 0.5799
     Epoch 7/20
     89/89 [==============================] - 44s 490ms/step - loss: 1.1479 - accuracy: 0.5746 - val_loss: 1.3767 - val_accuracy: 0.4988
     Epoch 8/20
     89/89 [==============================] - 45s 501ms/step - loss: 1.1469 - accuracy: 0.5700 - val_loss: 1.1956 - val_accuracy: 0.5405
     Epoch 9/20
     89/89 [==============================] - 45s 509ms/step - loss: 1.0860 - accuracy: 0.5874 - val_loss: 1.0097 - val_accuracy: 0.6134
```

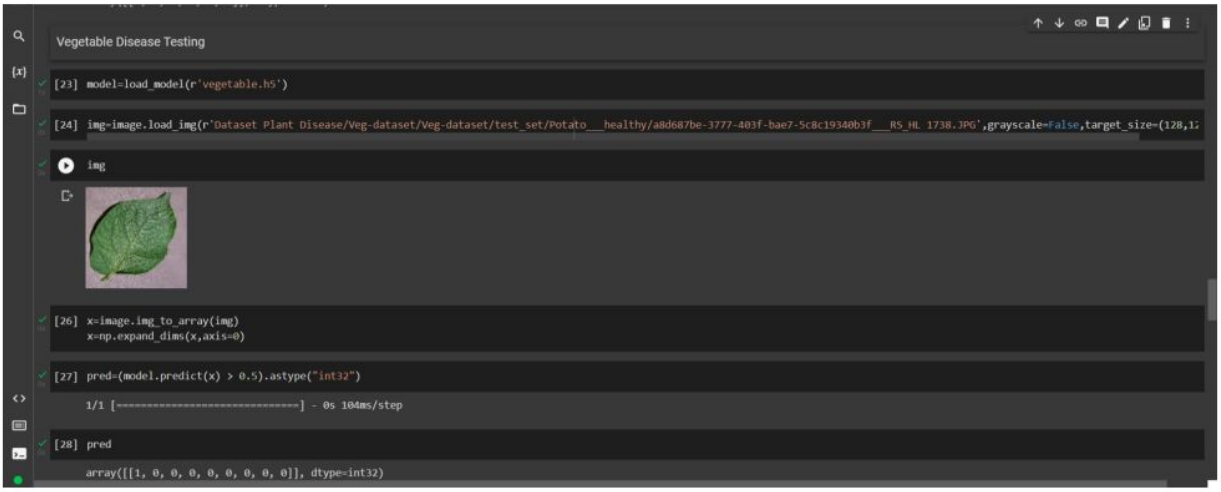
Vegetable Summary:

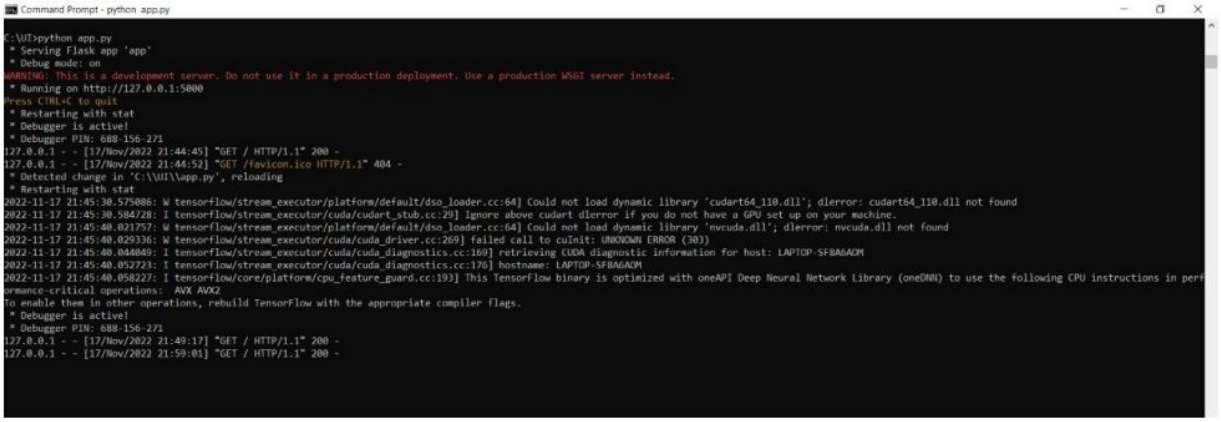
```
model.save(r'vegetable.h5')
model.summary()

Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 126, 126, 32)      896

 max_pooling2d (MaxPooling2D  (None, 63, 63, 32)       0
 )

 flatten (Flatten)           (None, 127008)            0

 dense (Dense)               (None, 40)                5080360

 dense_1 (Dense)             (None, 70)                2870

 dense_2 (Dense)             (None, 6)                 426

 dense_3 (Dense)             (None, 300)               2100

 dense_4 (Dense)             (None, 150)               45150

 dense_5 (Dense)             (None, 75)                11325

 dense_6 (Dense)             (None, 9)                 684

=================================================================
Total params: 5,143,811
Trainable params: 5,143,811
Non-trainable params: 0
_________________________________________________________________
```

Fruit Score:

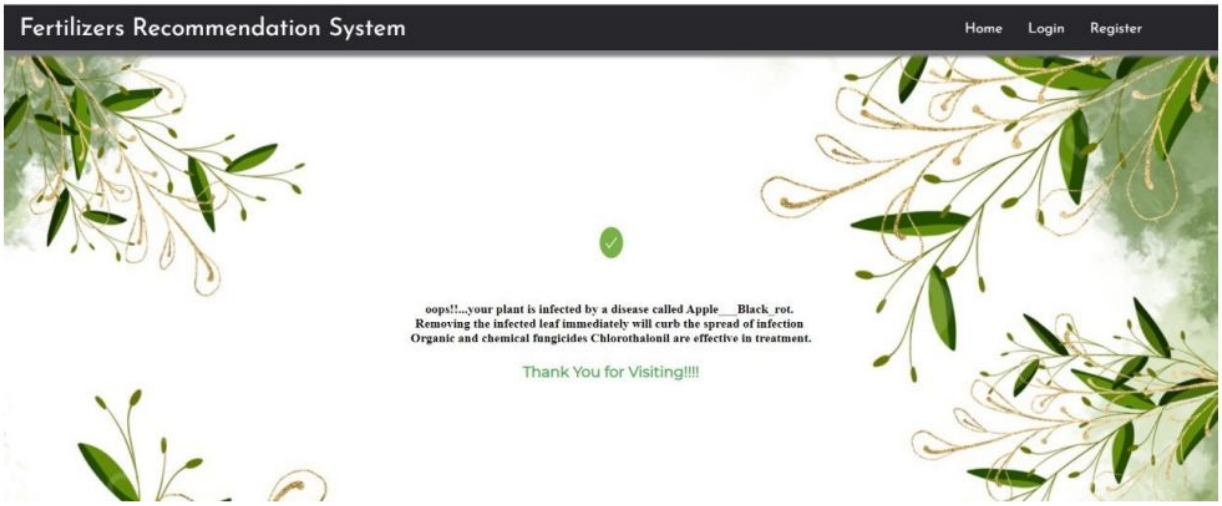


Vegetable Score:




Command Prompt - python app.py
C:\UI>python app.py
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 688-156-271
127.0.0.1 - - [17/Nov/2022 21:44:45] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 21:44:52] "GET /favicon.ico HTTP/1.1" 404 -
* Detected change in 'C:\\UI\\app.py', reloading
* Restarting with stat
2022-11-17 21:45:30.575086: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not found
2022-11-17 21:45:30.584728: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up on your machine.
2022-11-17 21:45:40.021757: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'nvcuda.dll'; dlerror: nvcuda.dll not found
2022-11-17 21:45:40.029336: W tensorflow/stream_executor/cuda/cuda_driver.cc:269] failed call to cuInit: UNKNOWN ERROR (303)
2022-11-17 21:45:40.044049: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:169] retrieving CUDA diagnostic information for host: LAPTOP-SF8A6AOM
2022-11-17 21:45:40.052723: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:176] hostname: LAPTOP-SF8A6AOM
2022-11-17 21:45:40.058227: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in perf
ormance-critical operations: AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
* Debugger is active!
* Debugger PIN: 688-156-271
127.0.0.1 - - [17/Nov/2022 21:49:17] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [17/Nov/2022 21:59:01] "GET / HTTP/1.1" 200 -


Fertilizers Recommendation System
Home
Logout
Detect if your Plant is infected!!!
Agriculture is one of the major sectors world wide.Over the years it has developed and the use of new technologies and equipments replaced almost all the traditional methods of farming. The plant Diseases effect the Production. Identification of diseases and taking necessary precautions is all done through naked eye,which requires labour and labouratory.This application helps farmers in detecting the diseases by observing the spots on the leaves,which inturn saves effort and labor costs.
Upload Image Here
Vegetable
Choose File


Fertilizers Recommendation System
Home
Login
Register
oops!!...your plant is infected by a disease called Apple___Black_rot.
Removing the infected leaf immediately will curb the spread of infection
Organic and chemical fungicides Chlorothalonil are effective in treatment.
Thank You for Visiting!!!!

10 ADVANTAGES & DISADVANTAGES

Advantages:

- The proposed model here produces very high accuracy of classification.
- Very large datasets can also be trained and tested.
- Images of very high can be resized within the proposed itself.

Disadvantages:

- For training and testing ,the proposed model requires very high computational time.
- The neural network architecture used in this project work has high complexity.

11 CONCLUSION

The model proposed here involves image classification of fruit datasets and vegetable datasets. The following points are observed during model testingand training:

- The accuracy of the classification also increased by varying dense layers.
- For different batch sizes, different classification accuracies are obtained.
- The accuracy of classification increased by increasing the number of epoch.
- Accuracies are different while varying the size of the train and test datasets.

12 FUTURE SCOPE

The proposed model in this project work can be extended to image recognition. The entire model can be converted to aplication software using python to exe software. The real time image classification,image recognition and video processing are possible with the help of OpenCV python library. This project work can be extended for security aplications such as finger print recognition , iris recognition and face recognition.

13 APPENDIX

Source Code

```
!apt install unzip
!unzip -u "/content/drive/MyDrive/dataset AI/Fertilizers_Recommendation_
System_For_Disease_ Prediction.zip"
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
train_datagen=ImageDataGenerator(rescale=1./255,horizontal_flip=True,vertical_flip=True,zoo
m_range=0.2)
test_datagen=ImageDataGenerator(rescale=1./255)
x_train = train_datagen.flow_from_directory(r"Dataset Plant Disease/fruit-dataset/fruit-
dataset/train",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
x_test = test_datagen.flow_from_directory(r"Dataset Plant Disease/fruit-dataset/fruit-
dataset/test",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
y_train = train_datagen.flow_from_directory(r"Dataset Plant Disease/Veg-dataset/Veg-
dataset/train_set",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
y_test = test_datagen.flow_from_directory(r"Dataset Plant Disease/Veg-dataset/Veg-
dataset/test_set",target_size = (128,128), batch_size = 32, class_mode = 'categorical')
```

Fruit Disease Training

```
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten

model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense(units=40,kernel_initializer='uniform',activation='relu'))
model.add(Dense(units=70,kernel_initializer='random_uniform',activation='relu'))
model.add(Dense(units=6,kernel_initializer='random_uniform',activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer="adam",metrics=["accuracy"])
model.fit(x_train,steps_per_epoch=168,epochs=3,validation_data=x_test,validation_steps=52)
model.save(r'fruit.h5')
model.summary()
```

Vegetable Disease Training

```
model.add(Dense(units=300,kernel_initializer='uniform',activation='relu'))
model.add(Dense(units=150,kernel_initializer='uniform',activation='relu'))
```

```
model.add(Dense(units=75,kernel_initializer='uniform',activation='relu'))
model.add(Dense(units=9,kernel_initializer='uniform',activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer="adam",metrics=["accuracy"])
model.fit(y_train,steps_per_epoch=89,epochs=20,validation_data=y_test,validation_steps=27)

model.save(r'vegetable.h5')
model.summary()
```

Fruit Disease Testing

```
pip install numpy

from keras.preprocessing import image
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.preprocessing import image
from tensorflow.keras.models import load_model
import numpy as np

model = load_model(r'fruit.h5')
img=image.load_img(r'Dataset Plant Disease/fruit-dataset/fruit-
dataset/test/Apple___Black_rot/00e909aa-e3ae-4558-9961-336bb0f35db3___JR_FrgE.S
8593.JPG',grayscale=False,target_size=(128,128))

img

x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred=(model.predict(x) > 0.5).astype("int32")
pred
```

Vegetable Disease Testing

```
model=load_model(r'vegetable.h5')
img=image.load_img(r'Dataset Plant Disease/Veg-dataset/Veg-
dataset/test_set/Potato___healthy/a8d687be-3777-403f-bae7-5c8c19340b3f___RS_HL
1738.JPG',grayscale=False,target_size=(128,128))
```

```
img

x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)

pred=(model.predict(x) > 0.5).astype("int32")
pred
```

Python - Flask (app.py)

```
import requests
from tensorflow.keras.preprocessing import image
from tensorflow.keras.models import load_model
import numpy as np
import pandas as pd
import tensorflow as tf
from flask import Flask,request,render_template,redirect,url_for
import os
from werkzeug.utils import secure_filename
from tensorflow.python.keras.backend import set_session



app=Flask(__name__)
model=load_model("vegetable.h5")
model1=load_model("fruit.h5")


@app.route('/')
def home():
    return render_template('index.html')



@app.route('/prediction')
def prediction():
    return render_template('output.html')
```

```
@app.route('/predict',methods=['POST'])
def predict():
    if request.method=='POST':
        f=request.files['image']
        basepath=os.path.dirname(__file__)
        file_path=os.path.join(basepath,'uploads',secure_filename(f.filename))
        f.save(file_path)
        img=image.load_img(file_path,target_size=(128,128))
        x=image.img_to_array(img)
        x=np.expand_dims(x,axis=0)
        plant=request.form['plant']
        print(plant)
        if(plant=="vegetable"):
            preds=model.predict_classes(x)
            print(preds)
            df=pd.read_excel('precautions-veg.xlsx')
            print(df.iloc[preds[0]]['caution'])
        else:
            preds=model1.predict_classes(x)

            df=pd.read_excel('precautions-fruits.xlsx')
            print(df.iloc[preds[0]]['caution'])
        return df.iloc[preds[0]]['caution']


if __name__=="__main__":
    app.run(debug=True)
```

HTML code:-

```
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
```

```
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Fertilizers Recommendation System for Disease prediction </title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/Style.css') }}" rel="stylesheet">


</head>
<body style="font-family:Montserrat;background-color:#333;">


    <div class="header">
     <div style="width:50%;float:left;font-size:2vw;text-align:left;color:white; padding-
top:1%">Fertilizers Recommendation System</div>
      <div class="topnav-right" style="padding-top:0.5%;">


        <a class="active" href="{{ url_for('login')}}">Home</a>
        <a  href="{{ url_for('index')}}">Logout</a>


      </div>
    </div>

<!--<body style="background-color:white";>
        <header id="head" class="header">
        <section  id="navbar">
           <br>
              <h1 style="color:green;"></i><center>Fertilizers Recommendation
System</center></h1>
```

```
        <div class="nav--items">

          <ul>
            <li><a  href="{{ url_for('index')}}">Home</a></li>
          <li><a href="{{ url_for('logout')}}">Logout</a></li>


                    </ul>
        </div>
      </section>
  </header>
-->
  <div class="container">
    <div id="content" style="margin-top:2em">
    <div class="container">
     <div class="row">
      <div class="col-sm-6 bd" > <br><br>
       <blockquote style="font-size:40px"> Detect if your Plant is infected!!!</blockquote>
       <p><h5><i style="color:white;font-size:25px;"> Agriculture is one of the major sectors world wide.Over the years it has developed and the use of new technologies and equipments replaced almost all the traditional methods of farming. The plant Diseases effect the Production. Identification of diseases and taking necessary precautions is all done through naked eye,which requires labour and labouratory.This application helps farmers in detecting the diseases by observing the spots on the leaves,which inturn saves effort and labor costs. </i></h5></p>
        <!---  <img src="https://www.spokanecounty.org/ImageRepository/Document?documentId=41892" style="height:240px"class="img-rounded" alt="Gesture">  -->
        <h4 style="color:black;">Upload Image Here</h4> <br>
        <form action = "http://localhost:5000/" id="upload-file" method="post" enctype="multipart/form-data">
          <label for="imageUpload" class="upload-label">
```

```
            </label>
            <input type="file" name="image" id="imageUpload" accept=".png, .jpg, .jpeg,.pdf">
          </form>
         <br>
                <button class="button button1">submit</button>
          </div>
          <div class="col-sm-6">
            <br><br><br><br><br><br>
            <div>
               <img
src="https://github.com/Yanjare/Fertilizer_recommendation_System/blob/main/templates/home.j
pg?raw=true" style="height:350px" class="img-rounded" alt="Gesture">

            </div>
          </div></div>




                </div>
       </div>
       </div>
   </div>
</body>


</html>
```

Style.css:

```
.bg-dark {
   background-color: #42678c!important;
}
#result {
   color: #0a1c4ed1;
```

```
}
.header {
        top:0;
        margin:0px;
        left: 0px;
        right: 0px;
        position: fixed;
        background-color:#00264d;
        color: white;
        box-shadow: 0px 8px 4px grey;
        overflow: hidden;
        padding-left:20px;
        font-family: 'Josefin Sans';
        font-size: 2vw;
        width: 100%;
        height:8%;
        text-align: center;
    }
.topnav {
overflow: hidden;
background-color: #333;
}

.topnav-right a {
float: left;
color: #f2f2f2;
text-align: center;
padding: 14px 16px;
text-decoration: none;
font-size: 18px;
}
```

```
.topnav-right a:hover {
background-color: #ddd;
color: black;
}

.topnav-right a.active {
background-color: #565961;
color: white;
}

.topnav-right {
float: right;
padding-right:100px;
}
.login{
margin-top: 100px;
}
body {

background-color:#ffffff;
background-repeat: no-repeat;
background-size:cover;
background-position: 0px 0px;
}

.button {
border: none;
color: white;
padding: 16px 32px;
text-align: center;
text-decoration: none;
display: inline-block;
```

```
font-size: 16px;
margin: 4px 2px;
transition-duration: 0.4s;
cursor: pointer;
}

.button1 {
background-color: white;
color: black;
border: 2px solid #4CAF50;
}

.button1:hover {
background-color: #4CAF50;
color: white;
}

img {
border-radius: 50%;
}
```

GitHub & Project Demo Link

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-1383-1658386536

Project Demo Link:

https://drive.google.com/file/d/1Gy52ZZCge2dkl6qt6CX61mwJo6fPObSE/view?usp=drivesdk