FERTILIZERS RECOMMENDATION SYSTEM FOR DISEASE PREDICTION

PROJECT REPORT

SUBMITTED BY

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In partial fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

In

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

V.S.B. ENGINEERING COLLEGE,KARUR

V.S.B ENGINEERING COLLEGE,KARUR
(Approved by AICTE & Affiliated by Anna University,

Chennai)

BONAFIDE CERTIFICATE

Certified that this project report titled "Fertilizer Recommendation System for Disease Prediction" is the bonafide record work done by **M.PRADEEPA(922519104115), P.LOGADHARSHINI(922519104089), P.MATHIYARASI(9225191040092) and N.PRABHA(922519104113)** for **IBM-NALIYATHIRAN** in **VII** semester of **B.E.,** degree course **in Computer Science and Engineering** branch during the academic year of 2022-2023

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ACKNOWLEDGEMENT

First and foremost, we express my thanks to our parents for providing us a very nice environment for doing this mini project. We wish to express our sincere thanks to our founder and Chairman **Shri.V.S.BALSAMY** for his endeavour in educating us in this premier institution.

We wish to express our appreciation and gratefulness to our principal, **Dr.V.NIRMAL KANNAN** and vice principal **Mr.T.S.KIRUBASANKAR** for their encouragement and sincere guidance.

We are grateful to our head of the department **Mr.P.ANBUMANI** and our IBM Nalaiyathiran project coordinator **Mr.P.GUNASEKARAN** Department of Computer Science and Engineering for their valuable support.

We express our indebtedness to the supervisor of our IBM Nalaiyathiran project, **Mr.P.GUNASEKARAN** Assistant Professor, Department of Computer Science and Engineering, for guidance throughout the course of our project.

Our sincere thanks to all the teaching staff of V.S.B Engineering College and our friends for their help in the successful completion of this IBM Nalaiyathiran project work. Finally, we bow before God, the Almighty who always had a better plan for us. We give our praise and glory to Almighty God for successful completion of this IBM Nalaiyathiran.

Project Report

ABSTRACT:

Agriculture is one among the most important sector of Indian Economy. More than 50% of population depends on agriculture as their source of income. Various environmental factors have a significant impact on the crop yield. More than thousands of years farming is done in India but they are unable to predict the disease in advance. As rural production network is impacted by agents, conflicting evaluating has adverse effect on Indian economy, farmers have been facing different hardships due to lacking information on appropriate advances and utilization of assets like water, fertilizers, water system strategies. But using Artificial Intelligence we will be able to predict the disease in advance and recommend the best fertilizers to increase both the quantity and quality crop yield. With the help of this technology both farmers and consumers gets benefited. This technology aims in using the fertilizers to avoid most of the diseases and promote the quality of the land and increases the yield. The agriculture sector can be considered as the backbone for any developing economy. To obtain the maximum yield from the crops, it is required that farmers should be provided with the best technologies and methodologies. Artificial intelligence is having its vast applications in various sectors.

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Artificial intelligence has a huge impact in all Industrial Sectors. Lately, Artificial Intelligence (AI) has been progressing at an outstanding speed. AI accomplished solving numerous problems and saving a profitable resource by minimizing environmental deterioration. Artificial Intelligence is making a revolution in agriculture by replacing traditional methods by using methods that are more efficient and helping the world to become a better place.In this project, two datasets name fruit dataset and vegetable dataset are collected. The collected datasets are trained and tested with deep learning neural network named Convolutional Neural Networks (CNN). First, the fruit dataset is trained and then tested with CNN. It has 6 classes and all the classes are trained and tested. Second, the vegetable dataset is trained and tested. The software used for training and testing of datasets is Python. All the Python codes are first written in Jupyter notebook supplied along with Anaconda Python and then the codes are tested in IBM cloud. Finally, a web-based framework is designed with help Flask a Python library. There are 2 html files are created in templates folder along with their associated files in static folder. The Python program 'app.py' used to interface with these two webpages is written in Spyder-Anaconda python and tested. Agriculture is the principal foundation of subsistence for about 58% of India's population. The population is expanding enormously with this expansion the interest of food and business is likewise expanding. Intervening of AI in Agriculture is serving farmers to recover their farming efficiency and diminish environmental hostile influences. Disease infection is the main drawback of Agriculture. Due to this drawback, the Quality and Quantity of agriculture products are degraded. To identify and detect the disease on agriculture product and recommend the correct fertilizers, the AI technique is introduced. In this paper, we are presenting a survey for application of artificial intelligence in Fertilizers Recommendation System for Disease Prediction.

1.2 PURPOSE

Now a days, plants are largely affected by various bacterial and fungal disease. Diseases on plants placed a major constraint on the production and a major threat to food security. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques. It is crucial to identify plant diseases in order to prevent the loss of agricultural yield and quantity. The purpose of our sytem is to predict the disease with the help of Artificial Intelligence and recommend the fertilizers depending upon both the disease of the plants and enhancing the quality of the soil. Sometimes some living organisms coming in contact with the

plants can enhance the plant growth but such living organisms has the possibility to die because of the chemicals present in the fertilizers. Our recommended systems takes into consideration of not only the plant growth but also the environment as a whole. The fertilizers recommended by our system can protect the environment and the factors that enhances the plant growth. The system recommends not only using fertilizers as a whole but also using the mixture of manures and fertilizers. In such cases, it will be of great help for the farmers to work peacefully in natural environment. Our system does not recommend a fertilizer full of toxins and chemicals that harms the health of the farmers when they are interacting too much with the crops. The fertilizers recommended consider the nutrients already present in soil and recommend fertilizers that contains the lacking nutrients of the soil. But using this system the farmers can increase the crop yield and gain benefits without harming the nutriens of the soil that provides them with the food they consume.

2.LITERATURE SURVEY:

A literature survey is a comprehensive summary of previous research on a topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research. The review should enumerate, describe, summarize, objectively evaluate and clarify this previous research. It should give a theoretical base for the research and help you (the author) determine the nature of your research. The literature review acknowledges the work of previous researchers, and in so doing, assures the reader that your work has been well conceived. It is assumed that by mentioning a previous work in the field of study, that the author has read, evaluated, and assimiliated that work into the work at hand.

Fertilizer usage is crucial for the improvement of soil yield. But excessive fertilization can also cause serious problems to land health. Using the right amount of product at the right time is therefore a primary mission for farmers. Luckily, today they can rely on growing technological support. The latest example comes from the United Kingdom, where scientists at Imperial College London have developed a new predictive testing tool. “Our technology could help to tackle this problem by empowering growers to know how much ammonia and nitrate are currently in soil, and to predict how much there will be in the future based on weather conditions,” explained the author
[1] “This could let them fine-tune fertilization to the specific needs of the soil and crops”. The author [2], developed a soil based fertilizer recommendation system that can be used for regional soil analysis. The advanced farming involves various techniques as IOT, Cloud computing and data mining. This helps the farmers to gather details regarding the fertilizers he can use from his soil sample. The tool was constructed in such a way involving regional languages. This makes it understandable to all the farmers and yield maximum production. The creator [3], proposed a new method for finding leaf diseases in plants. Plant disease, especially on leaves, is one of the major factors for reduction in both quality and quantity of the food crops. Finding the leaf disease is an important role of agriculture preservation. To identify the

disease the image of the affected leaf is fed as input into the system. As a first step pre-processing of the image is carried out using median filter. The filtered image then undergoes segmentation, which is carried out by Guided Active Contour method. Classification of the leaf disease was performed by using Support Vector Machine. They compared the performance of their proposed method with the existing CNN method. The author [4] says Artificial Intelligence (AI) is one of the mainstream of research in software engineering with its rapid scientific advancement and the tremendous region of Application. The fundamental idea of AI in agriculture is its adaptability, speedy performance, precision, and cost-viability. Artificial Intelligence in Agriculture not only helps farmers to use their farming skills but also shifts to direct farming to get higher yields and better quality with less resources. AI-based technology helps to improve efficiency in all sectors and manages the challenges facing various industries including various sectors in the agricultural sector such as crop harvesting, irrigation, soil content sensitivity, crop monitoring, weed, harvest and establishment. AI technology helps diagnose plant diseases, pests, and malnutrition on farms and AI sensors can detect and identify weeds. The mythologies utilized for disease detection, segmentation of the affected part and classification of the diseases.

2.1 EXISTING PROBLEM:

There are several systems in use today for fertilizer recommendation system based on predicting the disease. Here, the fertilizers are recommended based on identifying the disease just by analysing the leaves or stem of the plant. But the fertilizers recommended by this system can only diagnose the diseases of the plants but fail to check the nutrients and the problems present in the soil. The different diseases in different parts of the plants are sometimes caused by the issues with the soil. The systems in practice today does not accurately diagnose the soil rather focus on the plants. Though the nutrients in the soil can be partially identified it is still a bigger task to identify the cause for the disease in plants. The curret systems can only check the diseases caused by soil infertility and some others caused by chemicals. Sometimes the diseases in plants might not be actually caused by the lack of nutrients in soil but also by the living organisms that comes in contact with any part of the plant. These possibilities are widely ignored in the development of many fertilizer recommendation systems. The fertilizers recommended by the current systems also has high probability of causing soil infertility. The current sytems do not pay much attention in keeping the quality of the soil by recommending most toxic or chemical fertilizers that are good for plant growth but that hinders the soil fertility.

REFERENCE:

[1] https://resoilfoundation.org/en/innovation-technology/artificial-intelligence-fertilizer/

[2] Bodake, K., Ghate, R., Doshi, H., Jadhav, P., & Tarle, B. (2018). Soil based fertilizer recommendation system using Internet of Things. *MVP J. Eng.* Sci, *1*, 13-19.

[3] Neela, R., & Nithya, P. (2019). Fertilizers Recommendation System For Disease Prediction In Tree Leaves. International Journal Of Scientific & Technology Research, ISSN, (2277-8616).

[4] Sujawat, G. S. (2021). Application of Artificial Intelligence in detection of diseases in plants: A Survey. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(3), 3301- 3305**..**

PROBLEM STATEMENT DEFINITION:

Now a days, plants are largely affected by various bacterial and fungal disease. Diseases on plants placed a major constraint on the production and a major threat to food security. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques. It is crucial to identify plant diseases in order to prevent the loss of agricultural yield and quantity.

I am	The farmer, who is unable to predict the diseases in advance and couldn't save my plants. And also I'm not aware of using the correct fertilizers.
I'm trying to	Use the recent technologies which can help me in predicting the diseases and in increasing the yield of crops.
But,	I am unaware of the existing technologies that can save my crops by predicting the diseases. And I have no knowledge in using the correct fertilizers in correct proportions.
Because	I'm scared of affecting the soil quality by using incorrect fertilizers or unsure myths.
Which makes me feel	I'm not capable of saving my crops from the diseases and lead to low yield.

I am	I'm Trying to	But	Because	Which Makes Me Feel
Farmer	Use the recent technologies which can help me in predicting the diseases	I have no knowledge in using the correct fertilizers in correct proportions	I don't feel confident in using the fertilizers without expert advice	I'm incompetant in the field of agriculture

Problem Statement (PS)	I am	I'm trying to	But	Because	Which makes me feel
PS	A Farmer	Save my crops and increase production	I'm not aware of the technologies that predicts the infections	I have no knowledge of the existing technologies and fertilizers	Troubled and inexperienced in farming.

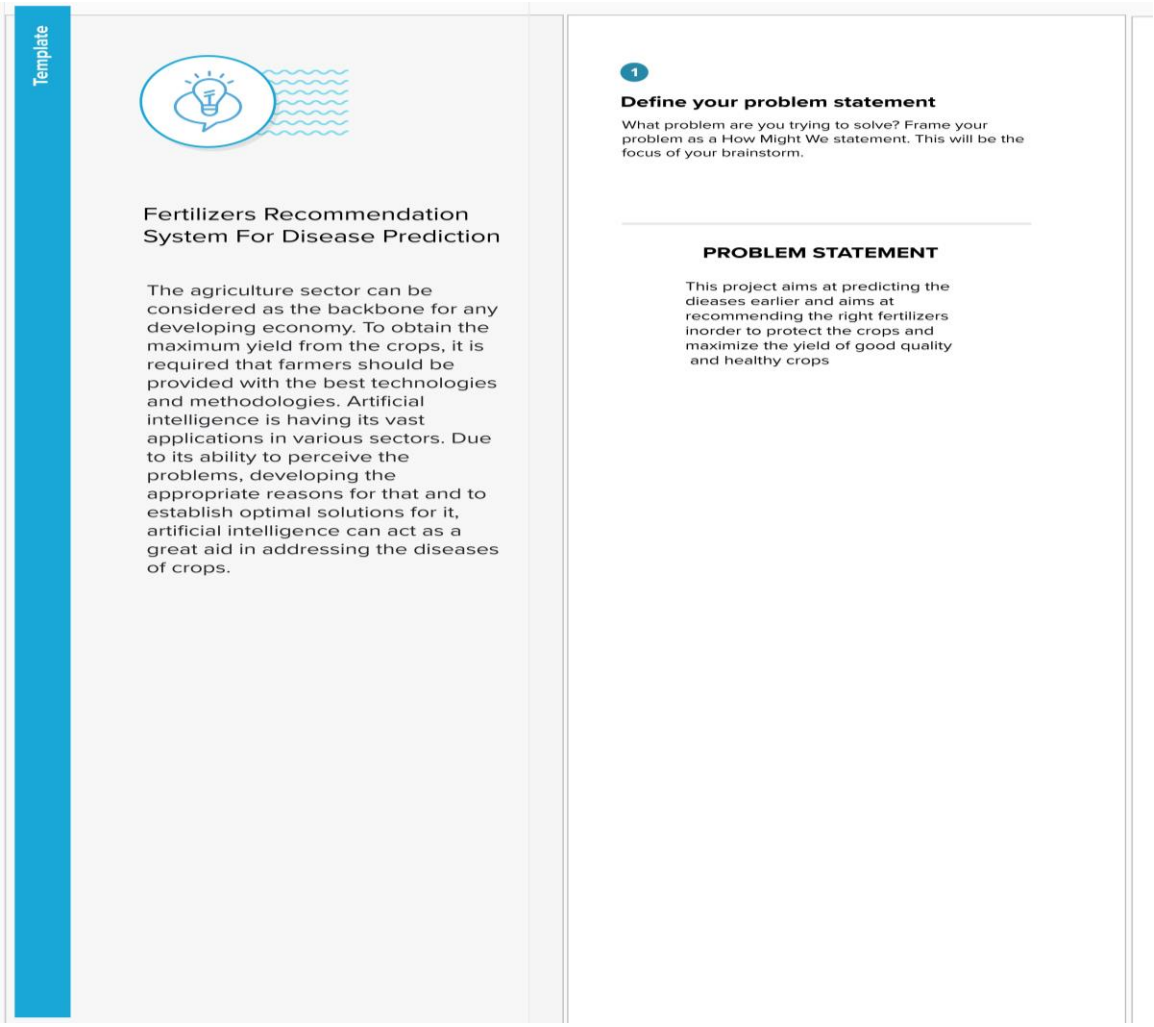
3.IDEATION AND PROPOSED SOLUTION:

3.1 EMPATHY MAP CANVAS:

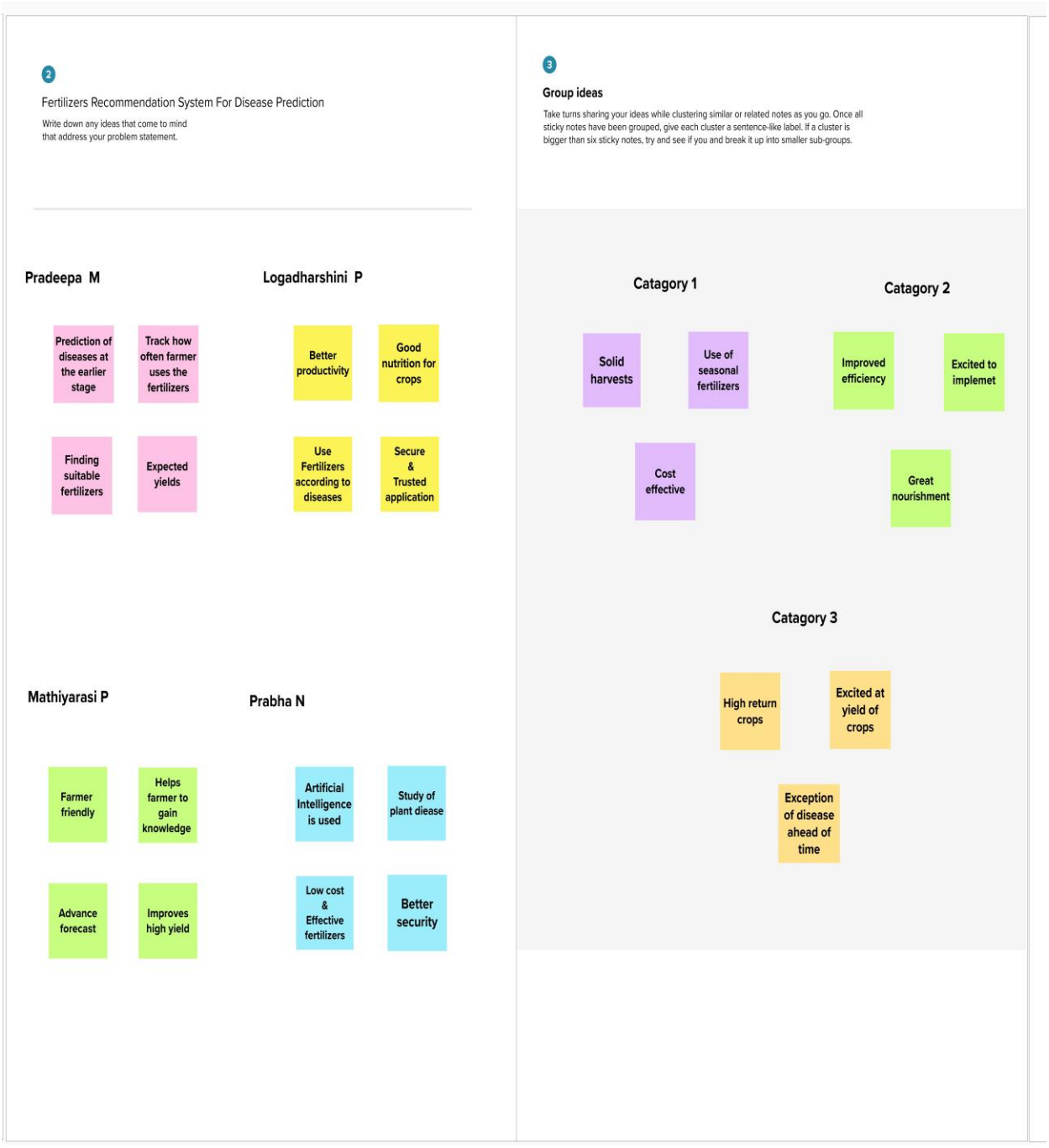
3.2 IDEATION AND BRAINSTORMING:

Ideation is the process where you generate ideas and solutions through sessions such as Sketching, Prototyping, Brainstorming, Brainwriting, Worst Possible Idea, and a wealth of other ideation techniques. Ideation is also the third stage in the Design Thinking process.

3.2.1 DEFINING THE PROBLEM STATEMENT:



3.2.2 GATHERING GROUP IDEAS:



3.2.3 PRIORTIZING THE GATHERED IDEAS:

3.3 PROPOSED SOLUTION:

Proposed Solution means the combination of software, hardware, other products or equipment, and any and all services (including any installation, implementation, training, maintenance and support services) necessary to implement the solution described by Vendor in its Proposal.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence, early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.
2.	Idea / Solution description	An automated system is designed to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. With the help of the artificial intelligence we can predict the diseases earlier and we can destroy the diseases at its root by using the proper fertilizer that is suitable. This Artificial Intelligence system recommends the right proportion of the fertilizer to be used in the land to maximize the production.

3.	Novelty / Uniqueness	Due to the arise of new diseases which cannot be identified by the farmers, they started to depend on new technologies to get more updated information on the specific diseases. With the help of Artificial Intelligence we are able to predict the diseases in advance and we can destroy them before they cause a massive loss. This AI system predicts the correct disease and recommends fertilizer which destroys the bacteria or fungus which caused the disease.

4.	Social Impact / Customer Satisfaction	User friendly application, the customer expect the correct prediction and identification of the disease. They expect better application performance and faster response to their feedback.

5.	Business Model (Revenue Model)	Making the business model strong leads to an ongoing business profit leading to increase in cash reserve and new investments. An application revenue model is an important element of a company concept or business plan, which should be completed before entering the development phase. Banner advertising, paid promotions, sponsored news, promoted content, campaign sponsorships, and subscription are just a few of the methods by which a news channel app may generate income.
6.	Scalability of the Solution	This model focuses on earlier prediction without any delay or any fault. This mainly focuses on the prediction and the recommendation to increase the yield. The measure of a system's ability to increase or decrease in performance and cost in response to changes in application.

3.4 PROBLEM SOLUTION FIT:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.

Here the problem solution fit canvas is used to give ah clear view on the problem statement.

Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

Farmers are the customers who are unable to predict the disease and who are not aware of using the right fertilizers.

6. CUSTOMER CONSTRAINTS — CC

The constraints that the customer face while using a fertilizer is its life span and its cost aalgae blooms in the waterways

5. AVAILABLE SOLUTIONS — AS

The solutions which we proposed are use of natural fertilizers, use of slow-release fertilizers and inhibitors, and recommending the right fertilizers which destroy the diseases.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Cope with climate change, and use the fertilizer according to the soil type. There will be no harm to land in using AI recommended fertilizers.

9. PROBLEM ROOT CAUSE — RC

Due to the inability to predict diseases in advance in traditional farming, the customer faces the consequences.

7. BEHAVIOUR — BE

Finding the right fertilizer plays the major role, because the fertilizers serve as multi vitamin or meal replacement for the plants.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS — TR

Some of the triggers are advertisements in the television and information from the experts.

4. EMOTIONS: BEFORE / AFTER — EM

With the traditional farming were depressed due to the inability to predict the disease which caused low yield but after using AI system they are happy with the high yield of the healthy crops.

10. YOUR SOLUTION — SL

Farmers are unable to predict the disease earlier and couldn't find the correct fertilizer which would produce high yield. Using Artificial Intelligence we can suggest how to use the sufficient mixture of chemical and bio-fertilizers so that it maximizes the yield and produces healthy crops.

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE

With help of various online channel farmers can predict and gain knowledge about the behaviour of various fertilizers.

8.2 OFFLINE

Buying fertilizers from authorized shops that are rich in multi-vitamin maximizes the yield of the crop.

Extract online & offline CH of BE

AMALTAMA

4.REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENTS:

Functional requirements **may involve calculations, technical details, data manipulation and processing, and other specific functionality that define what a system is supposed to accomplish**. Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Access to application	User can access via their mobiles User can access via their Id number
FR-4	Image processing	Capturing the disease Scanning with their mobile Preprocessing the image
FR- 5	Disease Identification	After the preprocessing the disease is identified. The identified disease is compared with the original disease parameter.
FR-6	Fertilizer Prediction	The correct fertilizer is recommended . Advised to use the fertilizer on small area of land. Checks for the best fertilizer for best yield.

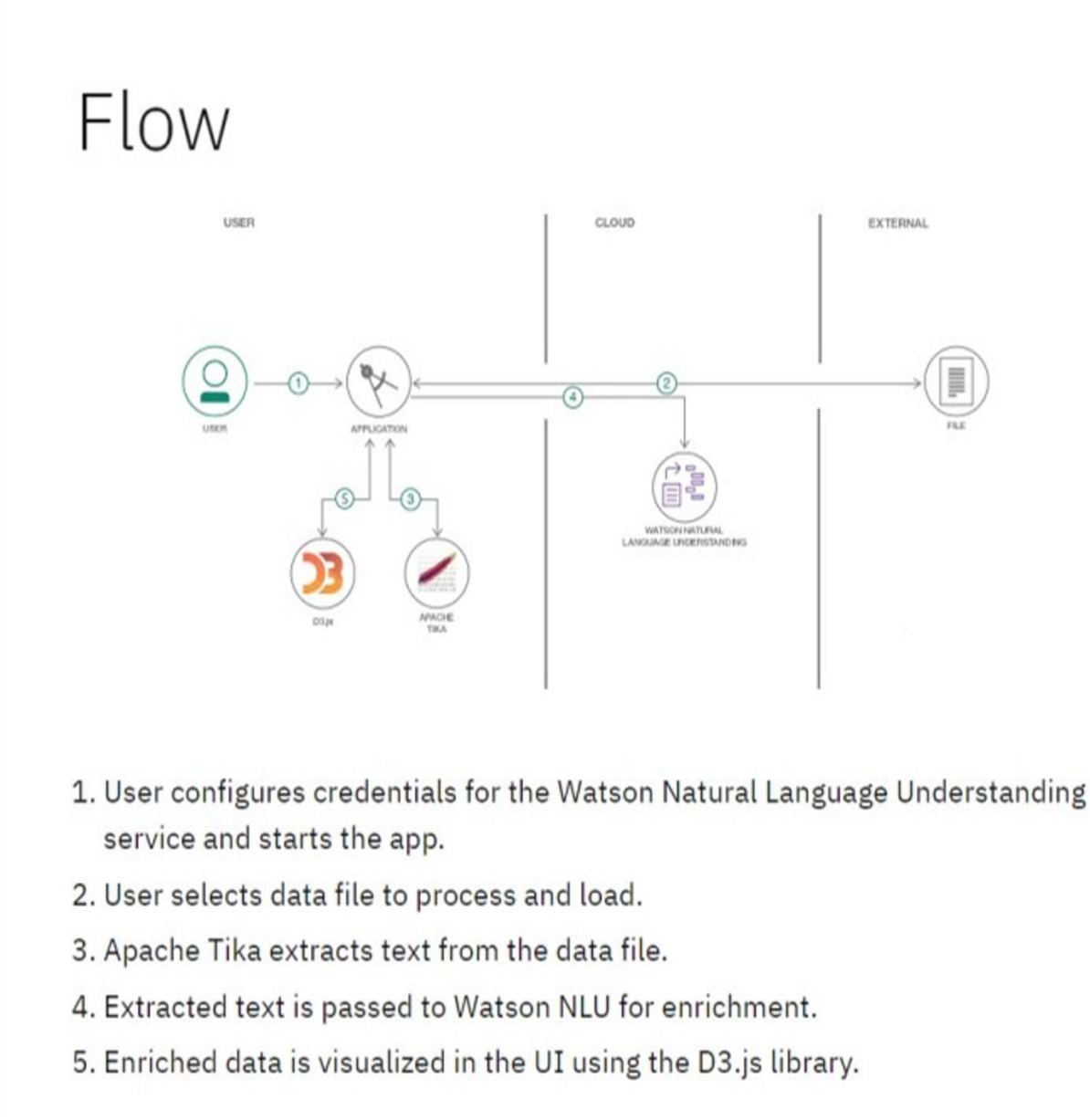
4.2 NON-FUNCTIONAL REQUIREMENT:

Nonfunctional Requirements (NFRs) **define system attributes such as security, reliability, performance, maintainability, scalability, and usability**. They serve as constraints or restrictions on the design of the system across the different backlogs.

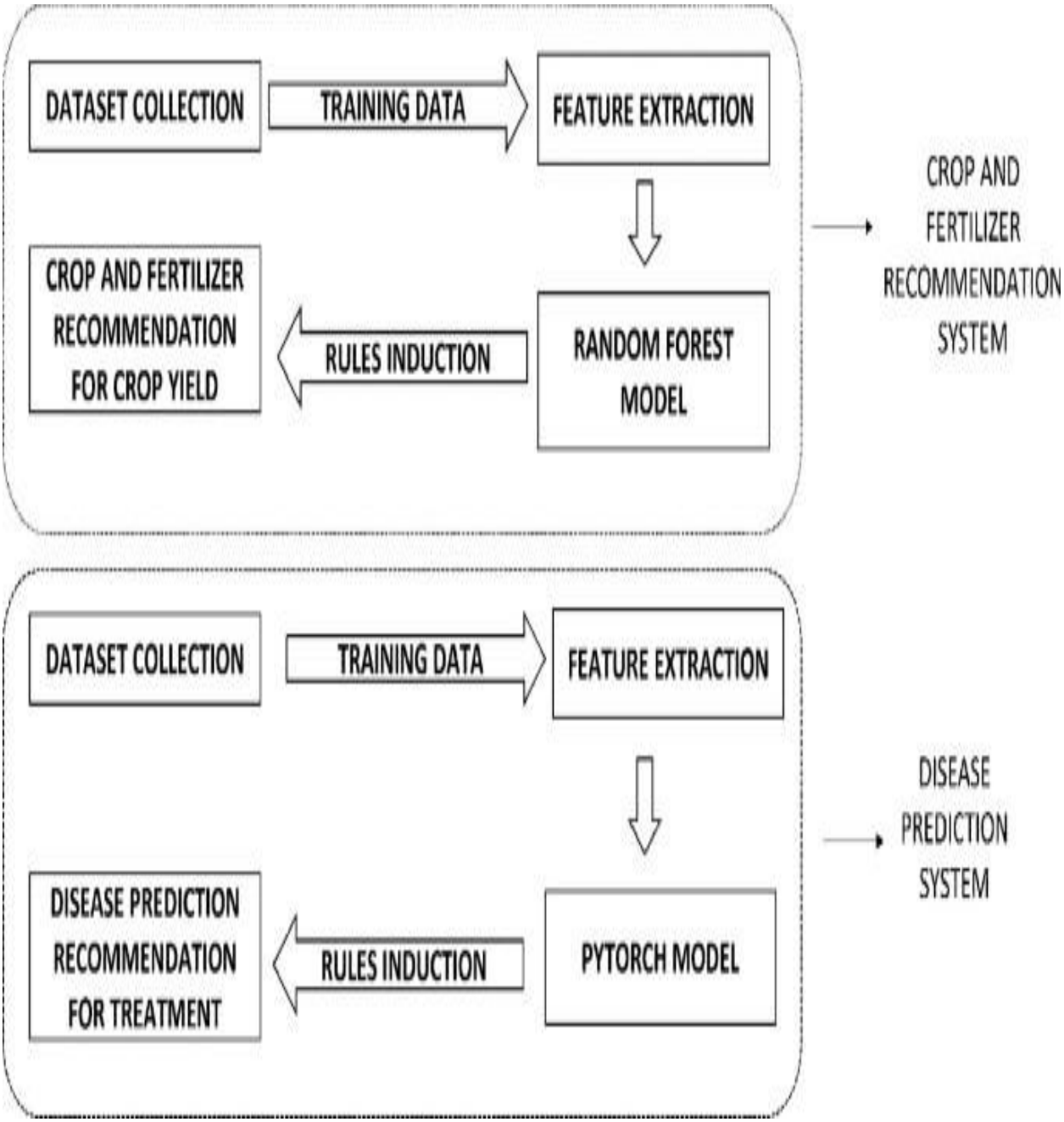
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Dataset helps in identification of the particular disease.
NFR-2	**Security**	The information of the user and the data contained in the application is more secure.
NFR-3	**Reliability**	It is more easy to use. And it is also more simple that user gets the disease identified at simpler steps and more flexible solution for that disease.
NFR-4	**Performance**	It depends on the disease dataset present in the application.
NFR-5	**Availability**	It is available for the all the registered user who are have access to use the application.
NFR-6	**Scalability**	Application can identify more disease as possible as contained in dataset.

5.PROJECT DESIGN:

5.1 DATA FLOW DIAGRAMS:

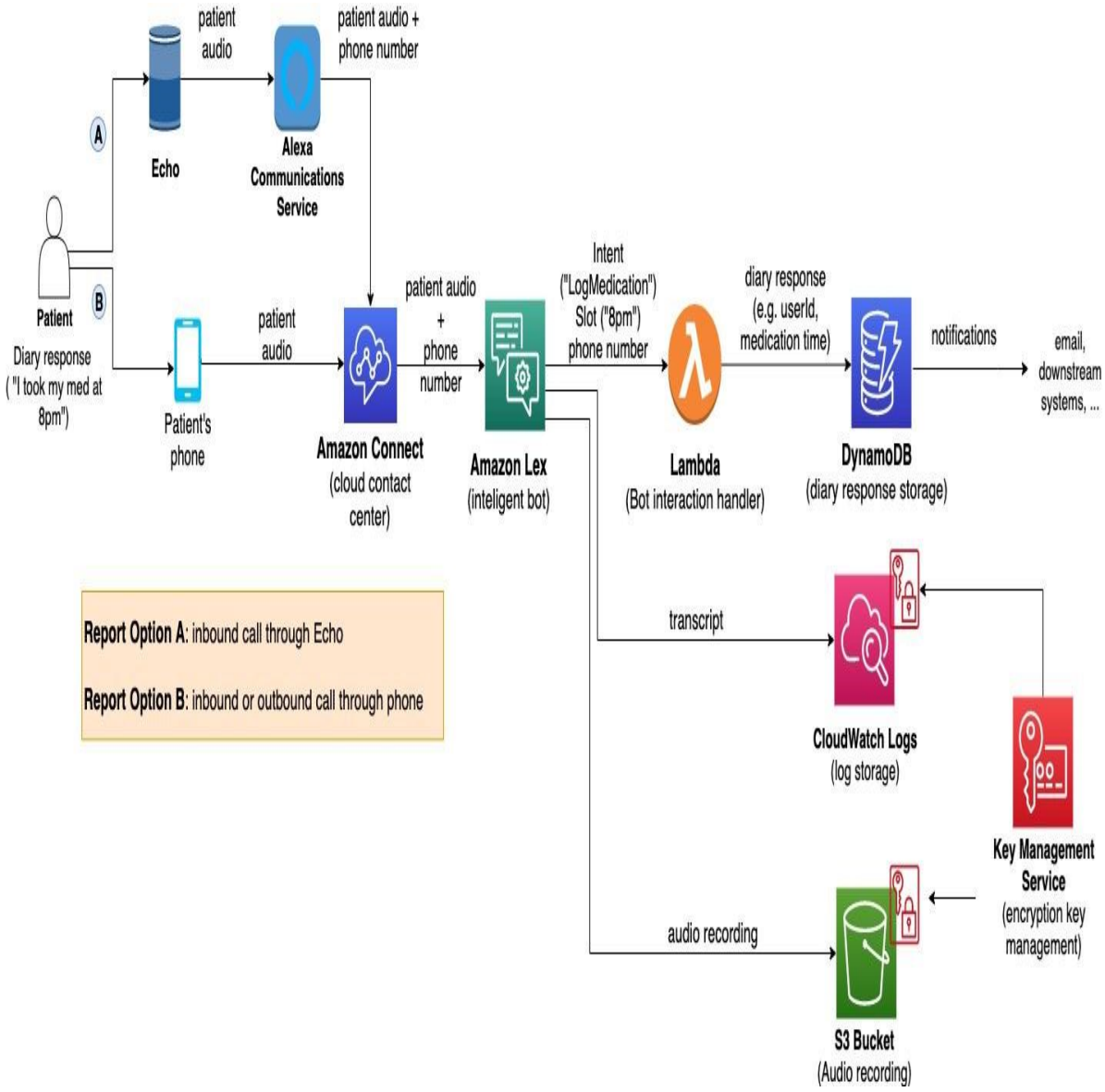


1. User configures credentials for the Watson Natural Language Understanding service and starts the app.
2. User selects data file to process and load.
3. Apache Tika extracts text from the data file.
4. Extracted text is passed to Watson NLU for enrichment.
5. Enriched data is visualized in the UI using the D3.js library.

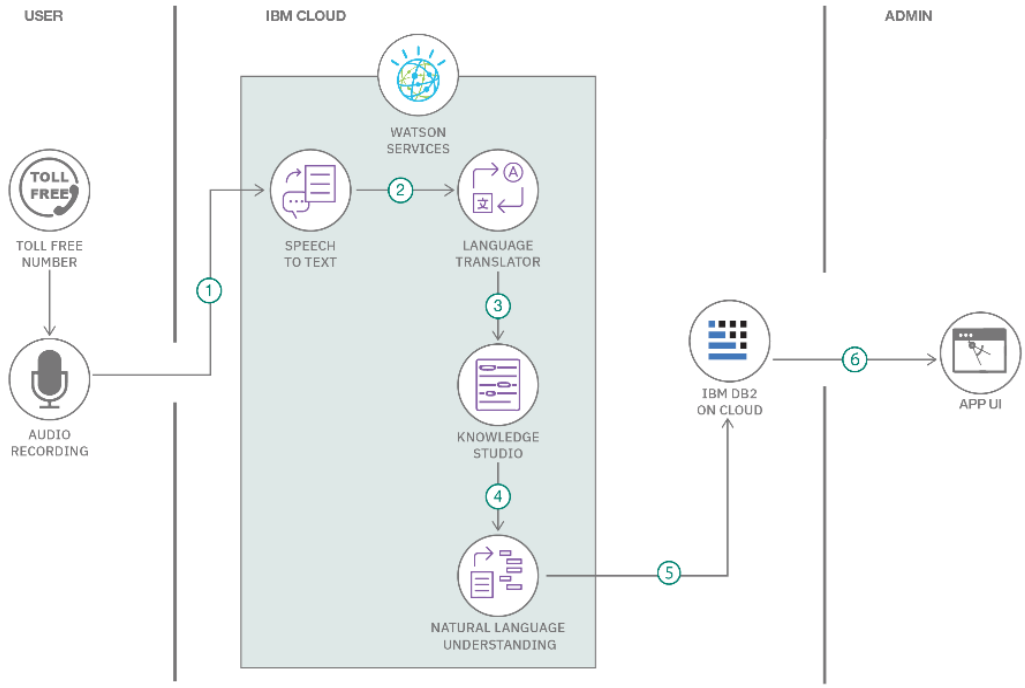

DATASET COLLECTION
TRAINING DATA
FEATURE EXTRACTION
CROP AND FERTILIZER RECOMMENDATION FOR CROP YIELD
RULES INDUCTION
RANDOM FOREST MODEL
CROP AND FERTILIZER RECOMMENDATION SYSTEM
DATASET COLLECTION
TRAINING DATA
FEATURE EXTRACTION
DISEASE PREDICTION RECOMMENDATION FOR TREATMENT
RULES INDUCTION
PYTORCH MODEL
DISEASE PREDICTION SYSTEM

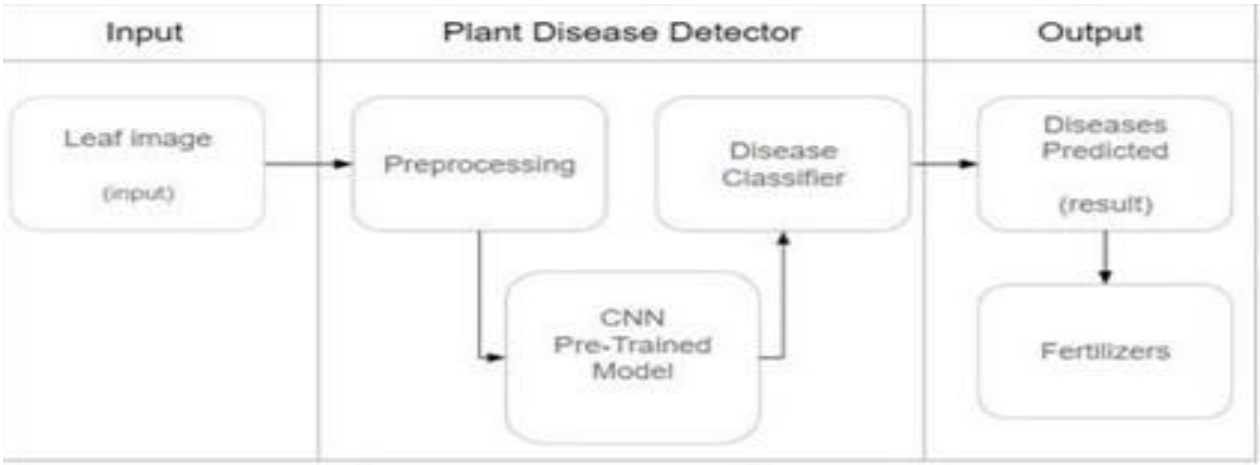
5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

5.2.1 SOLUTION ARCHITECTURE:

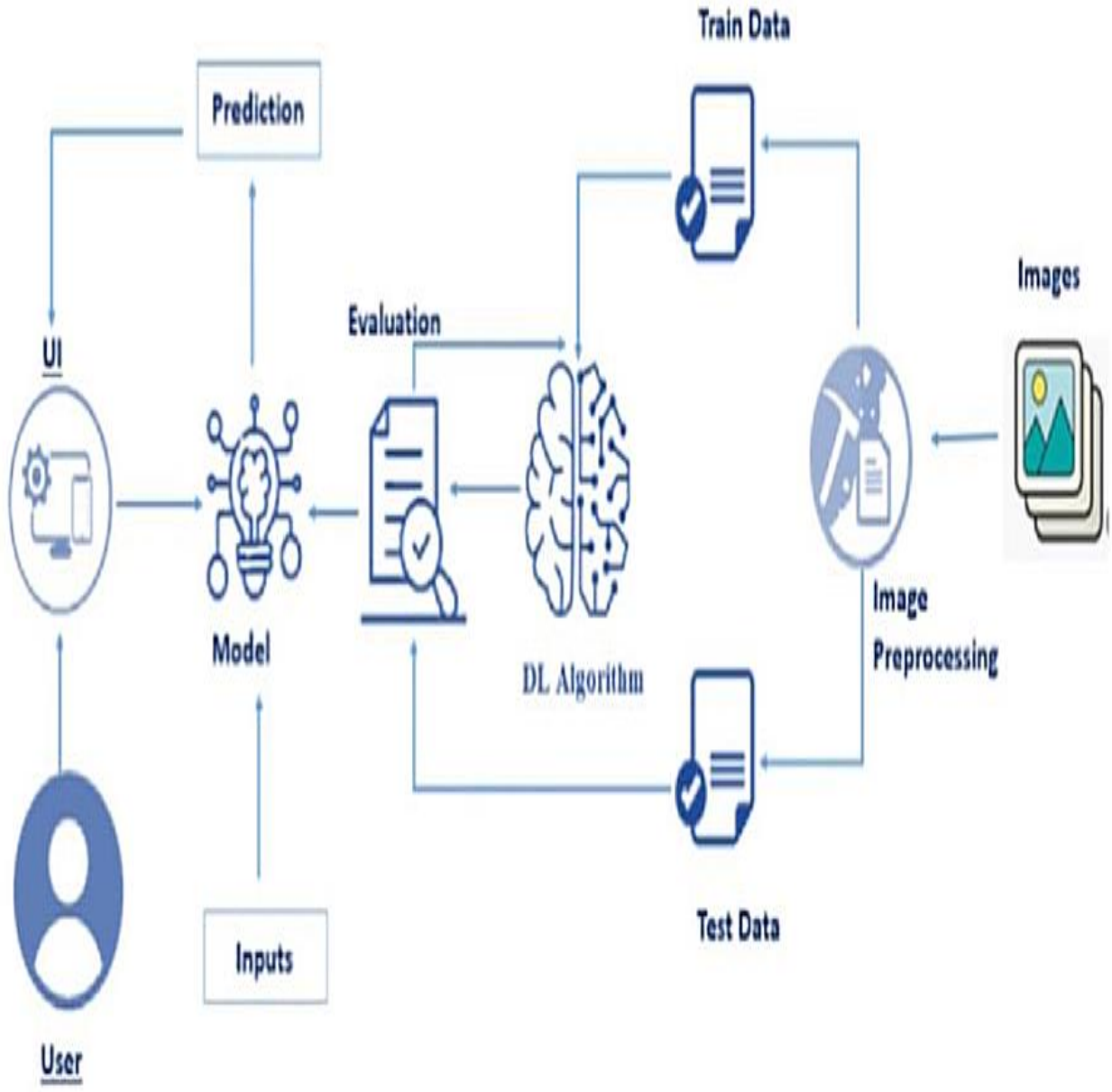


5.2.2 TECHNOLOGY STACK:





TECHNICAL ARECHITECTURE:



5.3 USER STORIES:

S.No	Component	Description	Technology
1.	User Interface	It describes about the application interface that a farmer can use.	Image Processing, Hybird algorithm
2.	Application Logic-1	It involvespre- processing of the image	Python
3.	Application Logic-2	It has various features like disease prediction, Disease identification, fertilizer recommendation and so on,…	Farming Applications.
4.	Application Logic-3	It has various options to identify symptoms and prediction at the earliest.	Machine Learning.
5.	Database	It includes analysing of various process like quality of the soil, type of the disease, recommending right fertilizer and others..	Web based Software
6.	Cloud Database	It helps farmer to make higher benefits by smart recommendations.	Weather stations, Satellite based images.
7.	File Storage	It involves image processing in pixels and handling image data.	CNN model

8.	External API-1	It involves using of data from third party applications that are required for processing the image.	IBM Weather API
9.	External API-2	It helps in providing the variant of fertilizers and various datasets regarding the diseases.	Data.World API
10.	Machine Learning Model	It helps in improving all aspects from end to end so as to produce high yield.	Pre-Harvesting machine learning
11.	Infrastructure (Server / Cloud)	Hybrid cloud is more useful so that to exchange the data between various service providers.	Hybird Cloud Computing

6.PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING AND ESTIMATION:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-1	Model Creation and Training (Fruits)		Create a model which can classify diseased fruit plants from given images. I also need to test the model and deploy it on IBM Cloud	8	High	Pradeepa, Logadharshini, Mathiyarasi, Prabha
	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images	2	High	Pradeepa, Logadharshini, Mathiyarasi, Prabha

Sprint	Functional Requirement (Epic)	User Story Nu	User Story / Task	Story Po	Priority	Team Members

		mb er		**int s (Total)**		
Sprint -2	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images and train on IBM Cloud	6	High	Pradeepa, Logadharshini , Mathiyarasi, Prabha
	Registration	USN-1	As a user, I can sign up and register respective sites to access the required detailsand data. And import the required libraries for the processes.	3	Medium	Pradeepa, Logadharshini , Mathiyarasi, Prabha
	Upload page	USN-2	As a user, I will be redirected to a page where I can upload my pictures of crops	4	High	Pradeepa, Logadharshini , Mathiyarasi, Prabha
	Suggestion results	USN-3	As a user, I can view the results and then obtain the suggestions provided by the ML model	4	High	Pradeepa, Logadharshini , Mathiyarasi, Prabha
	Base Flask App		A base Flask web app must be created as an interface for the ML model	2	High	Pradeepa, Logadharshini , Mathiyarasi, Prabha
Sprint -3	Login	USN-4	As a user/admin/shopkeeper, I will access the page, test and train the CNN model to	2	High	Pradeepa, Logadharshini , Mathiyarasi, Prabha

			predict or detect the plant disease.			
	User Dashboard	USN-5	As a user, I can view the previous results and history.	3	Medium	Pradeepa, Logadharshini, Mathiyarasi, Prabha

	Integration		Integrate Flask, CNN model with Cloudant DB	5	Medium	Pradeepa, Logadharshini, Mathiyarasi, Prabha
	Containerization		Containerize Flask app using Docker	2	Low	Pradeepa, Logadharshini, Mathiyarasi, Prabha
Sprint-4	Dashboard (Admin)	USN-6	As an admin, I can view other user details and uploads for other purposes	2	Medium	Pradeepa, Logadharshini, Mathiyarasi, Prabha
	Dashboard (Shopkeeper)	USN-7	As a shopkeeper, I can enter fertilizer products and then update the details if any	2	Low	Pradeepa, Logadharshini, Mathiyarasi, Prabha

	Containerization		Create and deploy Helm charts using Docker Image made before	2	Low	Pradeepa, Logadharshini, Mathiyarasi, Prabha

6.2 SPRINT DELIVERY SCHEDULE:

Project Tracker, Velocity & Burndown Chart: (4 Marks)

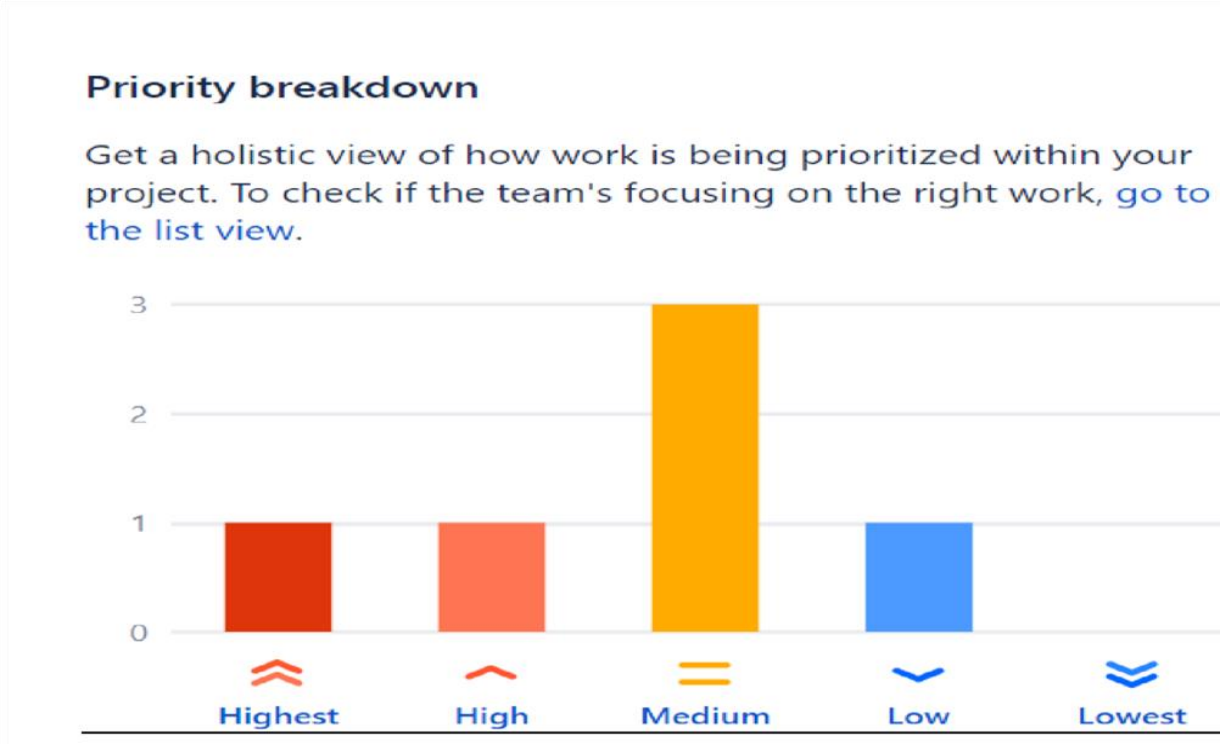
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	05 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	07 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	10	14 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

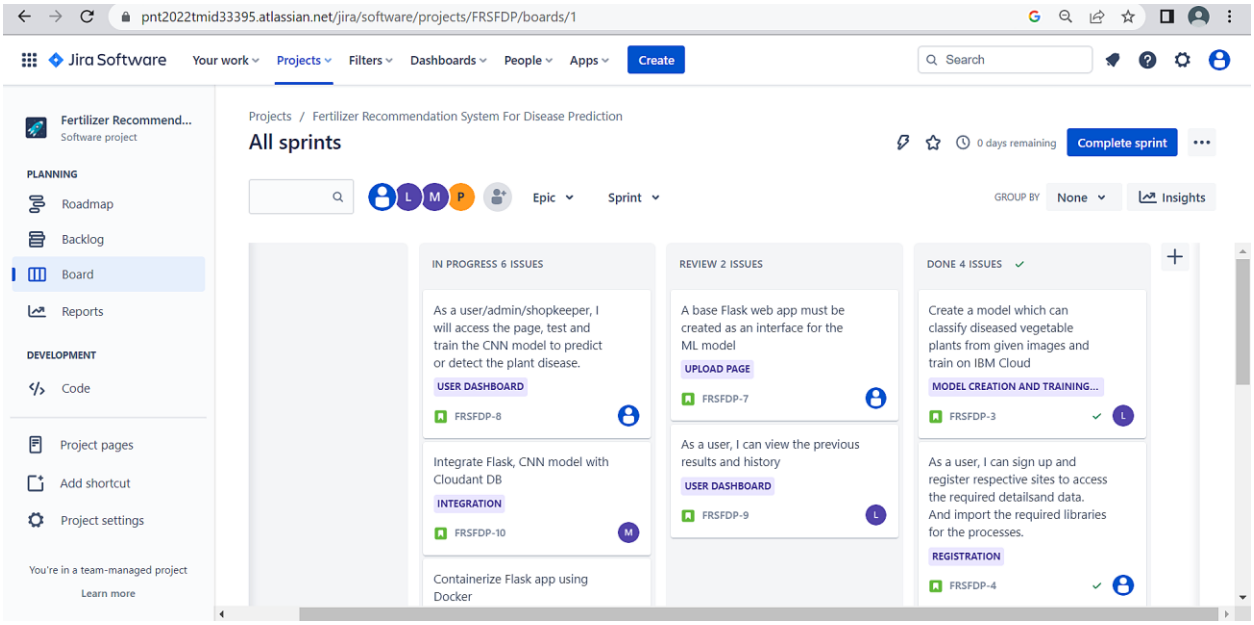
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Average Velocity(A---V) = 12/6 = 2

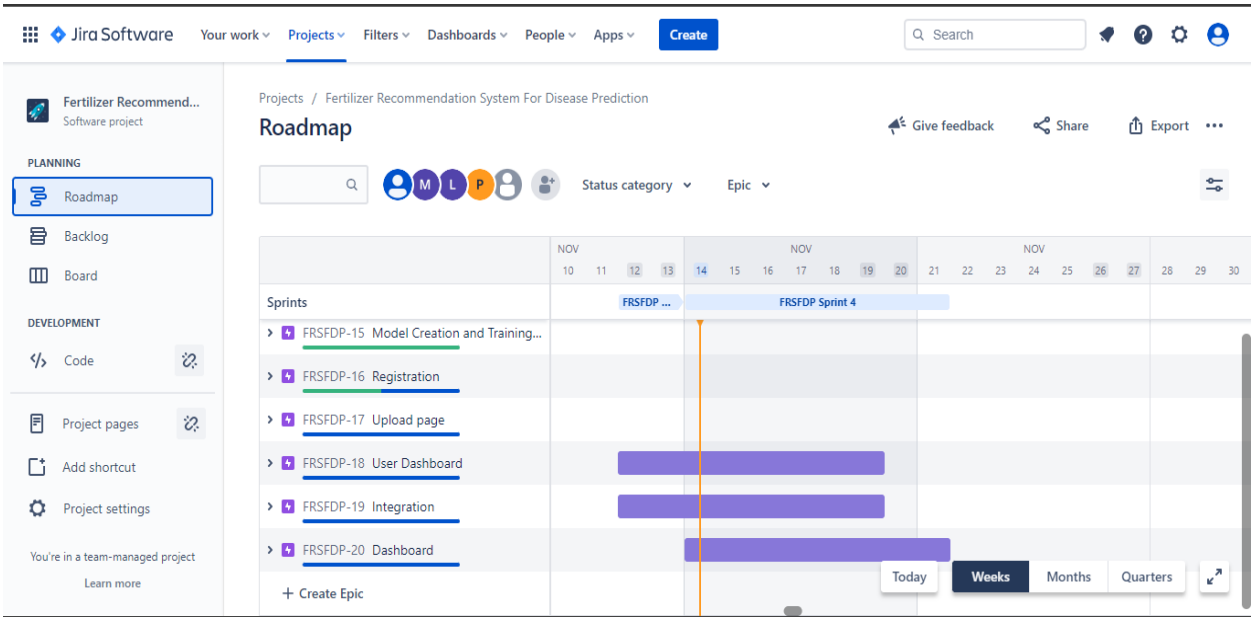


6.3 REPORTS FROM JIRA

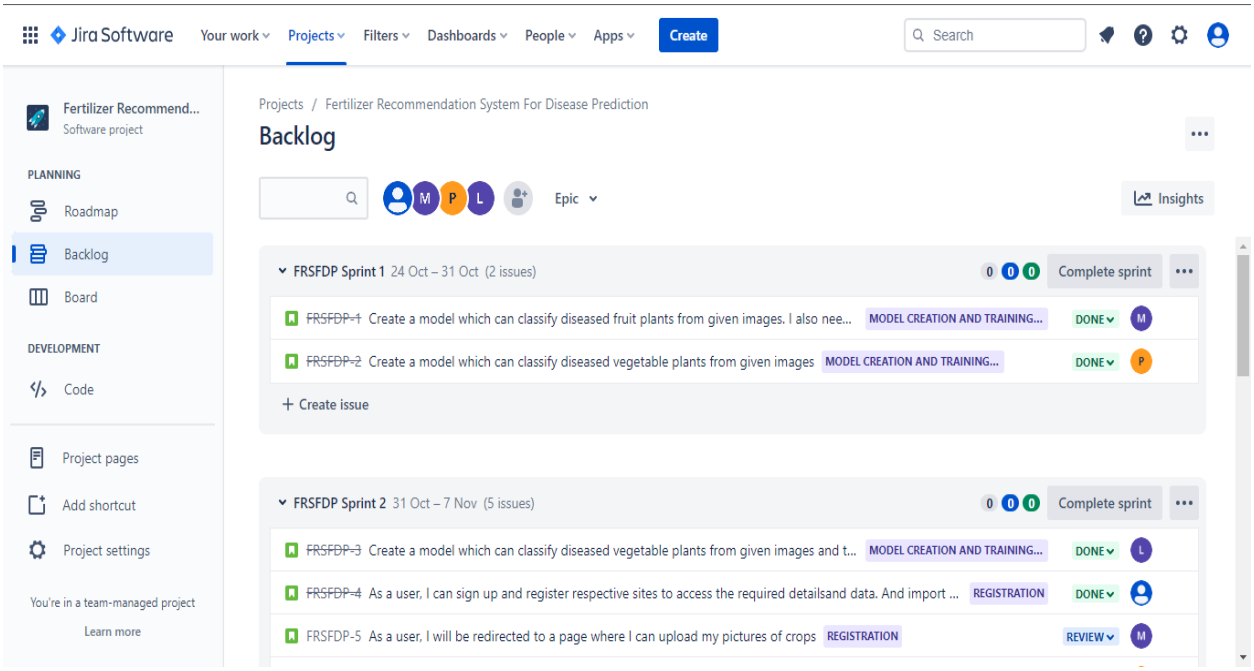
6.3.1 BOARD:



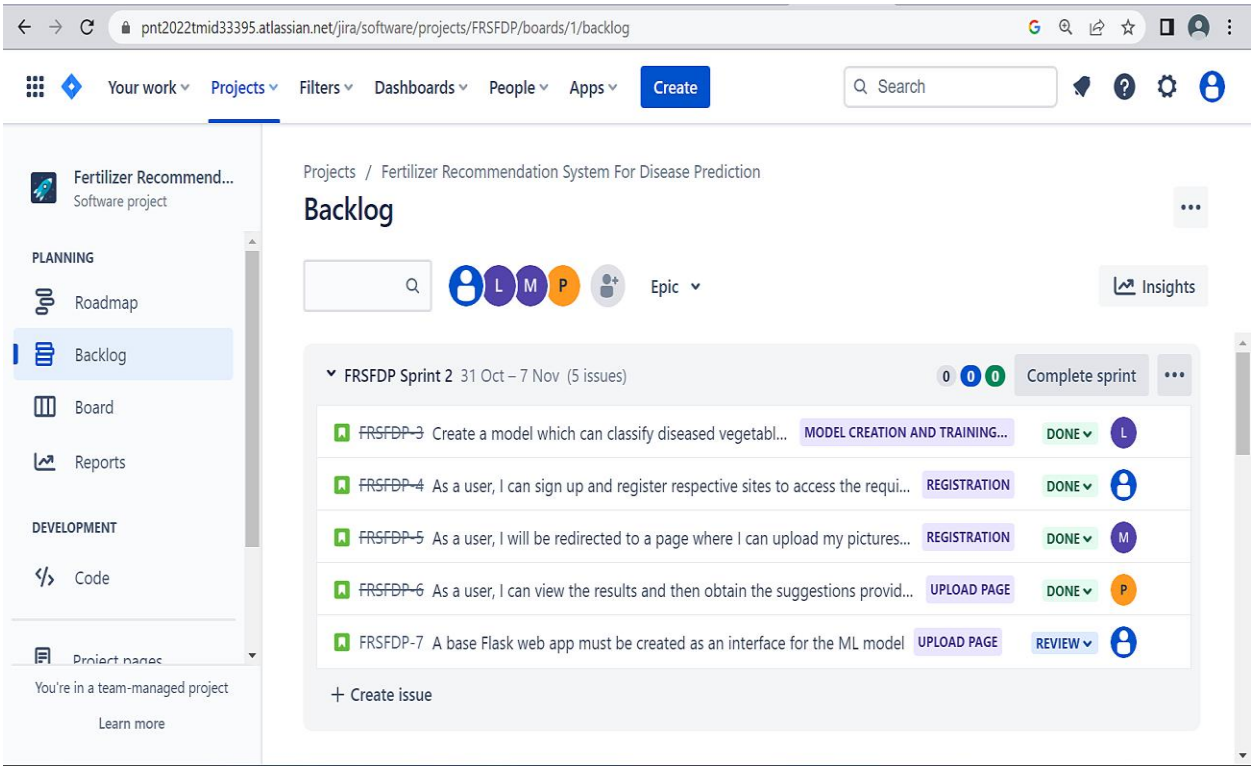
6.3.2 ROAD MAP:



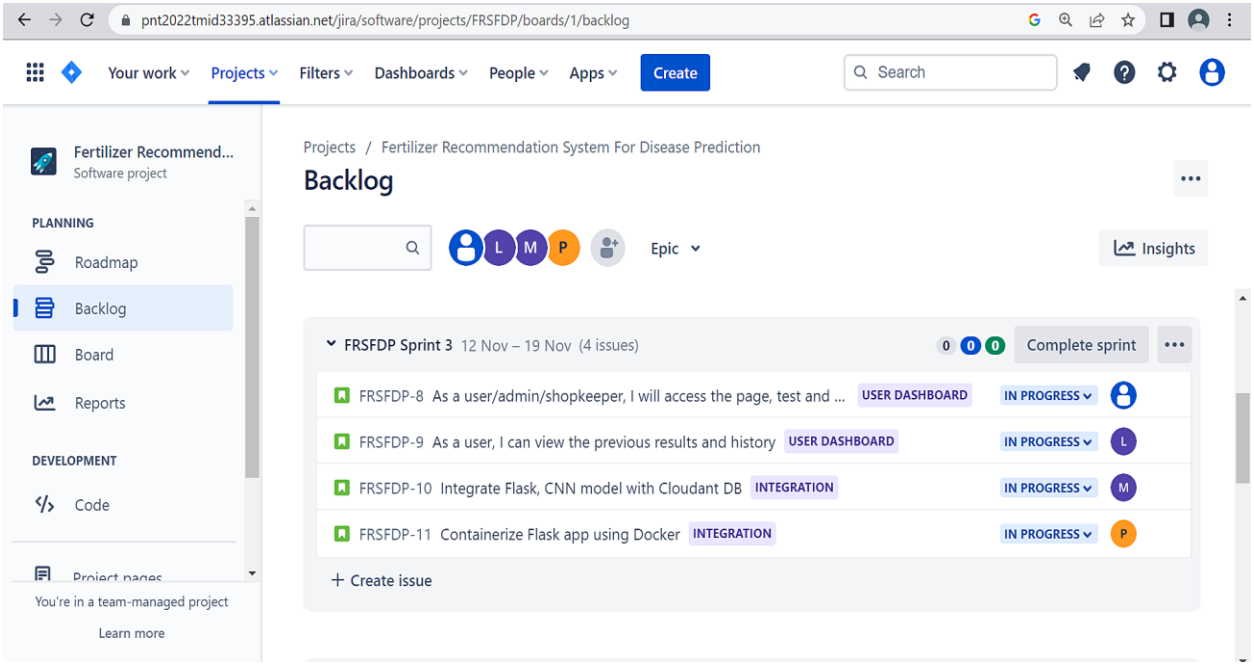
6.3.3 SPRINT 1



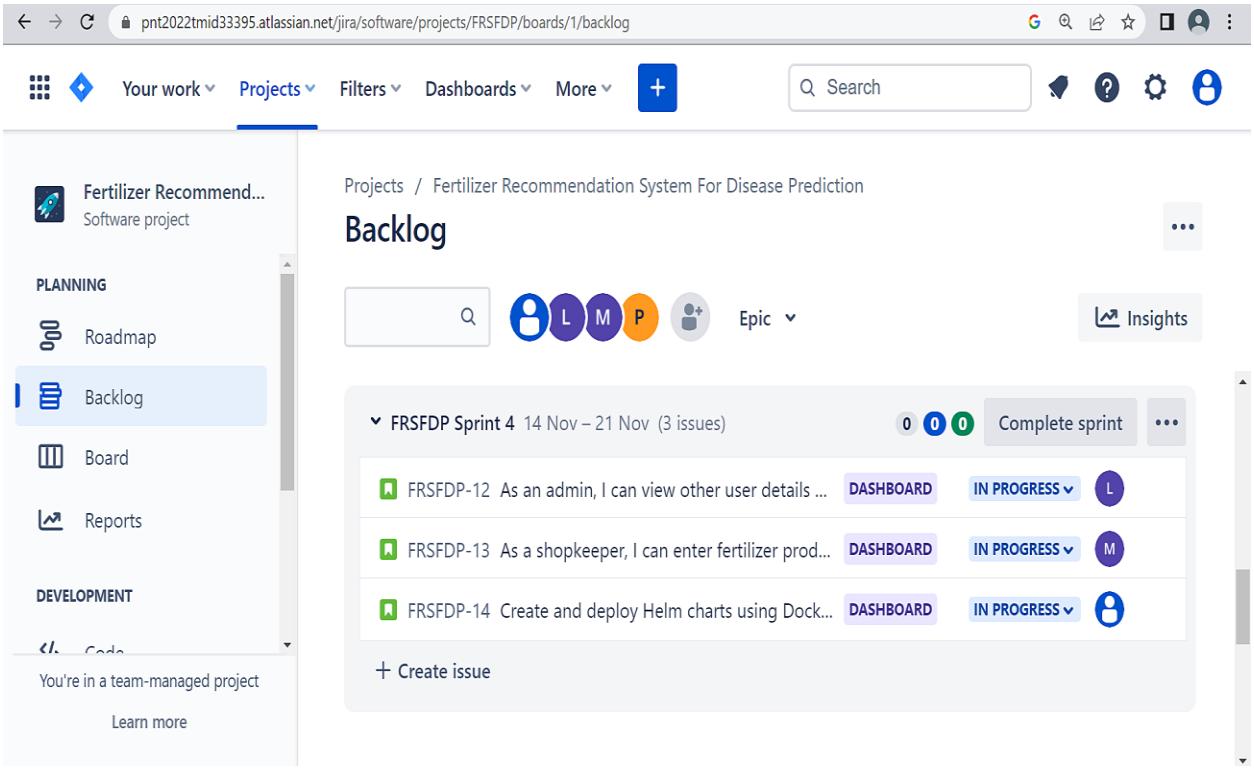
6.3.4 SPRINT 2 :



6.3.5 SPRINT 3:

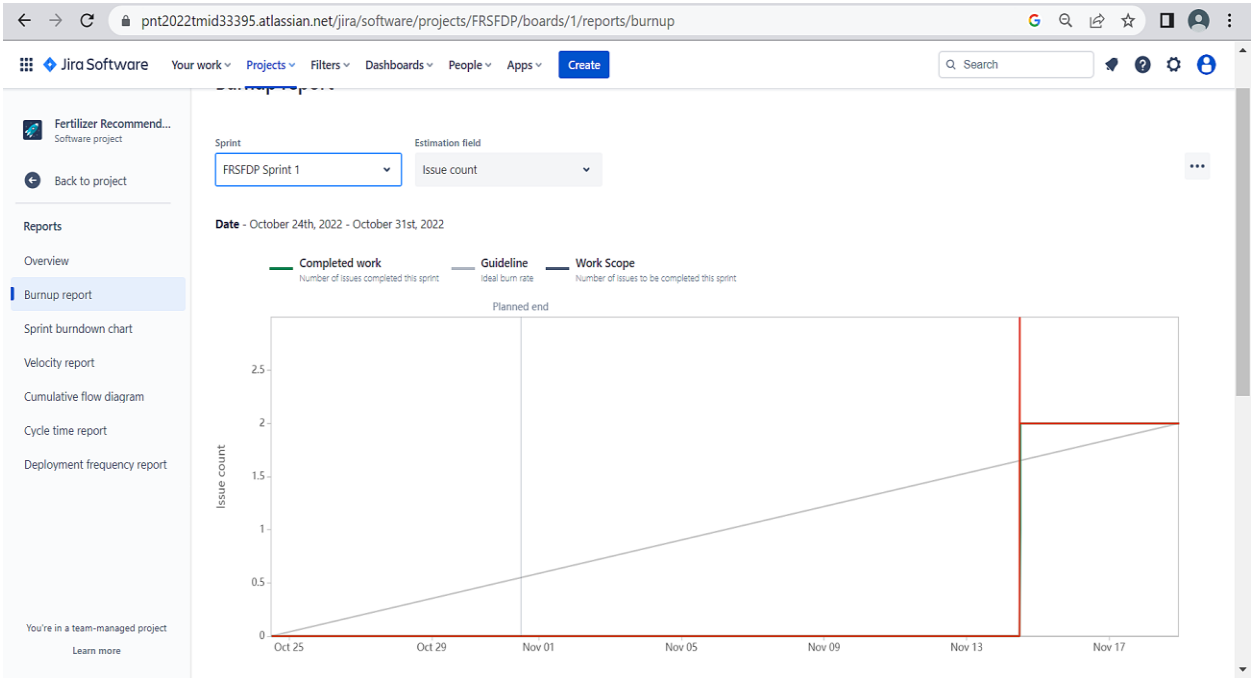


6.3.6 SPRINT 4:


pnt2022tmid33395.atlassian.net/jira/software/projects/FRSFDP/boards/1/backlog
Your work
Projects
Filters
Dashboards
More
Search
Fertilizer Recommend...
Software project
PLANNING
Roadmap
Backlog
Board
Reports
DEVELOPMENT
You're in a team-managed project
Learn more
Projects / Fertilizer Recommendation System For Disease Prediction
Backlog
Epic
Insights
FRSFDP Sprint 4 14 Nov – 21 Nov (3 issues)
Complete sprint
FRSFDP-12 As an admin, I can view other user details ...
DASHBOARD
IN PROGRESS
FRSFDP-13 As a shopkeeper, I can enter fertilizer prod...
DASHBOARD
IN PROGRESS
FRSFDP-14 Create and deploy Helm charts using Dock...
DASHBOARD
IN PROGRESS
Create issue

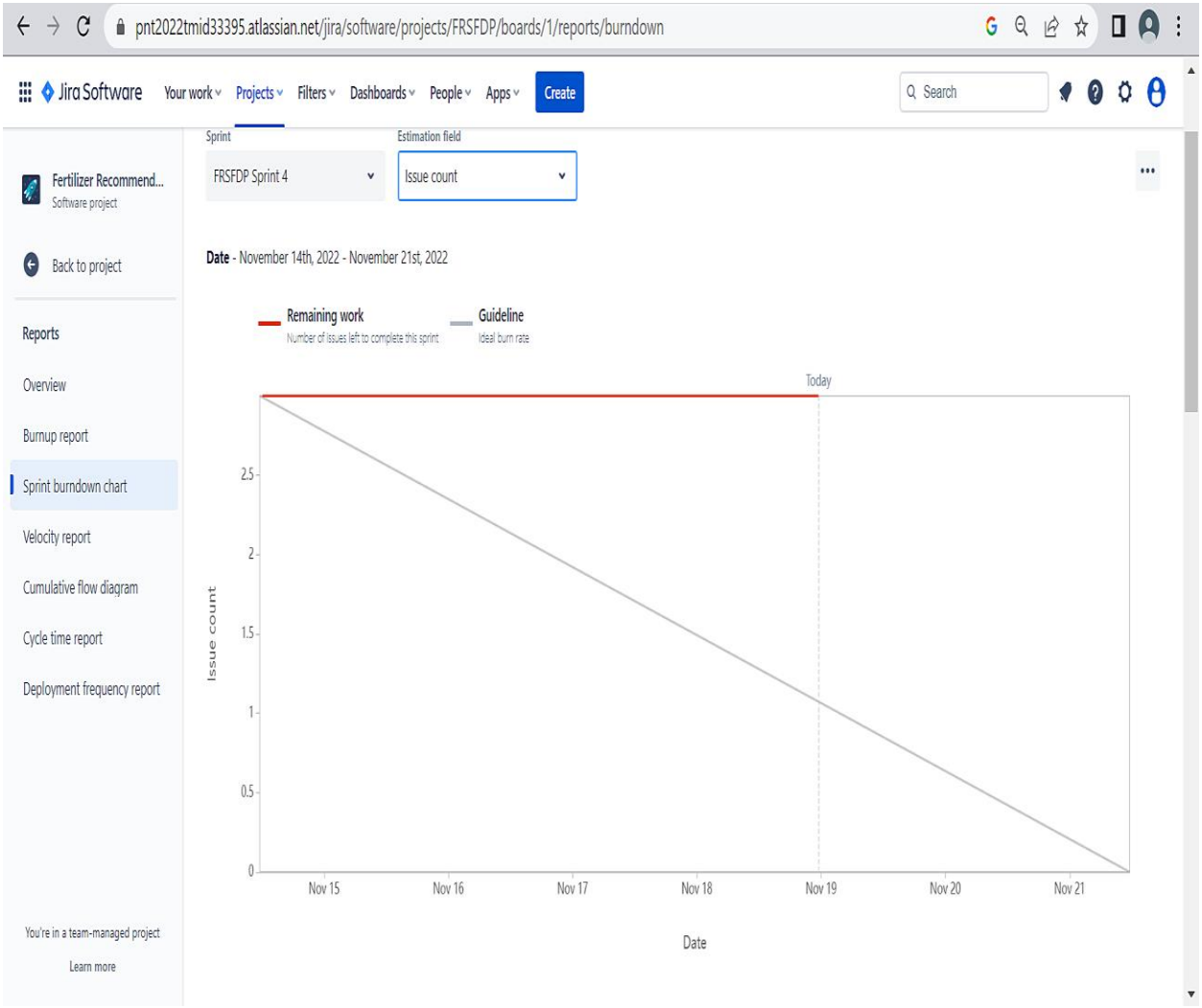
6.3.6 BURN UP CHART:

A burnup chart **highlights the work you've completed against your total project scope** while a burn down chart highlights the amount of work remaining in a project. A burnup chart contains a work completed line and a project scope line.



6.3.7 BURN DOWN REPORT:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



7. CODING AND SOLUTIONING:

7.1 FEATURE 1:

The leaf is uploaded in the prediction page and the page will ask seperately for the fruit and the vegetabe. According to the leaf category, the concerned leaf is uploaded in the page. After the leaf image is uploaded, the result is predicted for each of the leaf image. If the laef has no disease, it will indicate that the laef has no problem and the yield will be good. Suppose, if the leaf contains diseases, it will predict the disease. Also it will recommed the suitable fertilizer to solve the disease.

7.2 FEATURE 2:

The trained machine learning model can predict the output from an image that is uploaded, and the nutrition facts are also displayed on the same page. The model's accuracy was determined to be 95%, and when it was trained on the IBM cloud, it reached 100%. An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases.

7.3 DATABASE SCHEMA:

For designing the webpage, we have used HTML. We have developed the HTML page to structure the web page and used CSS(Cascading Style Sheets)

1_Histogram.ipynb

```
import cv2
import matplotlib.pyplot as plt
import numpy as np
img = cv2.imread('/content/drive/MyDrive/0a285c8b-1c31-48d4-89f2-
af8b9edc36f6___RS_HL 5759.JPG', 0)
plt.imshow(img, cmap='gray'), plt.grid(False)
plt.xticks([]), plt.yticks([])
hist = cv2.calcHist([img],[0],None,[50],[0,256])

# different methods for displaying a histogram
plt.bar(range(50), hist.ravel())
plt.title('Histogram of the airplane image')
plt.xlabel('Gray values')
plt.ylabel('Frequency')
# Another method
hist,bins = np.histogram(img.ravel(),256,[0,256])
plt.plot(hist)
# Let's read two other images
```

```
high = cv2.imread('/content/drive/MyDrive/aa04db6d-645f-4e8a-88dc-
c9f9396f0800___RS_HL 1975.jpg')
low = cv2.imread('/content/drive/MyDrive/0a285c8b-1c31-48d4-89f2-
af8b9edc36f6___RS_HL 5759.JPG')
# show images
plt.subplot(121), plt.imshow(high)
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(122), plt.imshow(low)
plt.grid(False), plt.xticks([]), plt.yticks([])
plt.show()
# Calculate histogram of both images for the last channel.
# Channels can differ from 0 to 2.
hist_high = cv2.calcHist([high],[2],None,[256],[0,256])
hist_low = cv2.calcHist([low],[2],None,[256],[0,256])

# Plot histograms
plt.subplot(121)
plt.plot(hist_high)

plt.subplot(122)
plt.plot(hist_low)

plt.show()
cdf_low = hist_low.cumsum()
cdf_high = hist_high.cumsum()

# plot cumulative histograms
plt.subplot(221), plt.plot(cdf_high), plt. title('cdf of bright image')
plt.subplot(222), plt.plot(hist_high, 'k'), plt. title('pdf of bright image')

plt.subplot(223), plt.plot(cdf_low), plt. title('cdf of dark image')
plt.subplot(224), plt.plot(hist_low, 'k'), plt. title('pdf of dark image')

# adjust the placement of subplots
plt.subplots_adjust(bottom=2, right=0.8, top=3)

plt.show()
low_gray = cv2.cvtColor(low, cv2.COLOR_BGR2GRAY)
high_gray = cv2.cvtColor(high, cv2.COLOR_BGR2GRAY)
# show images and their histograms
plt.subplot(221), plt.imshow(high_gray, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])
plt.subplot(223), plt.plot(cv2.calcHist([high_gray],[0],None,[256],[0,256]))

plt.subplot(222), plt.imshow(low_gray, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])
```

```
plt.subplot(224), plt.plot(cv2.calcHist([low_gray],[0],None,[256],[0,256]))

plt.show()
# Define a function to easily handle manipulation.
def manip_image(image, alpha, beta):

  new_image = np.zeros(image.shape, image.dtype)

  for y in range(image.shape[0]):
    for x in range(image.shape[1]):
       new_image[y,x] = np.clip(alpha*image[y,x] + beta, 0, 255)

  return new_image
# Test on the image
bright = manip_image(img, 1, 30)
dark = manip_image(img, 1, -30)

# Compare the results
plt.figure()
plt.subplot(231), plt.imshow(dark, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(232), plt.imshow(img, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])


plt.subplot(233),plt.imshow(bright, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(234)
plt.plot(cv2.calcHist([dark],[0],None,[256],[0,256])), plt.ylim((0, 1750))

plt.subplot(235)
plt.plot(cv2.calcHist([img],[0],None,[256],[0,256]))

plt.subplot(236)
plt.plot(cv2.calcHist([bright],[0],None,[256],[0,256]))
# Test on the dark image
l_bright = manip_image(low_gray, 1, 150)
l_dark = manip_image(low_gray, 1, -25)

# Compare the results
plt.figure()
plt.subplot(231), plt.imshow(l_dark, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(232), plt.imshow(low_gray, cmap='gray')
```

```
plt.grid(False), plt.xticks([]), plt.yticks([])


plt.subplot(233),plt.imshow(l_bright, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(234)
plt.plot(cv2.calcHist([l_dark],[0],None,[256],[0,256])), plt.ylim((0, 1100))

plt.subplot(235)
plt.plot(cv2.calcHist([low_gray],[0],None,[256],[0,256])), plt.ylim((0, 1100))

plt.subplot(236)
plt.plot(cv2.calcHist([l_bright],[0],None,[256],[0,256])), plt.ylim((0, 1100))
# Test on the image
increase_contrast = manip_image(img, 1.35, 0)
decrease_contrast = manip_image(img, 0.35, 0)

# Compare the results
plt.figure()
plt.subplot(231), plt.imshow(decrease_contrast, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(232), plt.imshow(img, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])


plt.subplot(233),plt.imshow(increase_contrast, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(234)
plt.bar(range(256),
    cv2.calcHist([decrease_contrast],[0],None,[256],[0,256]).ravel())
plt.ylim((0, 1750))

plt.subplot(235)
plt.bar(range(256),
    cv2.calcHist([img],[0],None,[256],[0,256]).ravel())
plt.ylim((0, 1750))

plt.subplot(236)
plt.bar(range(256),
    cv2.calcHist([increase_contrast],[0],None,[256],[0,256]).ravel())
plt.ylim((0, 1750))
img_eq = cv2.equalizeHist(img)

grid = plt.GridSpec(3, 4, wspace=0.4, hspace=0.3)
```

```
plt.subplot(grid[:2, :2])
plt.imshow(img, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(grid[:2, 2:])
plt.imshow(img_eq, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(grid[2, :2])
plt.bar(range(256),
      cv2.calcHist([img],[0],None,[256],[0,256]).ravel())

plt.subplot(grid[2, 2:])
plt.bar(range(256),
      cv2.calcHist([img_eq],[0],None,[256],[0,256]).ravel())
clahe = cv2.createCLAHE(clipLimit=2.0, tileGridSize=(16, 16))
img_cl = clahe.apply(img)

grid = plt.GridSpec(3, 4, wspace=0.4, hspace=0.3)

plt.subplot(grid[:2, :2])
plt.imshow(img, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(grid[:2, 2:])
plt.imshow(img_cl, cmap='gray')
plt.grid(False), plt.xticks([]), plt.yticks([])

plt.subplot(grid[2, :2])
plt.bar(range(256),
      cv2.calcHist([img],[0],None,[256],[0,256]).ravel())

plt.subplot(grid[2, 2:])
plt.bar(range(256),
      cv2.calcHist([img_cl],[0],None,[256],[0,256]).ravel())
```

2_Spatial_Filtering.ipynb

```
import cv2
import numpy as np
from matplotlib import pyplot as plt
ref = cv2.imread('/content/drive/MyDrive/0a285c8b-1c31-48d4-89f2-
af8b9edc36f6___RS_HL 5759.JPG')
plt.imshow(ref), plt.grid(False)
```

```
# while learning how to perform spatial filtering,
# you can also note how to apply different python commands.
plt.title('The original image')
plt.xticks([])
plt.yticks([])
plt.show()
# Defining a kernel using numpy.
kernel_5 = np.ones((5,5),np.float32)/25
kernel_3 = np.ones((3,3),np.float32)/9

# Convolves an image with the kernel.
# -1 means that the center of the kernel is located on the center pixel.
# compare two kernel sizes.
filtered_5 = cv2.filter2D(ref,-1,kernel_5)
filtered_3 = cv2.filter2D(ref,-1,kernel_3)

# plot the results in two subplots.
fig=plt.figure(figsize=(14, 14), dpi= 80, facecolor='w', edgecolor='k')

plt.subplot(121), plt.imshow(filtered_3), plt.title('3-by-3 filter')
plt.grid(False)
plt.xticks([])
plt.yticks([])

plt.subplot(122), plt.imshow(filtered_5), plt.title('5-by-5 filter')
plt.grid(False)
plt.xticks([])
plt.yticks([])

plt.show()
# you can check the docs for further information.
blurred = cv2.blur(ref, (5, 5), -1)

plt.imshow(blurred), plt.grid(False), plt.xticks([]), plt.yticks([]), plt.show()
top = 10; bottom = 5; left = 20; right = 5
const = 100
img2 = cv2.copyMakeBorder(ref, top, bottom, left, right,
                cv2.BORDER_WRAP)
img3 = cv2.copyMakeBorder(ref, top, bottom, left, right,
                cv2.BORDER_REFLECT)
img4 = cv2.copyMakeBorder(ref, top, bottom, left, right,
                cv2.BORDER_REPLICATE)
img5 = cv2.copyMakeBorder(ref, top, bottom, left, right,
                cv2.BORDER_CONSTANT, const)

# Display the images
```

```
fig=plt.figure(figsize=(14, 14), dpi= 80, facecolor='w', edgecolor='k')

plt.subplot(221), plt.imshow(img2), plt.grid(False)
plt.xticks([]), plt.yticks([]), plt.title('wrap')

plt.subplot(222), plt.imshow(img3), plt.grid(False)
plt.xticks([]), plt.yticks([]), plt.title('reflect')

plt.subplot(223), plt.imshow(img4), plt.grid(False)
plt.xticks([]), plt.yticks([]), plt.title('replicate')

plt.subplot(224), plt.imshow(img5), plt.grid(False)
plt.xticks([]), plt.yticks([]), plt.title('constant')

plt.show()
# vertical gradient kernel
# define a random kernel
vertical_gd = np.array([[1, 0, -1], [1, 0, -1], [1, 0, -1]])

# apply it.
filter_v = cv2.filter2D(ref[:, :, 2], -1, vertical_gd)

# show in a different colormap.
plt.imshow(filter_v, cmap='gray'), plt.grid(False)
plt.xticks([]), plt.yticks([])
s_and_p = np.random.rand(ref.shape[0], ref.shape[1])

# if we consider 5% salt and pepper noise, we'd like to have
# 2.5% salt and 2.5% pepper. thus:
salt = s_and_p > .975
pepper = s_and_p < .025

# in order to add some noise, we should turn off black (pepper) locations and
# turn on white (white) locations.
channel_2 = np.atleast_1d(ref[:, :, 1])
noisy = np.zeros_like(channel_2)

for i in range(channel_2.shape[0]*channel_2.shape[1]):
  if salt.ravel()[i] == 1:
    noisy.ravel()[i] = 255
  elif pepper.ravel()[i] == 1:
    noisy.ravel()[i] = 0
  else:
    noisy.ravel()[i] = channel_2.ravel()[i]

# apply median filter with size 3
Med = cv2.medianBlur(noisy, 3)
```

```
# Display the results
fig=plt.figure(figsize=(14, 14), dpi= 80, facecolor='w', edgecolor='k')
plt.subplot(121), plt.xticks([]), plt.yticks([])
plt.imshow(noisy, cmap='gray'), plt.grid(False)
plt.subplot(122), plt.xticks([]), plt.yticks([])
plt.imshow(Med, cmap='gray'), plt.grid(False)
plt.show()
# Creating random normal (gaussian) noise with pre-defined mean and std.
# The noisy image should be the size of the reference image.
mean = 0
sigma = 20.0
gauss_noise = np.random.normal(mean, sigma, (ref.shape[0], ref.shape[1]))

# Convert RGB image to Grayscale image using cvtColor()
gray = cv2.cvtColor(ref, cv2.COLOR_BGR2GRAY)

# Add gaussian noise to the image
g_noisy = gray + gauss_noise # Gaussian noisy image

# Showing gray image, noise image, and noisy image
fig=plt.figure(figsize=(14, 14), dpi= 80, facecolor='w', edgecolor='k')
plt.subplot(131), plt.xticks([]), plt.yticks([])
plt.imshow(gray, cmap='gray'), plt.grid(False)
plt.subplot(132), plt.xticks([]), plt.yticks([])
plt.imshow(gauss_noise, cmap='gray'), plt.grid(False)
plt.subplot(133), plt.xticks([]), plt.yticks([])
plt.imshow(g_noisy, cmap='gray'), plt.grid(False)
g_filtered = cv2.GaussianBlur(g_noisy, (3, 3), 20, 20)

# Display the result
plt.imshow(g_filtered, cmap='gray'), plt.grid(False)
plt.xticks([]), plt.yticks([])
# Create a single gaussian kernel
g_kernel = cv2.getGaussianKernel(3, 20)
print(g_kernel)

# Apply two separate kernels over the image.
g_filtered_2 = cv2.sepFilter2D(g_noisy, -1, g_kernel, g_kernel)

# Displaying the results.
fig=plt.figure(figsize=(14, 14), dpi= 80, facecolor='w', edgecolor='k')
plt.subplot(121), plt.xticks([]), plt.yticks([]), plt.title('first method')
plt.imshow(g_filtered, cmap='gray'), plt.grid(False)
plt.subplot(122), plt.xticks([]), plt.yticks([]), plt.title('second method')
plt.imshow(g_filtered_2, cmap='gray'), plt.grid(False)
```

3_Intensity_Transformations.ipynb

```
from skimage.io import imread
import matplotlib.pyplot as plt
import numpy as np
live = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple___Black_rot/0b37761a-de32-47ee-a3a4-e138b97ef542___JR_FrgE.S 2908.JPG')
mask = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple___Black_rot/00e909aa-e3ae-4558-9961-336bb0f35db3___JR_FrgE.S 8593.JPG')

plt.figure(figsize=(10, 10))
plt.subplot(121), plt.imshow(live, cmap='gray')
plt.subplot(122), plt.imshow(mask, cmap='gray')
plt.show()
plt.figure(figsize=(10, 10))
plt.subplot(121), plt.imshow(live, cmap='gray')
plt.subplot(122), plt.imshow(live - 20, cmap='gray')
plt.show()
plt.figure(figsize=(10, 10))
plt.subplot(131), plt.imshow(mask - live, cmap='gray')
plt.subplot(132), plt.imshow(-(mask - live + 128), cmap='gray')
plt.subplot(133), plt.imshow(mask - live + 128, cmap='gray')
plt.show()
shaded = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple___Black_rot/0b37761a-de32-47ee-a3a4-e138b97ef542___JR_FrgE.S 2908.JPG')
shading = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple___Black_rot/00e909aa-e3ae-4558-9961-336bb0f35db3___JR_FrgE.S 8593.JPG')

plt.figure(figsize=(10, 10))
plt.subplot(121), plt.imshow(shaded, cmap='gray')
plt.subplot(122), plt.imshow(shading, cmap='gray')
plt.show()
plt.figure(figsize=(10, 10))
plt.subplot(121), plt.imshow(np.multiply(shaded, 1/shading), cmap='gray')
plt.subplot(122), plt.imshow(shaded, cmap='gray')
plt.show()
# Test on the X-ray dental image
xray = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Apple___Black_rot/00e909aa-e3ae-4558-9961-336bb0f35db3___JR_FrgE.S 8593.JPG')
```

```
mask_xray = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Peach___Bacterial_spot/00ddc106-692e-4c67-b2e8-569c924caf49___Rutg._Bact.S 1228.JPG')
plt.figure(figsize=(10, 10))
plt.subplot(121), plt.imshow(xray, cmap='gray')
plt.subplot(122), plt.imshow(mask_xray, cmap='gray')
plt.show()
plt.figure()
plt.imshow(np.multiply(xray, mask_xray/255), cmap='gray')
plt.show()
# Test on another image
scan = imread('/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test/Corn_(maize)___Northern_Leaf_Blight/0a62fe5a-22db-42e2-bca0-53a8dcfd8129___RS_NLB 0810.JPG')
print(scan.shape)
# Showing the body scan image
plt.figure(figsize=(7, 7))
plt.imshow(scan, cmap='gray')
plt.show()
plt.figure(figsize=(10, 10))
plt.subplot(211), plt.imshow(xray, cmap='gray')
plt.subplot(212), plt.plot(np.histogram(xray, bins=256)[0])
plt.show()
```

Image Preprocessing.ipynb

```
from keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator (rescale = 1./255, shear_range= 0.2,zoom_range= 0.2, horizontal_flip = True)
test_datagen =ImageDataGenerator (rescale = 1)
x_train = train_datagen.flow_from_directory(r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/test',target_size = (128,128), batch_size = 32, class_mode = 'categorical')
x_test = test_datagen.flow_from_directory(r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-dataset/train',target_size = (128,128), batch_size = 32, class_mode = 'categorical')
x_train = train_datagen.flow_from_directory(r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/Veg-dataset/Veg-dataset/test_set',target_size = (128,128), batch_size = 32, class_mode = 'categorical')
x_test = test_datagen.flow_from_directory(r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/Veg-dataset/Veg-dataset/test_set',target_size = (128,128), batch_size = 32, class_mode = 'categorical')
```

TRAINING THE MODELS

FruitData.ipynb

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,
vertical_flip=False)
test_datagen=ImageDataGenerator(rescale=1./255)
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/DataSet/Dataset
Plant Disease/fruit-dataset/fruit-dataset/train",target_size=(128,128),
                                          class_mode='categorical',batch_size=24)
x_test=test_datagen.flow_from_directory(r"/content/drive/MyDrive/DataSet/Dataset Plant
Disease/fruit-dataset/fruit-dataset/test",target_size=(128,128),
                                          class_mode='categorical',batch_size=24)
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.summary()
32*(3*3*3+1)
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(6,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=le
n(x_test),epochs=10)
model.save('fruitdata.h5')
```

Vegetable Data.ipynb

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,
vertical_flip=False)
test_datagen=ImageDataGenerator(rescale=1./255)
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/DataSet/Dataset
Plant Disease/Veg-dataset/Veg-dataset/train_set",target_size=(128,128),
                                          class_mode='categorical',batch_size=24)
x_test=test_datagen.flow_from_directory(r'/content/drive/MyDrive/DataSet/Dataset Plant
Disease/Veg-dataset/Veg-dataset/test_set',target_size=(128,128),
```

```
                    class_mode='categorical',batch_size=24)
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.summary()
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(9,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=le
n(x_test),epochs=10)
model.save('vegetabledata.h5')
```

TESTING THE MODELS

Tested_fruitdat.ipynb

```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
test_dir=r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-dataset/fruit-
dataset/test'
model = tf.keras.models.load_model(r'/content/drive/MyDrive/DataSet/Dataset Plant
Disease/fruit-dataset/fruitdata.h5')
test_datagen_1=ImageDataGenerator(rescale=1)
test_generator_1=test_datagen_1.flow_from_directory(
   test_dir,
   target_size=(128,128),
   batch_size=20,
   class_mode='categorical'
)
img=image.load_img(r"/content/drive/MyDrive/DataSet/Dataset Plant Disease/fruit-
dataset/fruit-dataset/test/Apple___healthy/00fca0da-2db3-481b-b98a-
9b67bb7b105c___RS_HL 7708.JPG",target_size=(128,128))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=['Apple___Black_rot', 'Apple___healthy', 'Corn_(maize)___healthy',
'Corn_(maize)___Northern_Leaf_Blight', 'Peach___Bacterial_spot', 'Peach___healthy']
index[y[0]]
model.evaluate(test_generator_1,steps=50)
```

Tested_vegetabledata.ipynb

```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
test_dir=r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/Veg-dataset/Veg-dataset/test_set'
model = tf.keras.models.load_model(r'/content/drive/MyDrive/DataSet/Dataset Plant Disease/Veg-dataset/vegetabledata.h5')
test_datagen_1=ImageDataGenerator(rescale=1)
test_generator_1=test_datagen_1.flow_from_directory(
   test_dir,
   target_size=(128,128),
   batch_size=20,
   class_mode='categorical'
)
img=image.load_img(r"/content/drive/MyDrive/DataSet/Dataset Plant Disease/Veg-dataset/Veg-dataset/test_set/Pepper,_bell___healthy/b303761b-5357-4d82-9e78-1b26c2804196___JR_HL 7879.JPG",target_size=(128,128))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=['Pepper,_bell___Bacterial_spot', 'Pepper,_bell___healthy', 'Potato___Early_blight', 'Potato___healthy', 'Potato___Late_blight',
'Tomato___Bacterial_spot','Tomato___Late_blight','Tomato___Leaf_Mold','Tomato___Septoria_leaf_spot']
y[0]
index[y[0]]
```

APPLICATION BUILDING

app.py

```
#Import necessary libraries
from flask import Flask, render_template, request

import numpy as np
import os

from tensorflow.keras.preprocessing.image import load_img
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model
```

```
filepath =
'C:/Users/Anand/AppData/Local/Programs/Python/Python38/Tomato_Leaf_Disease_Predi
ction/fruitdata.h5'
model = load_model(filepath)
print(model)

print("Model Loaded Successfully")

def pred_tomato_dieas(plant):
  test_image = load_img(plant, target_size = (128, 128)) # load image
  print("@@ Got Image for prediction")

  test_image = img_to_array(test_image)/255 # convert image to np array and normalize
  test_image = np.expand_dims(test_image, axis = 0) # change dimention 3D to 4D

  result = model.predict(test_image) # predict diseased palnt or not
  print('@@ Raw result = ', result)

  pred = np.argmax(result, axis=1)
  print(pred)
  if plant=="fruit":
    if pred==0:
       return "Apple__Black_rot", 'Apple__Black_rot.html'

    elif pred==1:
       return "Apple__healthy", 'Apple__healthy.html'

    elif pred==2:
       return "Corn_(maize)__healthy", 'Corn_(maize)__healthy.html'

    elif pred==3:
       return "Corn_(maize)__Northern_Leaf_Blight",
'Corn_(maize)__Northern_Leaf_Blight.html'

    elif pred==4:
       return "Peach__Bacterial_spot", 'Peach__Bacterial_spot.html'

    elif pred==5:
       return "Peach__healthy", 'Peach__healthy.html'
  elif plant=="Vegetable":
    if pred==0:
       return "Pepper,_bell__Bacterial_spot", 'Pepper,_bell__Bacterial_spot.html'
    elif pred==1:
       return "Pepper,_bell__healthy", 'Pepper,_bell__healthy.html'

    elif pred==2:
```

```
        return "Potato__Early_blight", 'Potato__Early_blight.html'

    elif pred==3:
        return "Potato__healthy", 'Potato__healthy.html'

    elif pred==4:
        return "Potato__Late_blight", 'Potato__Late_blight.html'

    elif pred==5:
        return "Tomato__Bacterial_spot", 'Tomato__Bacterial_spot.html'

    elif pred==6:
        return "Tomato__Late_blight" , 'Tomato__Late_blight.html'

    elif pred==7:
        return "Tomato__Leaf_Mold" , 'Tomato__Leaf_Mold.html'

    elif pred==8:
        return "Tomato__Septoria_leaf_spot" , 'Tomato__Septoria_leaf_spot.html'




# Create flask instance
app = Flask(__name__)

# render index.html page
@app.route("/", methods=['GET', 'POST'])
def home():
        return render_template('index.html')


# get input image from client then predict class and render respective .html page for
solution
@app.route("/predict", methods = ['GET','POST'])
def predict():
    if request.method == 'POST':
        file = request.files['image'] # fet input
        filename = file.filename
        print("@@ Input posted = ", filename)

        file_path =
os.path.join('C:/Users/Madhuri/AppData/Local/Programs/Python/Python38/Tomato_Leaf
_Disease_Prediction/static/upload/', filename)
        file.save(file_path)
```

```
    print("@@ Predicting class.....")
    pred, output_page = pred_tomato_dieas(tomato_plant=file_path)

    return render_template(output_page, pred_output = pred, user_image = file_path)

# For local system & cloud
if __name__ == "__main__":
   app.run(threaded=False,port=8080)
```

HTML AND CSS CODE

index.html

```
<html>
<head>
<style>

* {
        margin: 0px;
        padding: 0px;
        box-sizing: border-box;


    }



    form {
        display: flex;
        height: 85vh;
        justify-content: center;
        align-items: center;
        margin-top: -150px;
        width: 60%;
        text-align: center;
                        margin-left:300px;

    }


    .details h2 {

        position: relative;
        top: 100px;
        margin: auto;
        color: rgb(18, 231, 231);
```

```
    font-size: 3rem;
}

label:hover {
    transform: scale(1.03);
}

.details h2 {
    /* margin-bottom: 300px; */
    position: relative;
    top: 100px;
    margin: auto;
    color: rgb(18, 231, 231);
    font-size: 3rem;

}




.details h1 {
    color: white;
    padding: 20px;
    border-radius: 15px;
    background-color: rgb(8, 8, 8);
}


.upload {

    font-size: 20px;
    background-color: rgb(255, 252, 252);
    border-radius: 20px;
    outline: none;
    width: 500px;
    color: rgb(0, 0, 0);
    border: 3px solid rgb(45, 47, 49);
}

.lload {
    position: relative;
    top: 40px; left: 390px;
    font-size: 20px;
    background-color: rgb(255, 252, 252);
    border-radius: 20px;
    outline: none;
    width: 500px;
```

```
        color: rgb(0, 0, 0);
        border: 3px solid rgb(45, 47, 49);
    }

    .txt {
        position: relative;
        top: 40px; left: 390px;
    }

    ::-webkit-file-upload-button {
        color: rgb(255, 252, 252);
        padding: 20px;
        border: 2px solid rgb(201, 6, 6);
        background-color: rgb(201, 6, 6);
        border-radius: 15px;

    }

    ::-webkit-file-upload-button:hover {
        border-radius: 20px;
        border: 2px solid rgb(177, 174, 174);


    }



    input[type="submit"] {
        position: absolute;
        margin-top: 200px;
        padding: 15px 35px;
        background-color: rgb(31, 185, 190);
        border-radius: 15px;
        color: black;
        font-size: 1.5rem;
        border: 4px solid rgb(31, 185, 190);
    }
</style>
</head>
<body style="background-image: url('Background.jpeg');">
        <h1 style="text-align:center;font-size:4rem;">Predict Plant Disease & Get
Cure</h1>
<section>



  <label for="cars" class = "txt" >Choose your plant:</label>
```

```
   <select name="cars" id="cars" class="lload">
      <option value="Fruit">Fruit plant</option>
      <option value="Vegetable">vegetable plant</option>
   </select>
         <form action="/predict" method="post" enctype="multipart/form-data"
onsubmit="showloading()">

            <br>
            <input type="file" name="image" class="upload">
                              <br>
                              <br>
            <input type="submit" value="Predict">

         </form>
      </div>
   </section>

</body>
</html>
```

Pepper_bell_bacterial_spot.html

```
<!DOCTYPE html>
<html lang="en">

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

   <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">
 <title>PLANT DISEASE PREDICTION</title>

   <style>
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
```

```
    }

  </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-attachment: fixed;">

  <div>
    <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict Disease And Get Cure</h1>
  </div>

 <br>
 <br>


  <div class="container my-2">
    <div class="row mb-5">

      <div class="col-sm" style="margin-bottom: 23px;">
        <span class="border border-primary">
          <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG' )}}" alt="Image Not Found" style="width:500px;height:500px;">


        </span>
      </div>

      <div class="col-sm">

        <div>
          <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
            class="text-center mb-5 content-h1 rounded">
            {{pred_output}} </h1>
        </div>
        <div class="details">
                                    <div class="box" style="background-color: aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
            <p style="text-align: center;font-size: 30px;color: black"><b>Treatment</b></p>
          </div>
```

```
            <div class="box-sol" style="background-color: white;height: 200px;width: 600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left: 20px;top: 30px;">
                 <p style="text-align: center;position: relative;top: 0px;font-size: 15.5px;">
                  Control of bacterial spot on greenhouse transplants is an essential step for preventing the spread of the leaf spot bacteria in the field. Transplants should be inspected regularly to identify symptomatic seedlings. Transplants with symptoms may be removed and destroyed or treated with streptomycin, if detected at the very early stage of disease development. It should be noted that strains of leaf spot bacteria resistant to streptomycin may arise with multiple applications of streptomycin

                </p>
                </div>

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


    </div>
</body>

</html>
```

pepper_bell_healthy.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
```

```
        box-sizing: border-box;

      }

      .border img {
        border-radius: 15px;
        border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG' )}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
                  {{pred_output}} </h1>
            </div>
            <div class="details">
```

```
                                    <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
              </div>

              <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                  <p style="text-align: center;position: relative;top: 50px;font-size: 22px;">
                    This leaf is <span style="color: green;"><b>healthy</b></span>.
                  </p>
                  </div>

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


    </div>
</body>

</html>
```

Potato_early_blight.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
```

```
        box-sizing: border-box;

      }

      .border img {
        border-radius: 15px;
        border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG' )}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
                  {{pred_output}} </h1>
            </div>
            <div class="details">
```

```
                                    <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
              </div>

              <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                  <p style="text-align: center; font-size: 15.5px;">
                    Early blight can be minimized by maintaining optimum growing
conditions, including proper fertilization, irrigation, and management of other pests. Grow
later maturing, longer season varieties. Fungicide application is justified only when the
disease is initiated early enough to cause economic loss.
                </p>
                </div>

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


    </div>
</body>

</html>
```

Potato_healthy.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
```

```
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
```

```
                {{pred_output}} </h1>
            </div>
            <div class="details">
                                        <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
              </div>

              <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                  <p style="text-align: center;position: relative;top: 50px;font-size: 22px;">
                   This leaf is <span style="color: green;"><b>healthy</b></span>.
                </p>
                </div>

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


    </div>
</body>

</html>
```

Potato_late_blight.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
```

```
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
```

```
                {{pred_output}} </h1>
            </div>
            <div class="details">
                                        <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
                </div>

                <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                  <p style="text-align: center; font-size: 15.5px;">
                   Late blight is controlled by eliminating cull piles and volunteer potatoes,
using proper harvesting and storage practices, and applying fungicides when necessary.
Air drainage to facilitate the drying of foliage each day is important. Under marginal
conditions, overhead sprinkler irrigation can favor late blight; in Tule Lake under solid set
sprinklers, conditions conducive to late blight development are enhanced by day time
irrigation but not night time irrigation.
                </p>
                </div>

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


    </div>
</body>

</html>
```

Tomato_bacterial_spot.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
```

```
    integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

  <title>PLANT DISEASE PREDICTION</title>

  <style>
    * {
      margin: 0px;
      padding: 0px;
      box-sizing: border-box;

    }

    .border img {
      border-radius: 15px;
      border: 2px solid black;
    }

  </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

  <div>
    <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
  </div>

 <br>
 <br>


  <div class="container my-2">
    <div class="row mb-5">

      <div class="col-sm" style="margin-bottom: 23px;">
        <span class="border border-primary">
          <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


        </span>
```

```
        </div>

        <div class="col-sm">

           <div>
              <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                 class="text-center mb-5 content-h1 rounded">
                 {{pred_output}} </h1>
              </div>
              <div class="details">
                                          <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                    <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
                 </div>

                 <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                    <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                     <p style="text-align: center; font-size: 15.5px;">
                      Plant pathogen-free seed or transplants to prevent the introduction of
bacterial spot pathogens on contaminated seed or seedlings.  If a clean seed source is not
available or you suspect that your seed is contaminated, soak seeds in water at 122°F for 25
min. to kill the pathogens.
                    </p>
                    </div>

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


     </div>
</body>

</html>
```

Tomato_late_blight.html

```
<!DOCTYPE html>
<html lang="en">

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

```
    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

    <div>
        <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
    </div>

   <br>
   <br>


    <div class="container my-2">
        <div class="row mb-5">

            <div class="col-sm" style="margin-bottom: 23px;">
                <span class="border border-primary">
                    <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">
```

```
            </span>
          </div>

          <div class="col-sm">

            <div>
              <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                class="text-center mb-5 content-h1 rounded">
                {{pred_output}} </h1>
            </div>
            <div class="details">
                                        <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
              </div>

              <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                  <p style="text-align: center; font-size: 15.5px;">
                    Continue weekly spray applications to protect plants from further
infection. Severely infected plants can be rogued and either buried or burned. Avoid
composting diseased plants
                </p>
                </div>

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


    </div>
</body>

</html>
```

Tomato_leaf_mold.html

```
<!DOCTYPE html>
<html lang="en">

<head>
```

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

    <div>
        <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
    </div>

   <br>
   <br>


    <div class="container my-2">
        <div class="row mb-5">

            <div class="col-sm" style="margin-bottom: 23px;">
                <span class="border border-primary">
```

```
            <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


          </span>
        </div>

        <div class="col-sm">

          <div>
            <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
              class="text-center mb-5 content-h1 rounded">
              {{pred_output}} </h1>
          </div>
          <div class="details">
                                    <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
              <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
            </div>

            <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
              <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                <p style="text-align: center; font-size: 15.5px;position:relative;top: 50px;">
                  Maintain night temps higher than outside temperatures.

              </p>
              </div>

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


    </div>
</body>

</html>
Tomato_septoria_leaf_spot.html

<!DOCTYPE html>
<html lang="en">

<head>
```

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

    <div>
        <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
    </div>

   <br>
   <br>


    <div class="container my-2">
        <div class="row mb-5">

            <div class="col-sm" style="margin-bottom: 23px;">
                <span class="border border-primary">
```

```
            <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


          </span>
        </div>

        <div class="col-sm">

          <div>
            <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
              class="text-center mb-5 content-h1 rounded">
              {{pred_output}} </h1>
          </div>
          <div class="details">
                                        <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
              <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
            </div>

            <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
              <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                <p style="text-align: center; font-size: 15.5px;">
                  Improve air circulation around the plants. If the plants can still be handled
without breaking them, stake or cage the plants to raise them off the ground and promote
faster drying of the foliage.
              </p>
              </div>

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


    </div>
</body>

</html>

Apple_Black_Rot.html

<!DOCTYPE html>
<html lang="en">
```

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

   <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

   <title>PLANT DISEASE PREDICTION</title>

   <style>
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">
```

```
        <div class="col-sm" style="margin-bottom: 23px;">
          <span class="border border-primary">
            <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


          </span>
        </div>

        <div class="col-sm">

          <div>
            <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
              class="text-center mb-5 content-h1 rounded">
              {{pred_output}} </h1>
          </div>
          <div class="details">
                                        <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
              <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
            </div>

            <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
              <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                <p style="text-align: center;">
                  Carefully prune and dispose of dead wood. This should be an important
component of both current-season and long-range management.
                  Prune and remove cankers; properly dispose of prunings by burial or
burning.
                  Remove all mummified fruit.
                  Control fire blight by pruning out infected wood or controlling insect
vectors
              </p>
              </div>

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


    </div>
</body>
```

```
</html>
```

Apple_Healthy.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

    <div>
        <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
    </div>

   <br>
```

```
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
                  {{pred_output}} </h1>
            </div>
            <div class="details">
                                          <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                  <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
               </div>

               <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                  <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                    <p style="text-align: center;position: relative;top: 50px;font-size: 22px;">
                     This leaf is <span style="color: green;"><b>healthy</b></span>.
                  </p>
                  </div>

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


   </div>
</body>
```

```
</html>
```

Corn(maize)_Healthy.html

```
<!DOCTYPE html>
<html lang="en">

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

   <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

   <title>PLANT DISEASE PREDICTION</title>

   <style>
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>
```

```
   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
                  {{pred_output}} </h1>
            </div>
            <div class="details">
                                       <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                  <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
               </div>

               <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                  <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                    <p style="text-align: center;position: relative;top: 50px;font-size: 22px;">
                     This leaf is <span style="color: green;"><b>healthy</b></span>.
                  </p>
                  </div>

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

   </div>
</body>

</html>
```

Corn(maize)_northern_leaf_blight.html

```
<!DOCTYPE html>
<html lang="en">

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

   <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
      integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

   <title>PLANT DISEASE PREDICTION</title>

   <style>
      * {
         margin: 0px;
         padding: 0px;
         box-sizing: border-box;

      }

      .border img {
         border-radius: 15px;
         border: 2px solid black;
      }

   </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>
```

```
  <div class="container my-2">
    <div class="row mb-5">

      <div class="col-sm" style="margin-bottom: 23px;">
        <span class="border border-primary">
          <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


        </span>
      </div>

      <div class="col-sm">

        <div>
          <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
            class="text-center mb-5 content-h1 rounded">
            {{pred_output}} </h1>
        </div>
        <div class="details">
                                    <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
            <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
          </div>

          <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
            <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
              <p style="text-align: center;position: relative;top: 0px;font-size: 18px;">
                First, choose corn varieties or hybrids that are resistant or at least have
moderate resistance to northern corn leaf blight. When you grow corn, make sure it does
not stay wet for long periods of time. The fungus that causes this infection needs between
six and 18 hours of leaf wetness to develop. Plant corn with enough space for airflow and
water in the morning so leaves can dry throughout the day.

            </p>
            </div>

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

```
    </div>
</body>

</html>
```

Peach_bacterial_spot.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">

    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

    <div>
        <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
```

```
  </div>

  <br>
  <br>


  <div class="container my-2">
    <div class="row mb-5">

      <div class="col-sm" style="margin-bottom: 23px;">
        <span class="border border-primary">
          <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


        </span>
      </div>

      <div class="col-sm">

        <div>
          <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
            class="text-center mb-5 content-h1 rounded">
            {{pred_output}} </h1>
        </div>
        <div class="details">
                                    <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
            <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
          </div>

          <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
            <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
              <p style="text-align: center; font-size: 15.5px;">
                The best strategy is to use cultivars with better bacterial spot resistance.
This is especially true for orchards in sandy sites prone to the disease. Varieties developed
by breeding programs in wet, sandy regions will tend to have better bacterial spot
resistance than those developed for dry regions such as California. A variety with moderate
resistance to bacterial spot may do well in a site sheltered from wind but have unacceptable
symptoms in a bacterial spot-prone site or if planted with highly susceptible varieties.
            </p>
            </div>

          </div>
```

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


    </div>
</body>

</html>
```

Peach_healthy.html

```
<!DOCTYPE html>
<html lang="en">

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

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.1/css/bootstrap.min.css"
        integrity="sha384-
VCmXjywReHh4PwowAiWNagnWcLhlEJLA5buUprzK8rxFgeH0kww/aWY76TfkUoSX"
crossorigin="anonymous">



    <title>PLANT DISEASE PREDICTION</title>

    <style>
        * {
            margin: 0px;
            padding: 0px;
            box-sizing: border-box;

        }

        .border img {
            border-radius: 15px;
            border: 2px solid black;
        }

    </style>
</head>

<body style="background-image: url('https://media.istockphoto.com/photos/tractor-
spraying-pesticides-on-soybean-field-with-sprayer-at-spring-picture-
```

```
id966855552?b=1&k=20&m=966855552&s=170667a&w=0&h=xtZdO1-
cST47qsG2rGkhCpyC7poG3kGcTrYVC3djIG0=');background-size: cover;background-
attachment: fixed;">

   <div>
      <h1 style="text-align:left;font-size: 50px;padding: 20px;color: white;">Predict
Disease And Get Cure</h1>
   </div>

  <br>
  <br>


   <div class="container my-2">
      <div class="row mb-5">

         <div class="col-sm" style="margin-bottom: 23px;">
            <span class="border border-primary">
               <img src="{{url_for('static',filename = 'images/Tomato___Leaf_Mold.JPG'
)}}" alt="Image Not Found" style="width:500px;height:500px;">


            </span>
         </div>

         <div class="col-sm">

            <div>
               <h1 style="padding: 15px; background-color:rgb(95, 231, 95); color: white;"
                  class="text-center mb-5 content-h1 rounded">
                  {{pred_output}} </h1>
            </div>
            <div class="details">
                                       <div class="box" style="background-color:
aliceblue;width: 200px;border-radius: 10px;position: relative;left: 200px;top: 72px;">
                  <p style="text-align: center;font-size: 30px;color:
black"><b>Treatment</b></p>
               </div>

               <div class="box-sol" style="background-color: white;height: 200px;width:
600px;border-radius: 10px;position: relative;top: 50px;">
                  <div class="mypara" style="height: 150;width: 550px; position: relative;left:
20px;top: 30px;">
                    <p style="text-align: center;position: relative;top: 50px;font-size: 22px;">
                     This leaf is <span style="color: green;"><b>healthy</b></span>.
                  </p>
                  </div>
```

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


    </div>
</body>

</html>
```

8.TESTING

8.1 TEST CASES

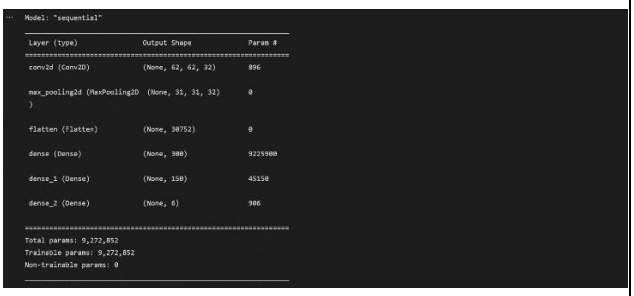
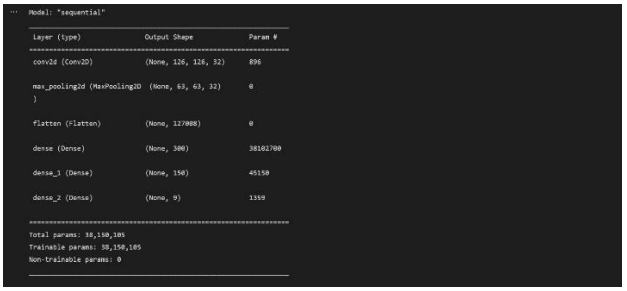
Test Case	Feature	Components	Test Scenario	Expected Result	Actual Result	Status	Comments	Bug	Executed by
Home Page	Functional	Home Page	Verify User Can See the Home Page	Yes, The Option Is Available	Option is Available	Pass	Success	No	Prabha
Prediction For Fruit	Functional	Home Page	Verify User Can See the Home Page	Can Visible	Yes Visible	Pass	Success	No	Pradeepa
Prediction For Vegetable	Functional	Home Page	Verify User Can See the Home Page	Can Visible	Yes Visible	Pass	Success	No	Logadharshini
Backend Process	Functional	Python Coding	Coding is done to implement the application	Working	Working	Pass	Success	No	Mathiyarasi

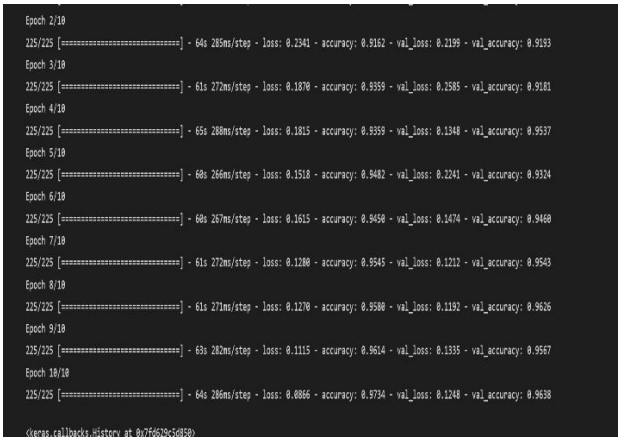
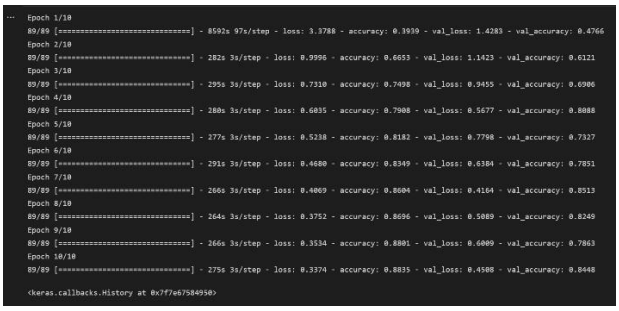
Results:

Fertilizer Recommendation System using Artificial Intelligence is developed and executed at the level of completed progress.

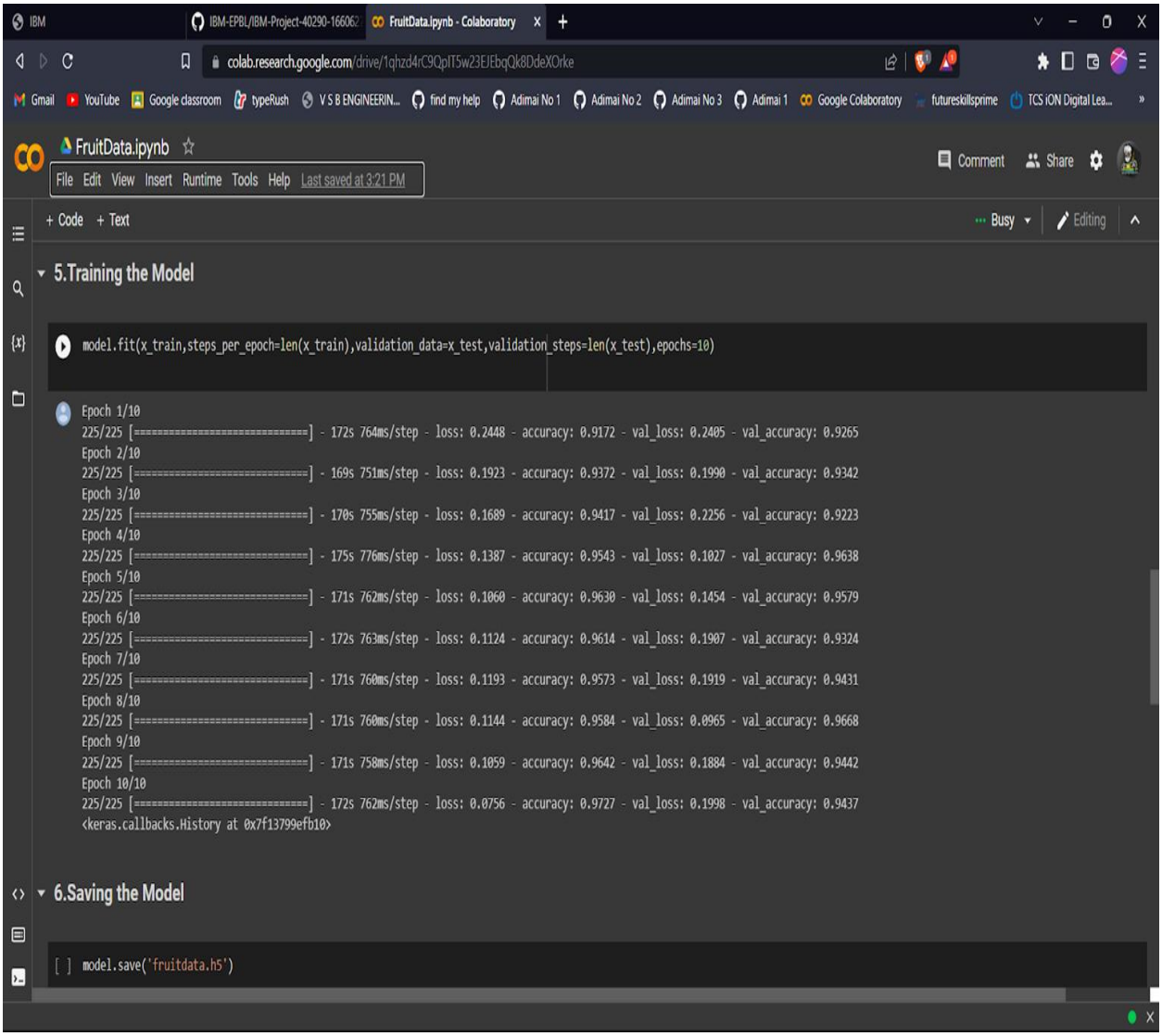
9.RESULTS

9.1 PERFORMANCE METRICS

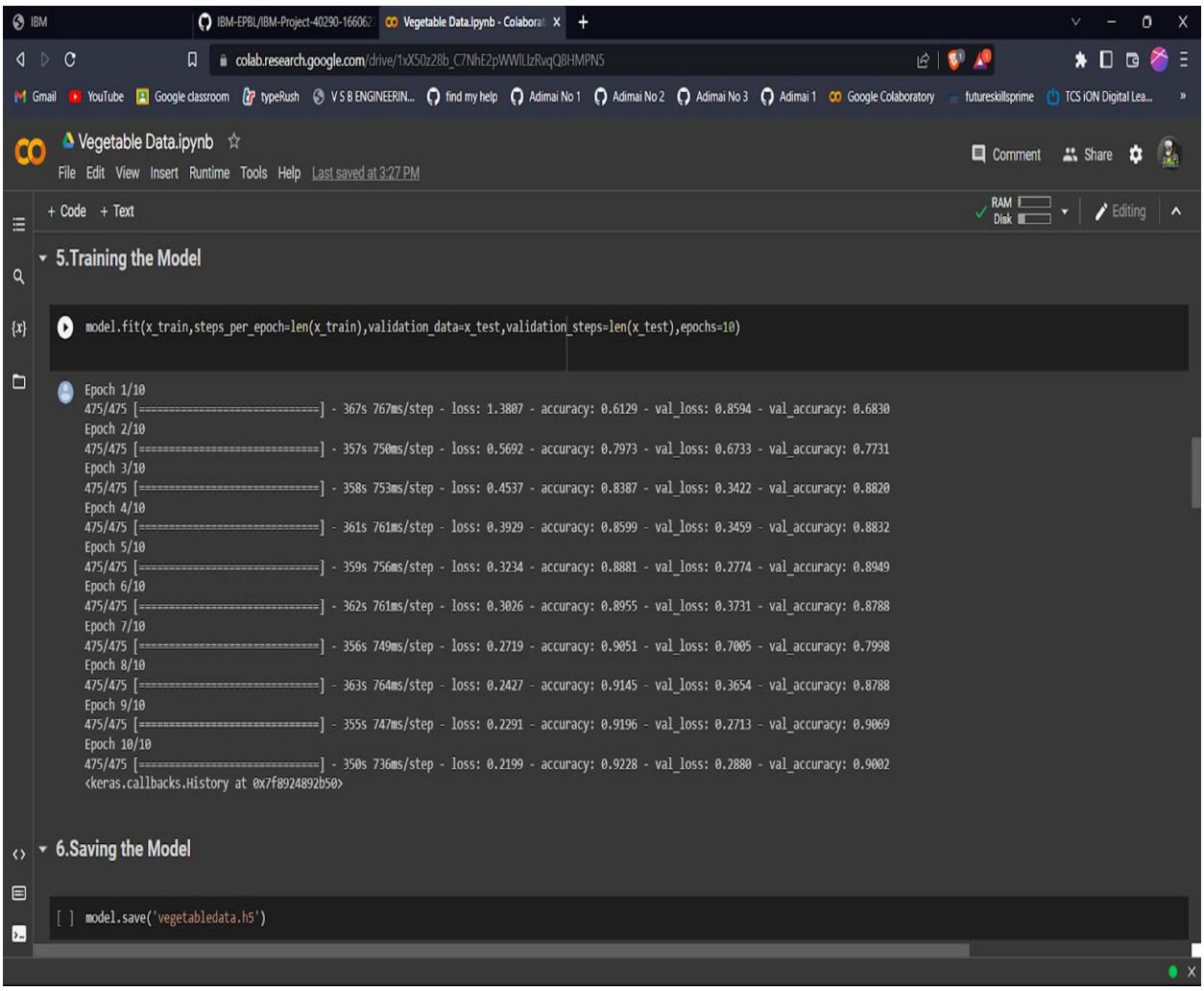
S. No.	Parameter	Values	Screenshot
1.	Model Summary of Fruit	Training the dataset of Vegetable images by using the CNN models to predict the disease of the given leaves.	
2.	Model Summary for Vegetable	Training the dataset of Vegetable images by using the CNN models to predict the disease of the given leaves.	

3.	Accuracy for Fruit	Training Accuracy - 0.9734 Validation Accuracy - 0.9638	
4.	Accuracy for Vegetable	Training Accuracy - 0.8835 Validation Accuracy - 0.8448	

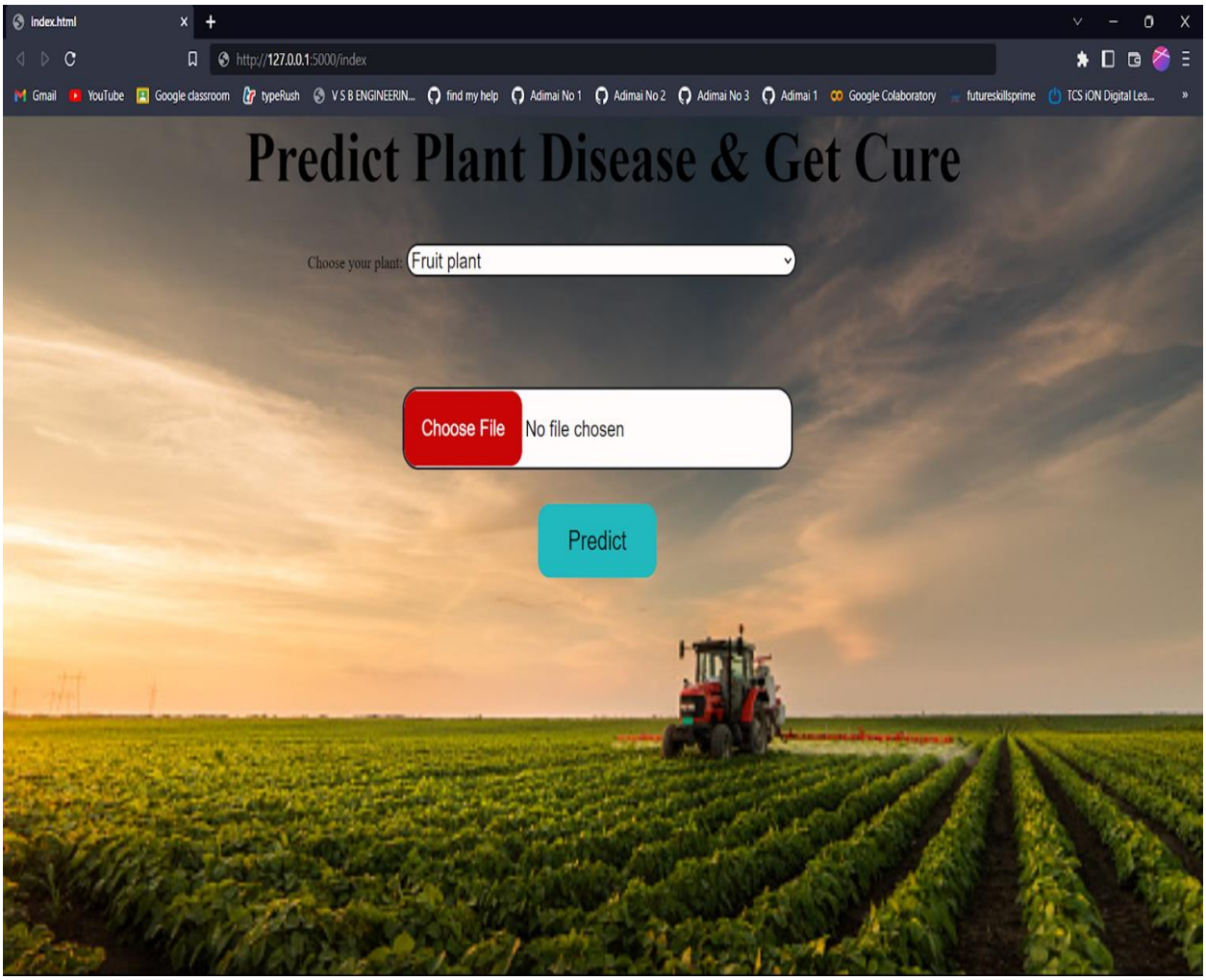
Training Fruits Dataset:



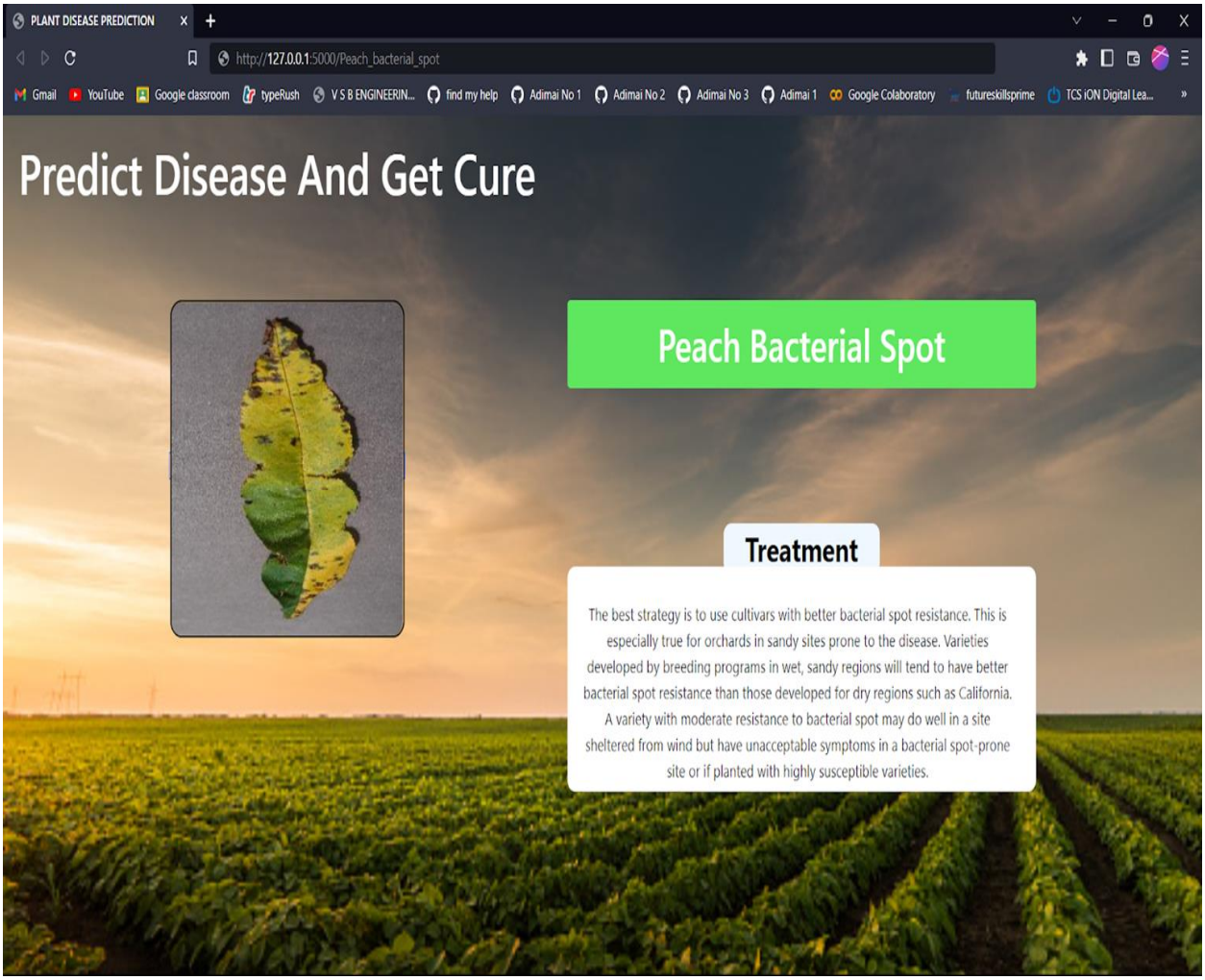
Training Vegetable Dataset:



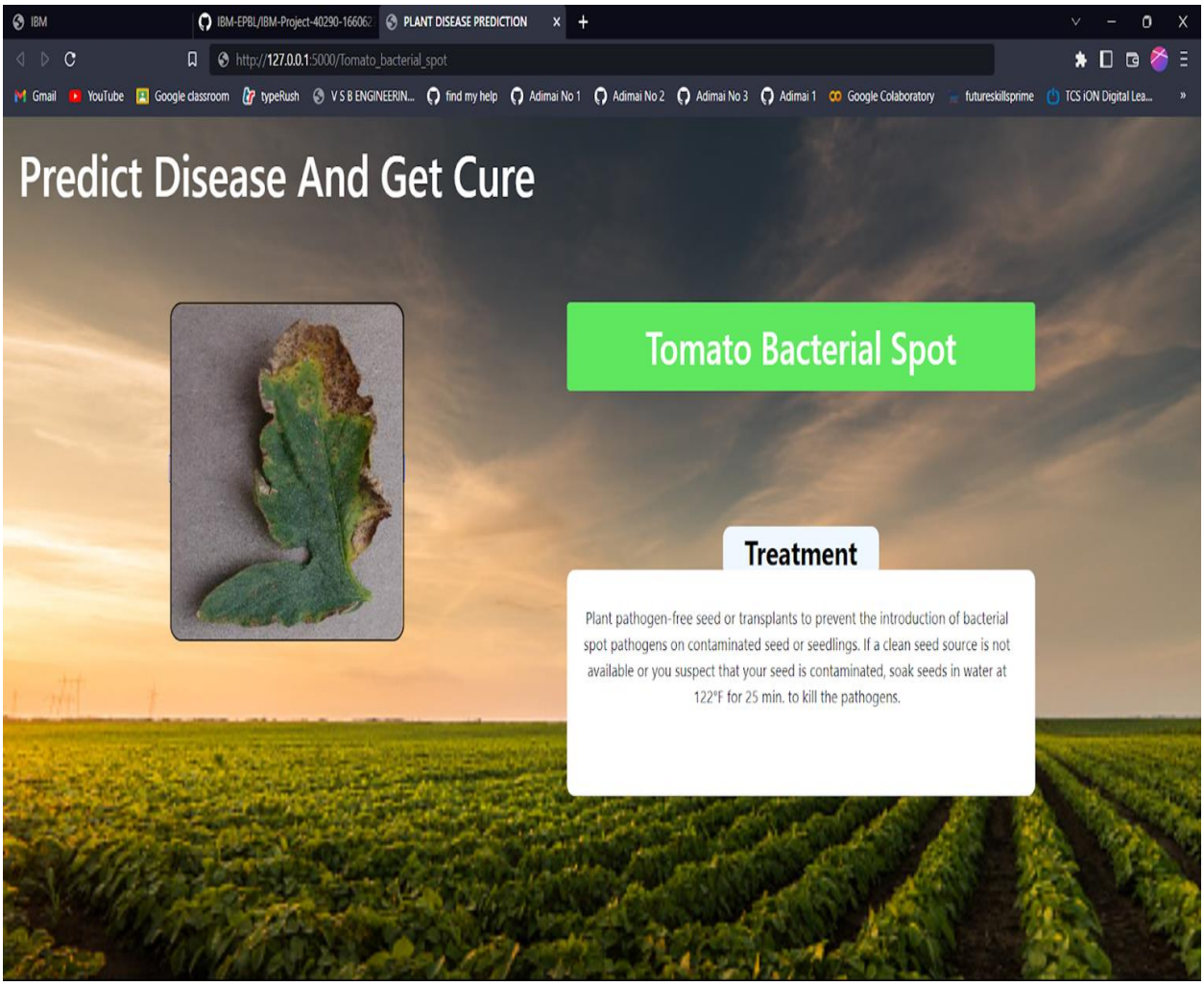
Login Page


index.html
http://127.0.0.1:5000/index
Gmail
YouTube
Google classroom
typeRush
V S B ENGINEERIN...
find my help
Adimai No 1
Adimai No 2
Adimai No 3
Adimai 1
Google Colaboratory
futureskillsprime
TCS iON Digital Lea...
Predict Plant Disease & Get Cure
Choose your plant:
Fruit plant
Choose File
No file chosen
Predict

Predicting the Fruit Leaf:



Predicting the Vegetable Leaf:



10. ADVANTAGES & DISADVANTAGES

Advantages:

- Pre-Identification of the diseases is more easier
- Greater Nourishment
- Better Productivity
- Farmer Friendly
- High yield of Crops
- Forecasting the diseases helps the farmer to protect the crops
- Pre-processing the Image with high capability
- More accurate Prediction
- Easy Detection
- More secure

Disadvantages:

- Correct fertilizer for the predicted disease may not be available at the required time
- Language Barrier.
- Without prior knowledge using the application may be difficult.
- Due to improper network predicted results may differ with the actual predicted disease.
- If software crash occurs, the application Might get error.
- Sometimes results may vary due to some factors.
- Poor uploaded images may not provide exact results.

11. CONCLUSION:

Different approaches and models of Artificial Intelligence were explored and used in this project so that it can detect and classify plant diseases correctly through image processing of leaves of the plants. The procedure starts from collecting the images used for training, testing and validation to image preprocessing and augmentation and finally comparison of different pretrained models over their accuracy. Finally, at the end , our model detects and distinguishes between a healthy plant and different diseases and provides suitable remedies so as to cure the disease.This paper proposed and developed a system which uses plant leaf images to detect different types of disease in tomato crops, and also provides appropriate fertilizer suggestions. The following points are observed during model testing and training:

- The accuracy of classification increased by increasing the number of epochs.
- For different batch sizes, different classification accuracies are obtained.
- The accuracies are increased by increasing more convolution layers.
- The accuracy of classification also increased by varying dense layers.
- Different accuracies are obtained by varying the size of kernel used in the convolution layer output.
- Accuracies are different while varying the size of the train and test datasets.

12.FUTURE SCOPE:

The vast potential of Indian agriculture remains unexplored, and we still have a long way to go in this field of study, as we need to make the device more compact, lightweight, and inexpensive to farmers. The technology will assist farmers by providing required advice on crops, their growth, and other basic information. It will also offer the location of the nearest store where farmers can purchase fertilizer and other materials. It would also assist farmers in selling their commodities to merchants by providing accurate information on market prices and merchant details. The device can also help farmers calculate crop MSP. The disease detection feature can also be improved by adding dedicated cameras to the device, which will improve the device's accuracy even further.An App could also be developed for the projectwhichcould make the work of the farmers easier. They could directly upload image on the app and it would tell the disease and the cure then and there. This would reduce the time and efforts. This project is limited to just one crop for now but in the future more crops and even flowersdataset can be added so that it is helpfulfor every agriculturalneed. Newer models can also be added and tried with time which may result in better accuracy

13. APPENDIX:

Source Code:

```
#Import necessary libraries
from flask import Flask, render_template, request

import numpy as np
import os

from tensorflow.keras.preprocessing.image import load_img
from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model

filepath =
'C:/Users/Pradeepa/AppData/Local/Programs/Python/Python38/Tomato_Leaf_Dis
ease_Prediction/fruitdata.h5'
model = load_model(filepath)
print(model)

print("Model Loaded Successfully")

def pred_tomato_dieas(plant):
```

```
  test_image = load_img(plant, target_size = (128, 128)) # load image
  print("@@ Got Image for prediction")

  test_image = img_to_array(test_image)/255 # convert image to np array and
normalize
  test_image = np.expand_dims(test_image, axis = 0) # change dimention 3D to 4D

  result = model.predict(test_image) # predict diseased palnt or not
  print('@@ Raw result = ', result)

  pred = np.argmax(result, axis=1)
  print(pred)
  if plant=="fruit":
    if pred==0:
        return "Apple__Black_rot", 'Apple__Black_rot.html'

    elif pred==1:
        return "Apple__healthy", 'Apple__healthy.html'

    elif pred==2:
        return "Corn_(maize)__healthy", 'Corn_(maize)__healthy.html'

    elif pred==3:
```

```
        return "Corn_(maize)__Northern_Leaf_Blight",
'Corn_(maize)__Northern_Leaf_Blight.html'

    elif pred==4:
        return "Peach__Bacterial_spot", 'Peach__Bacterial_spot.html'

    elif pred==5:
        return "Peach__healthy", 'Peach__healthy.html'
  elif plant=="Vegetable":
    if pred==0:
        return "Pepper,_bell__Bacterial_spot", 'Pepper,_bell__Bacterial_spot.html'

    elif pred==1:
        return "Pepper,_bell__healthy", 'Pepper,_bell__healthy.html'

    elif pred==2:
        return "Potato__Early_blight", 'Potato__Early_blight.html'

    elif pred==3:
        return "Potato__healthy", 'Potato__healthy.html'

    elif pred==4:
```

```
        return "Potato__Late_blight", 'Potato__Late_blight.html'

    elif pred==5:
        return "Tomato__Bacterial_spot", 'Tomato__Bacterial_spot.html'

    elif pred==6:
        return "Tomato__Late_blight" , 'Tomato__Late_blight.html'

    elif pred==7:
        return "Tomato__Leaf_Mold" , 'Tomato__Leaf_Mold.html'

    elif pred==8:
        return "Tomato__Septoria_leaf_spot" , 'Tomato__Septoria_leaf_spot.html'




# Create flask instance
app = Flask(__name__)

# render index.html page
```

```
@app.route("/", methods=['GET', 'POST'])
def home():
        return render_template('index.html')



# get input image from client then predict class and render respective .html page
for solution
@app.route("/predict", methods = ['GET','POST'])
def predict():
    if request.method == 'POST':
        file = request.files['image'] # fet input
        filename = file.filename
        print("@@ Input posted = ", filename)


        file_path =
os.path.join('C:/Users/pradeepa/AppData/Local/Programs/Python/Python38/Tomat
o_Leaf_Disease_Prediction/static/upload/', filename)
        file.save(file_path)


        print("@@ Predicting class.....")
        pred, output_page = pred_tomato_dieas(tomato_plant=file_path)
```

```
        return render_template(output_page, pred_output = pred, user_image =
file_path)


# For local system & cloud
if __name__ == "__main__":
    app.run(threaded=False,port=8080)
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-40037-1660621567

PROJECT DEMO LINK:
LINK:

https://drive.google.com/file/d/11_O6eATc715Vwyys_fgSoJIlx0Gx8vvu/view?usp=sharing