PROJECT BASED EXPERIENTIAL LEARNING PROGRAM (NALAIYA THIRAN)

FERTILIZER RECOMMENDATION FOR DISEASE PREDICTION

Submitted by

GIRIHARAN R (111719106042)

GURUPRASAD A K (111719106046)

HARESH R (111719106048)

HARIPRASATH P (111719106050)

Team Id: PNT2022TMID16002

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R.M.K. ENGINEERING COLLEGE

(An Autonomous Institution)

R.S.M. Nagar, Kavaraipettai-601206

ANNA UNIVERSITY: CHENNAI 600 025

NOVEMBER 2022

TABLE OF CONTENTS

1. **INTRODUCTION**
   1.1 Project Overview
   1.2 Purpose
2. **LITERATURE SURVEY**
   2.1 Existing problem
   2.2 References
   2.3 Problem Statement Definition
3. **IDEATION & PROPOSED SOLUTION**
   3.1 Empathy Map Canvas
   3.2 Ideation & Brainstorming
   3.3 Proposed Solution
   3.4 Problem Solution fit
4. **REQUIREMENT ANALYSIS**
   4.1 Functional requirement
   4.2 Non-Functional requirements
5. **PROJECT DESIGN**
   5.1 Data Flow Diagrams
   5.2 Solution & Technical Architecture
   5.3 User Stories
6. **PROJECT PLANNING & SCHEDULING**
   6.1 Sprint Planning & Estimation
   6.2 Sprint Delivery Schedule
   6.3 Reports from JIRA
7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**
   7.1 Feature 1
   7.2 Feature 2
   7.3 Database Schema (if Applicable)
8. **TESTING**
   8.1 Test Cases
   8.2 User Acceptance Testing
9. **RESULTS**
   9.1 Performance Metrics

10.ADVANTAGES & DISADVANTAGES

11.CONCLUSION

12.FUTURE SCOPE

13.APPENDIX

Source Code

GitHub & Project Demo Link

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Fertilizer Recommendation system for disease Prediction is asimple ML and DL based website which recommends the best crop to grow, fertilizers to use and the diseases caught by your crops. PROBLEM STATEMENT In India, the agriculture industry is extremely vital and crucial for economic and social development and jobs. In India, the agricultural sectorprovides a living for almost 48% of the population. As per the 2019-2020 economic survey, an Indian farmer's median wage in 16 states is Rupees 2500. Most of the Indian population depends on agriculture for their livelihood.
Agriculture gives an opportunity of employment to the village people to develop a country like India on large scale and give a push in the economic sector. The majority of farmers face the problem of planting an inappropriate crop for their land based on a conventional or non-scientific approach. This is achallenging task for a country like India, where agriculture feeds approximately42% of the population. And the outcomes for the farmer of choosing the wrongcrop for land is moving towards metro city for livelihoods, suicide, quitting the agriculture and give land on lease to industrialist or use for the non-agriculture purpose. The outcome of wrong crop selection is less yield and less profit

Modern Technology is enhancing and optimizing the performance of the Artificial Intelligences (AI) Model based crop yield disease prediction system and is helpful forfarmers to prevent the crop from various disease that can identify the disease within a
process of capturing the Image at the plant and Machine Learning Algorithm will give affected Disease Name. In this Project Milestone will be given the Best Solution for thefarmer using the completely friendly and simple user interface using a web application to fetch the solution by own.

In addition to this, the process we planned is to add a valid module which is fertilizer recommendation for a specific disease. It can give both artificial fertilizer and natural fertilizer in suggestion.

1.2 PURPOSE

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. LITERATURE SURVEY

Sr.no	Name of researcher, Year of Publication	Paper title	Methodology Adopted / Modules Used	Observations Noted
1	Prof. Rakesh Shirsath, 2017	Agriculture decision support system using data mining	1.Subscription based system 2. ANN 3. Android application 4. Personalized content	1. Android app with a login module 2. Previously planted crops known to system 3. User feedback mechanism
2	Ji-chun Zhao, Jian-xin Guo, 2018	Big Data Analysis Technology	1.Inference engine	

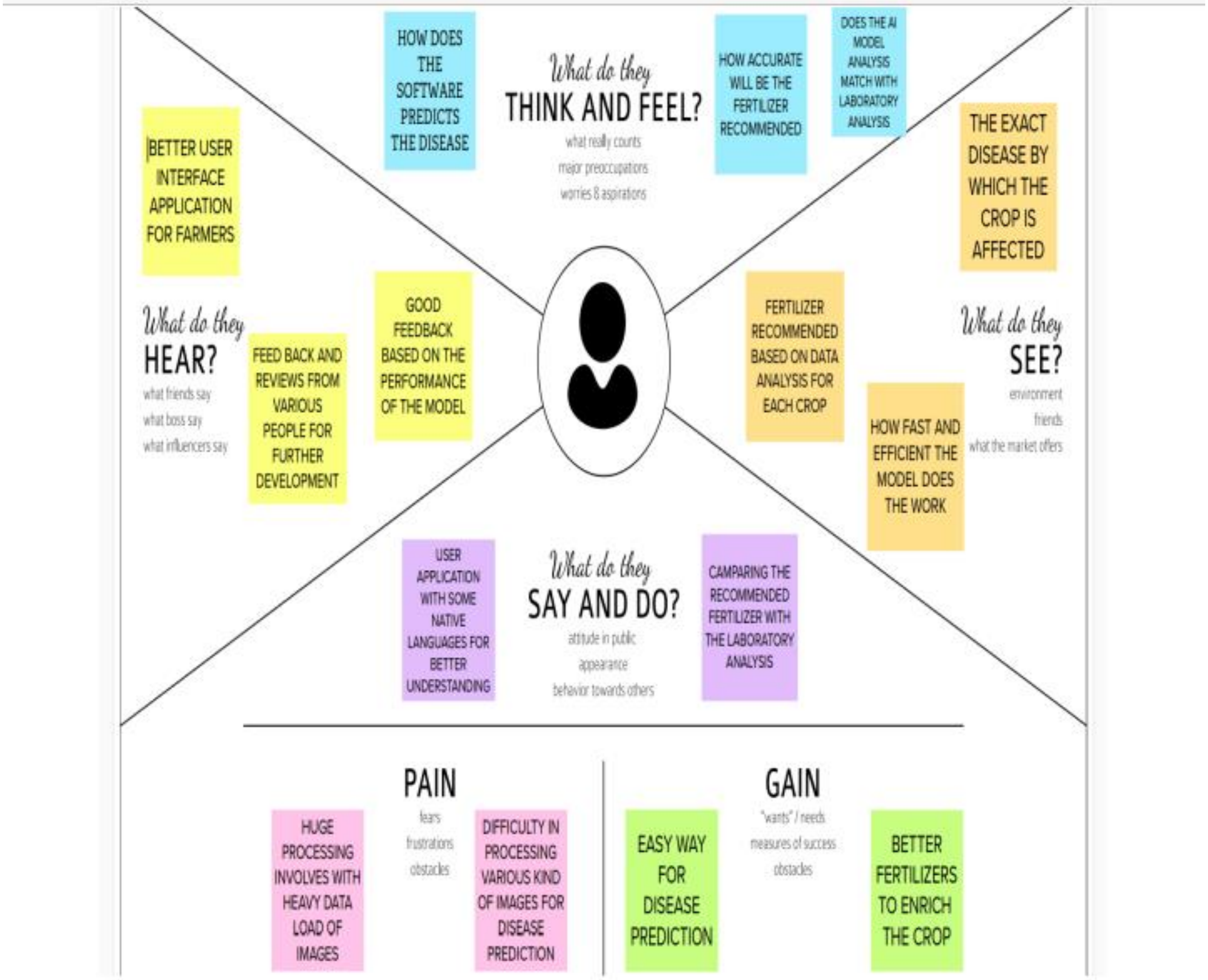
		Application in Agricultural Intelligence Decision System	2.Domain expertise 3.Knowledge engineering 4.Knowledge acquisition module 5.Knowledge base for recommendation system	4. Maintenance of crop.
3	Miftahul Jannat Mokarrama, 2017	RSF: A Recommendation System for Farmers	1.Location Detection 2.Data analysis and storage 3.Similar location detection 4. Recommendation generation module.	1. Large database of crops 2. Processed using Hadoop 3. Professional knowledge 4. Past experiences 5. Feature selection using HDFS 6. Future Scope: Using Hadoop with Artificial Neural Networks.
4	S.Pudumalar, E.Ramanujam, 2016	Crop Recommendation System for Precision Agriculture	1. Random tree 2. CHAID 3. KNN 4. Naïve Bayes 5. WEKA tool	1. Physiographic, thermal, crop growing period, crop production rate 2. Seasonal crop database
5	Yogesh Gandge, Sandhya, 2017	A Study on Various Data Mining Techniques for Crop Yield Prediction	1. Attribute selection	2. Similar location detection

			2. Multiple Linear Regression 3. Decision Tree using ID3 4. SVM 5. Neural Networks 6. C4.5	3. Generating the set of crops 4. Similarity between the crops planted in a region 1. Pre-processing of data 2. Handling missing and out-of-range values 3. Feature extraction 4. Ensemble model to get higher accuracy 5. Rule generation 1. Selection of agricultural field 2. Selection of crop previously planted 3. Input from user 4. Preprocess 5. Attribute Selection

3. IDEATION & PROPOSED SOLUTION

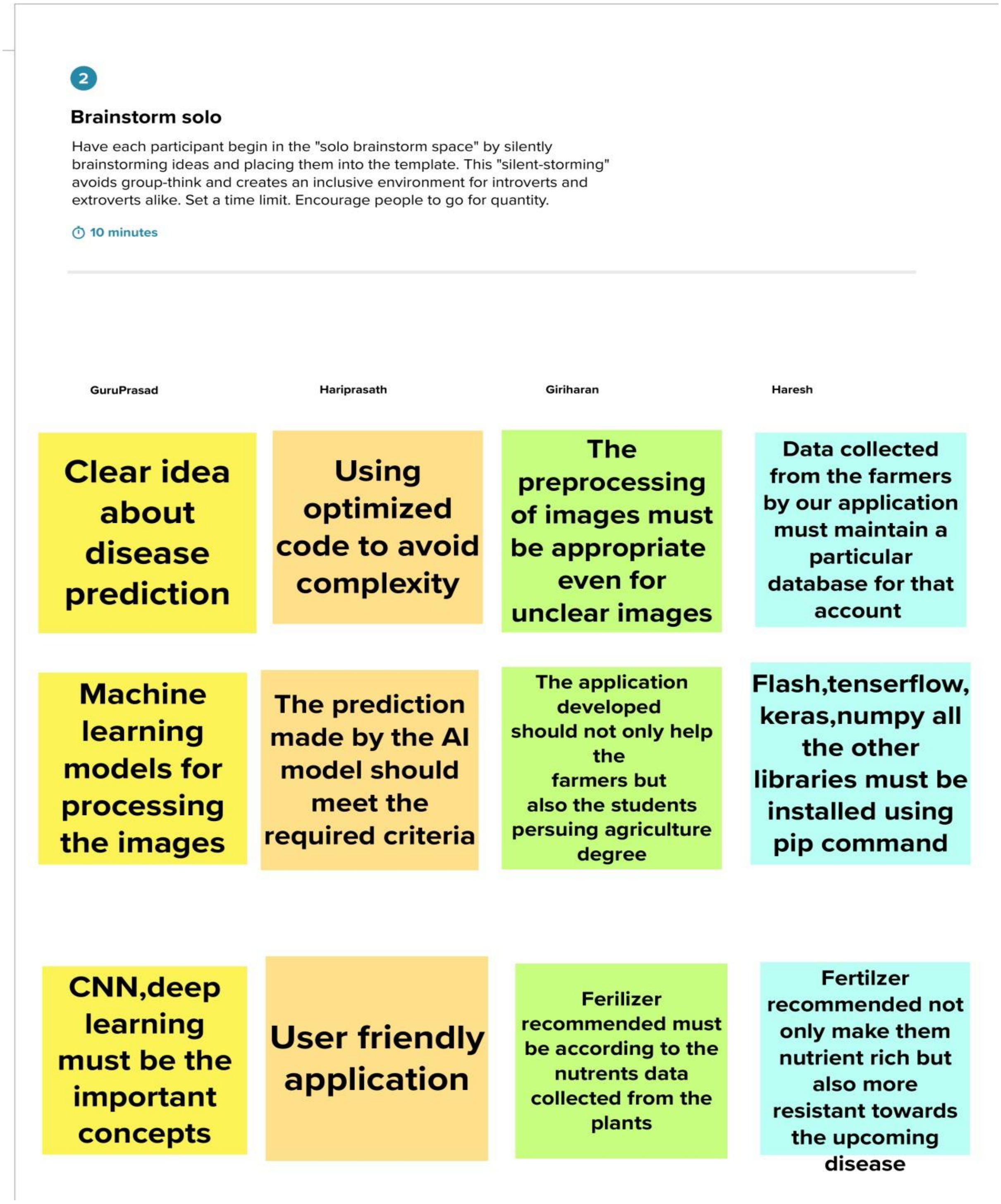
3.1 EMPATHY MAP

An empathy map is used to gain deeper insights on the customer'sinteraction with the system. It gives an idea on what the user feels and experiences while using the system, what fears the user has respective tothe system, etc. It also specifies how supportive the system environment is and what the users are likely to hear from the people around them regarding the usage of the system


What do they THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
HOW DOES THE SOFTWARE PREDICTS THE DISEASE
HOW ACCURATE WILL BE THE FERTILIZER RECOMMENDED
DOES THE AI MODEL ANALYSIS MATCH WITH LABORATORY ANALYSIS
BETTER USER INTERFACE APPLICATION FOR FARMERS
THE EXACT DISEASE BY WHICH THE CROP IS AFFECTED
What do they HEAR?
what friends say
what boss say
what influencers say
FEED BACK AND REVIEWS FROM VARIOUS PEOPLE FOR FURTHER DEVELOPMENT
GOOD FEEDBACK BASED ON THE PERFORMANCE OF THE MODEL
FERTILIZER RECOMMENDED BASED ON DATA ANALYSIS FOR EACH CROP
HOW FAST AND EFFICIENT THE MODEL DOES THE WORK
What do they SEE?
environment
friends
what the market offers
USER APPLICATION WITH SOME NATIVE LANGUAGES FOR BETTER UNDERSTANDING
What do they SAY AND DO?
attitude in public
appearance
behavior towards others
CAMPARING THE RECOMMENDED FERTILIZER WITH THE LABORATORY ANALYSIS
PAIN
fears
frustrations
obstacles
HUGE PROCESSING INVOLVES WITH HEAVY DATA LOAD OF IMAGES
DIFFICULTY IN PROCESSING VARIOUS KIND OF IMAGES FOR DISEASE PREDICTION
GAIN
"wants" / needs
measures of success
obstacles
EASY WAY FOR DISEASE PREDICTION
BETTER FERTILIZERS TO ENRICH THE CROP

3.2 IDEATION AND BRAIN STORMING

Ideation and Brainstorming are performed to generate ideas and solutions.Brainstorming is a group activity unlike ideation.



2

Brainstorm solo

Have each participant begin in the "solo brainstorm space" by silently brainstorming ideas and placing them into the template. This "silent-storming" avoids group-think and creates an inclusive environment for introverts and extroverts alike. Set a time limit. Encourage people to go for quantity.

10 minutes

GuruPrasad

Clear idea about disease prediction

Machine learning models for processing the images

CNN,deep learning must be the important concepts

Hariprasath

Using optimized code to avoid complexity

The prediction made by the AI model should meet the required criteria

User friendly application

Giriharan

The preprocessing of images must be appropriate even for unclear images

The application developed should not only help the farmers but also the students persuing agriculture degree

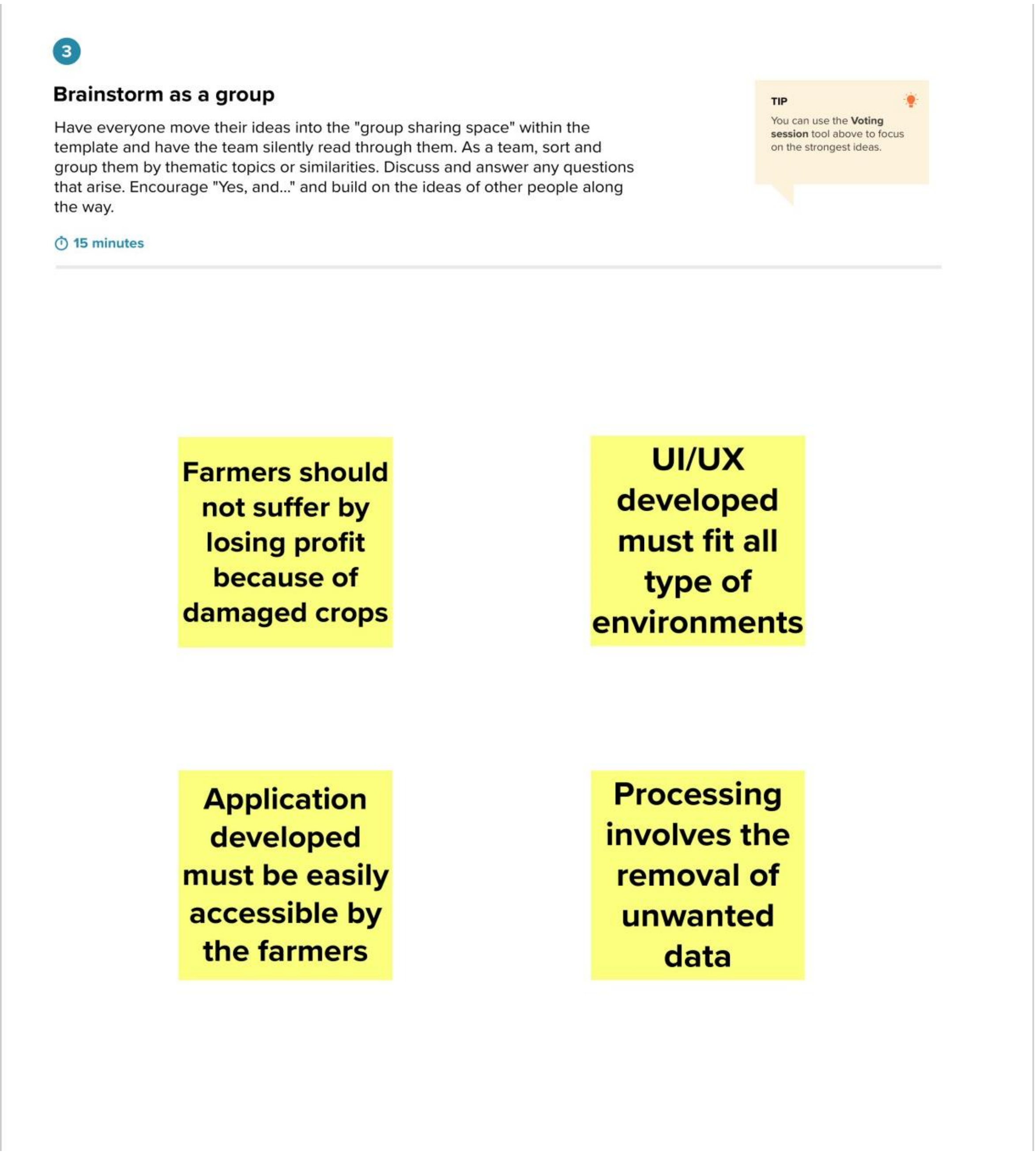
Ferilizer recommended must be according to the nutrents data collected from the plants

Haresh

Data collected from the farmers by our application must maintain a particular database for that account

Flash,tenserflow, keras,numpy all the other libraries must be installed using pip command

Fertilzer recommended not only make them nutrient rich but also more resistant towards the upcoming disease



3

Brainstorm as a group

Have everyone move their ideas into the "group sharing space" within the template and have the team silently read through them. As a team, sort and group them by thematic topics or similarities. Discuss and answer any questions that arise. Encourage "Yes, and..." and build on the ideas of other people along the way.

15 minutes

TIP

You can use the **Voting session** tool above to focus on the strongest ideas.

Farmers should not suffer by losing profit because of damaged crops

UI/UX developed must fit all type of environments

Application developed must be easily accessible by the farmers

Processing involves the removal of unwanted data

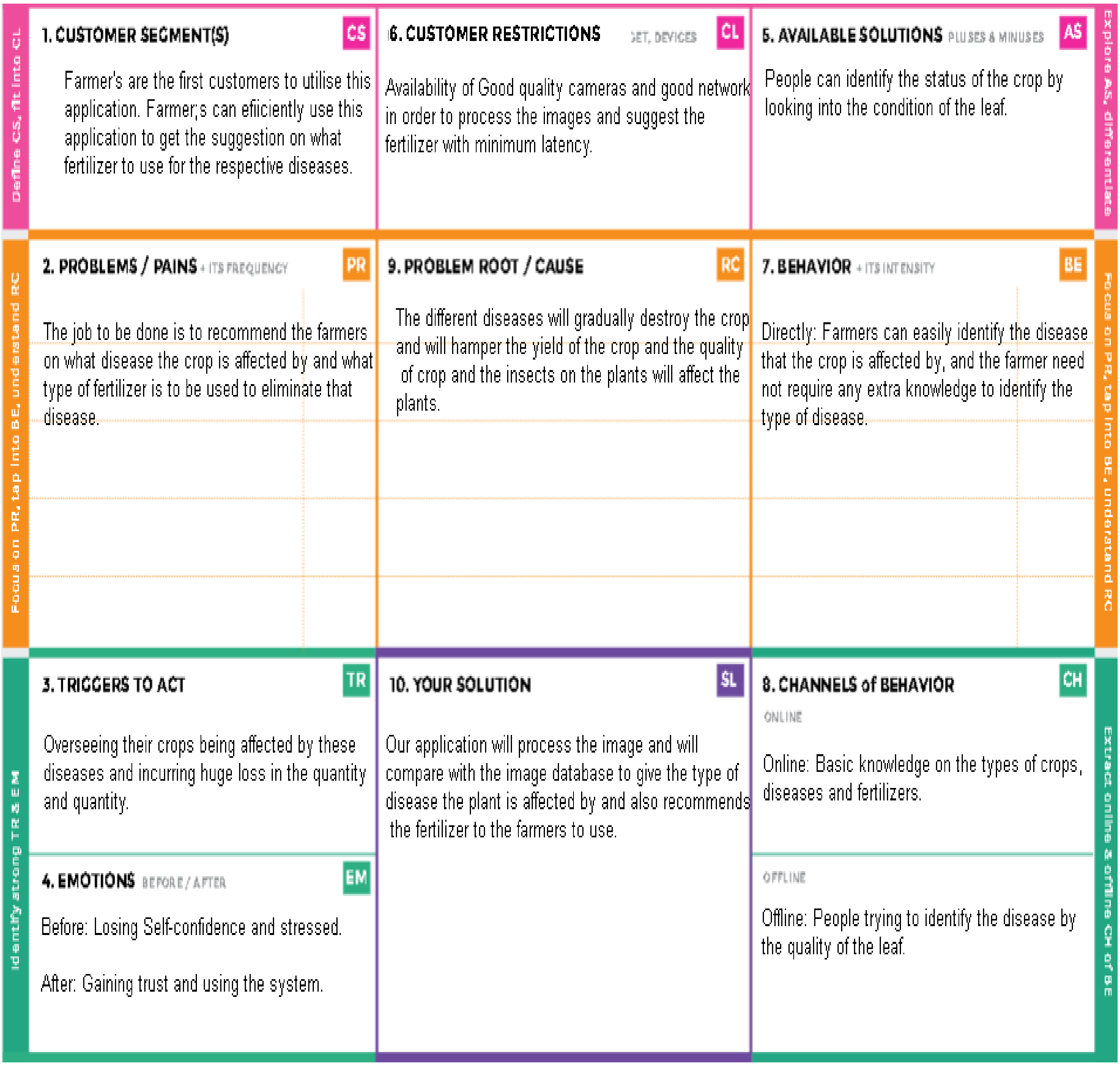
3.3 PROPOSED SOLUTION

The solution to the problem is Machine learning utilizing CNN, which is one of the applications of Artificial Intelligence, is being used to implement the proposed system. Crop recommendation is going to recommend you the best crop you can grow in your land as per the soil nutrition value and along with as per the climate in that region. And recommending the best fertilizer for every particular crop is also a challenging task.

One of the most important issues is when a plant gets caught by heterogeneous diseases that effect on less amount of agriculture production and compromises with quality as well. To overcome all these issues this recommendation has been proposed.

Nowadays a lot of research and work is being implemented in the smart and modern agriculture domain. Crop recommendation is characterized by a soil

3.4 PROBLEM SOLUTION FIT



Define CS, fit into CL

1. CUSTOMER SEGMENT(S) CS

Farmer's are the first customers to utilise this application. Farmer;s can efiiciently use this application to get the suggestion on what fertilizer to use for the respective diseases.

6. CUSTOMER RESTRICTIONS JET, DEVICES CL

Availability of Good quality cameras and good network in order to process the images and suggest the fertilizer with minimum latency.

5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS

People can identify the status of the crop by looking into the condition of the leaf.

Explore AS, differentiate

Focus on PR, tap into BE, understand RC

2. PROBLEMS / PAINS + ITS FREQUENCY PR

The job to be done is to recommend the farmers on what disease the crop is affected by and what type of fertilizer is to be used to eliminate that disease.

9. PROBLEM ROOT / CAUSE RC

The different diseases will gradually destroy the crop and will hamper the yield of the crop and the quality of crop and the insects on the plants will affect the plants.

7. BEHAVIOR + ITS INTENSITY BE

Directly: Farmers can easily identify the disease that the crop is affected by, and the farmer need not require any extra knowledge to identify the type of disease.

Focus on PR, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TO ACT TR

Overseeing their crops being affected by these diseases and incurring huge loss in the quantity and quantity.

4. EMOTIONS BEFORE / AFTER EM

Before: Losing Self-confidence and stressed.

After: Gaining trust and using the system.

10. YOUR SOLUTION SL

Our application will process the image and will compare with the image database to give the type of disease the plant is affected by and also recommends the fertilizer to the farmers to use.

8. CHANNELS of BEHAVIOR CH

ONLINE

Online: Basic knowledge on the types of crops, diseases and fertilizers.

OFFLINE

Offline: People trying to identify the disease by the quality of the leaf.

Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form
FR-2	User Confirmation	Confirmation via Email
FR-3	User Profile	Filling the profile page after logging in
FR-4	Uploading Dataset (Leaf)	Images of the leaves are to be uploaded
FR-5	Requesting solution	Uploaded images is compared with the pre-defined Model and solution is generated
FR-6	Downloading Solution	The Solution in pdf format which contains the recommendations of fertilizers and the possible diseases.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Description	The system allows the user to perform the tasks easily and efficiently and effectively.
NFR-2	Security	Assuring all data inside the system or its part will be protected against malware attacks or unauthorized access.

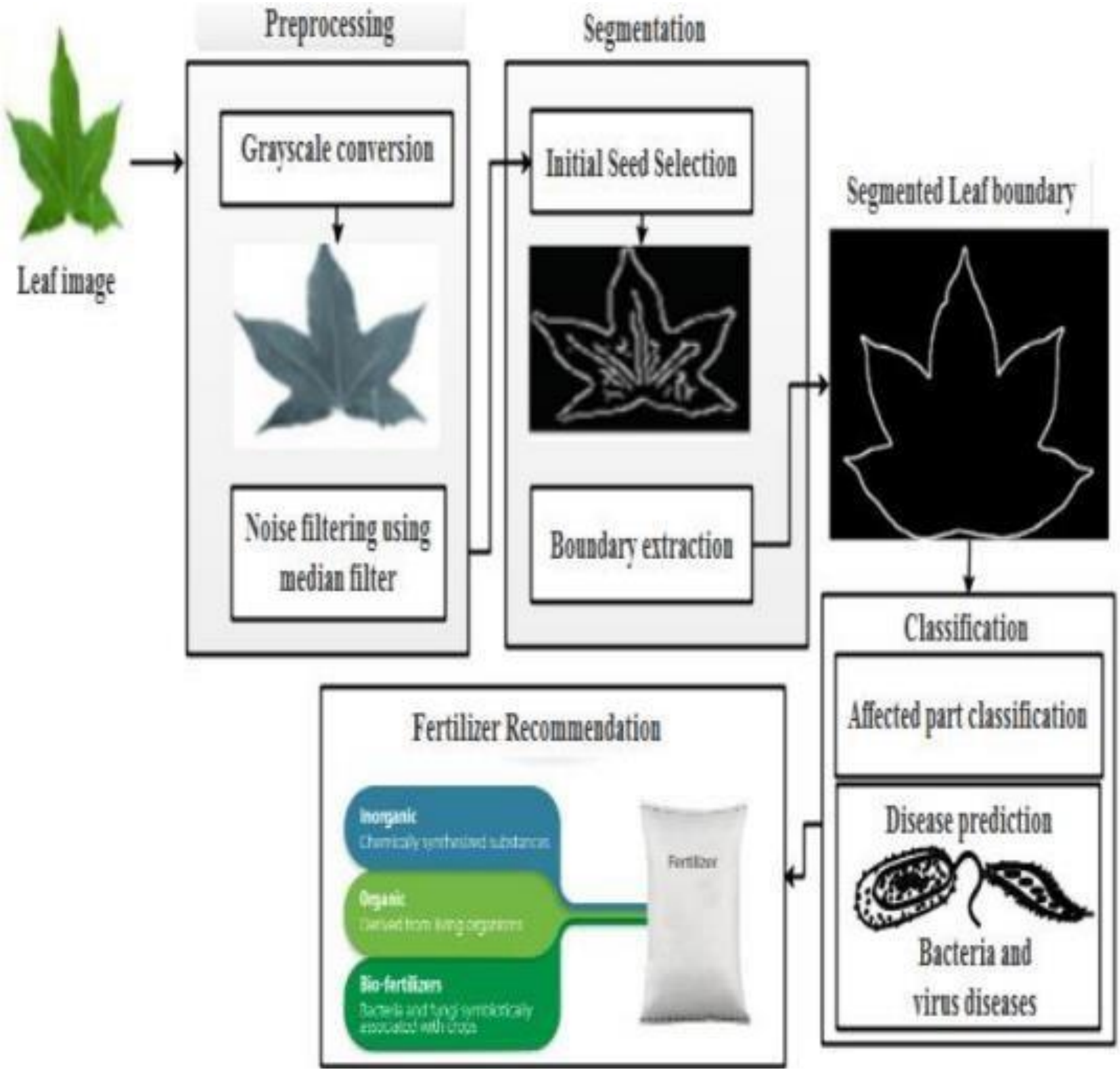
5. PROJECT DESIGN

5.1 DATAFLOW DIAGRAM

A data flow diagram or DFD(s) maps out the flow of information for any process or system. DFDs help you better understand process or system operation to discover potential problems, improve efficiency, and develop better processes.

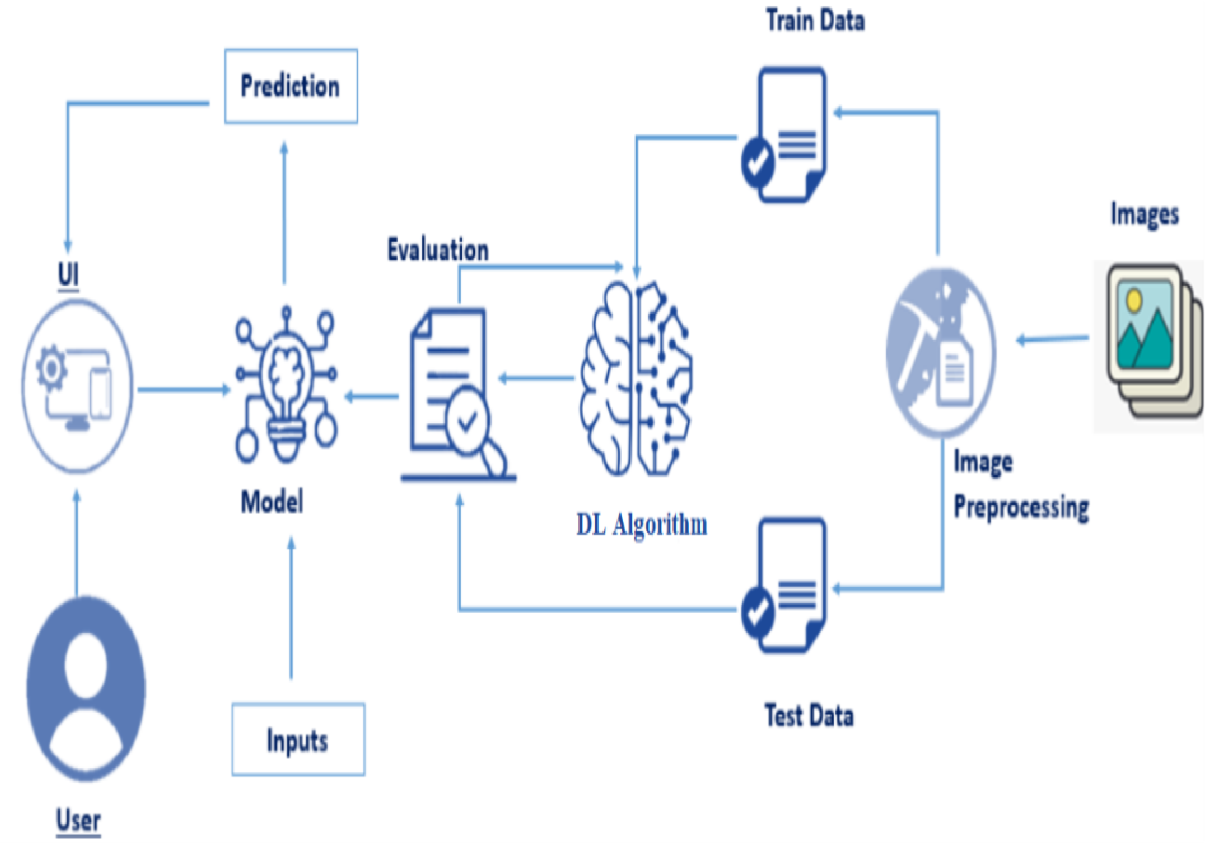
5. SOLUTION ARCHITECTURE

Solution architecture is the process of developing solutions based on predefined processes, guidelines and best practices with the objective that the developed solution fits within the enterprise architecture in terms of information architecture, system portfolios,integration requirements, etc


Leaf image
Preprocessing
Grayscale conversion
Noise filtering using median filter
Segmentation
Initial Seed Selection
Boundary extraction
Segmented Leaf boundary
Classification
Affected part classification
Disease prediction
Bacteria and virus diseases
Fertilizer Recommendation
Inorganic
Chemically synthesized substances
Organic
Derived from living organisms
Bio-fertilizers
Bacteria and fungi symbiotically associated with crops
Fertilizer

5.2 TECHNICAL ARCHITECTURE

Technical architecture involves the development of a technical blueprint regarding the arrangement, interaction, and interdependence ofall elements so that system-relevant requirements are met.



5.3 USER STORIES

Our project was given out to several customers for experimentation and testing. They had given us satisfactory and valuable feedback in great detail on its range of use, accuracy, simplicity in handling, etc. It was tested and analysed on exhaustive number of leaf types and was proved to be effective in achieving what it was developed for – to predict the disease way before it becomes severe. The data garnered indicating various characteristics of the studied specimen using image processing and related techniques had helped them to develop a clear picture of its transformation when diseased.

It had a well-developed interface, although, complicated in its operation on the inside, very simple on the outside. Translation of all its comprehensive measurements to a inclusive output is highly needed and it surely does fulfil it.

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer(Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
Trader	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Farmer	Signing up	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	rJIRA-2
Customer (Web user)	Registration	USN-4	As a web user, I can register for the application through Gmail	I can register for the application through gmail	Medium	Sprint-1
Administrator	Login	USN-5	As a administrator, I can log into the	I can log into the	High	Sprint-3

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			application by entering email & password	application using mail & password		

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint1

In this module we have done the dataset collection for vegetable and fruit disease prediction along with some image processing files in it

Sprint2

In this module we have developed the model for fruit and vegetable disease prediction with some CNN model and transfer learning and also we did the testing for both the models

Sprint3

In this module we have developed and designed our web application with front end as with HTML and backend with python scripts along with recommendation models trained with IBM

Sprint4

This is the final module for our project which contains the trained model for fruit and vegetable disease prediction

6.2 SPRINT DELIVERY SCHEDULE

The delivery plan of project deliverables is a strategic element for every project manager. The goal of every project is, in fact, to produce a result that serves a specific purpose. By the word“purpose “, we mean the most disparate goals: a software program, a chair, a building, a translation and the sort.

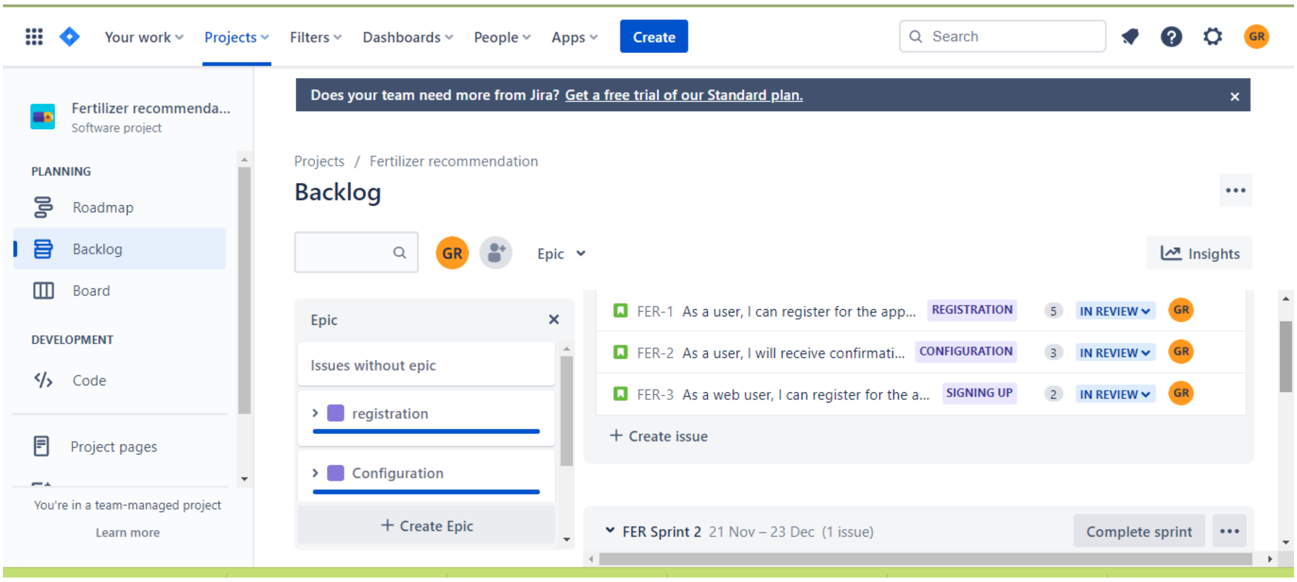
In Project Spirit Delivery, planning is one of the vital process of completing the project and show casing thetime line of the project planning. This delivery plan helps us to understand the process and work flow of the project being done by every team mate.

Every Single Module is assigned to the team mates to show case their work and contribution in developing the project.

6.3 REPORTS FROM JIRA

Backlog:

A backlog is a list of issues that’s related to the project and the functions of the system. It makes it simple to make, store, managea variety of problems including the ones the team is working on.



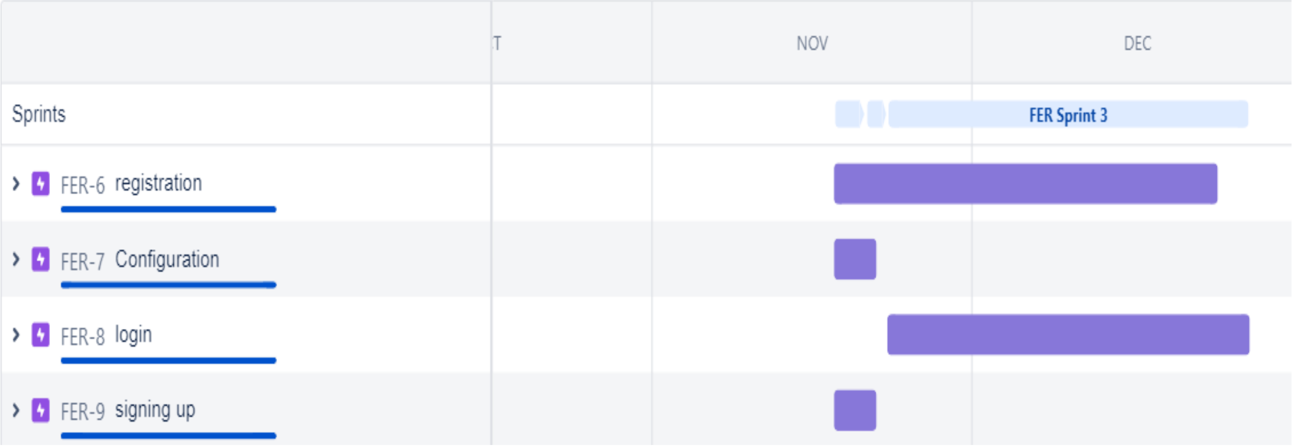
Does your team need more from Jira? Get a free trial of our Standard plan.

FER-1 As a user, I can register for the app... REGISTRATION 5 IN REVIEW GR

FER-2 As a user, I will receive confirmati... CONFIGURATION 3 IN REVIEW GR

FER-3 As a web user, I can register for the a... SIGNING UP 2 IN REVIEW GR

FER Sprint 2 21 Nov – 23 Dec (1 issue)



FER-6 registration

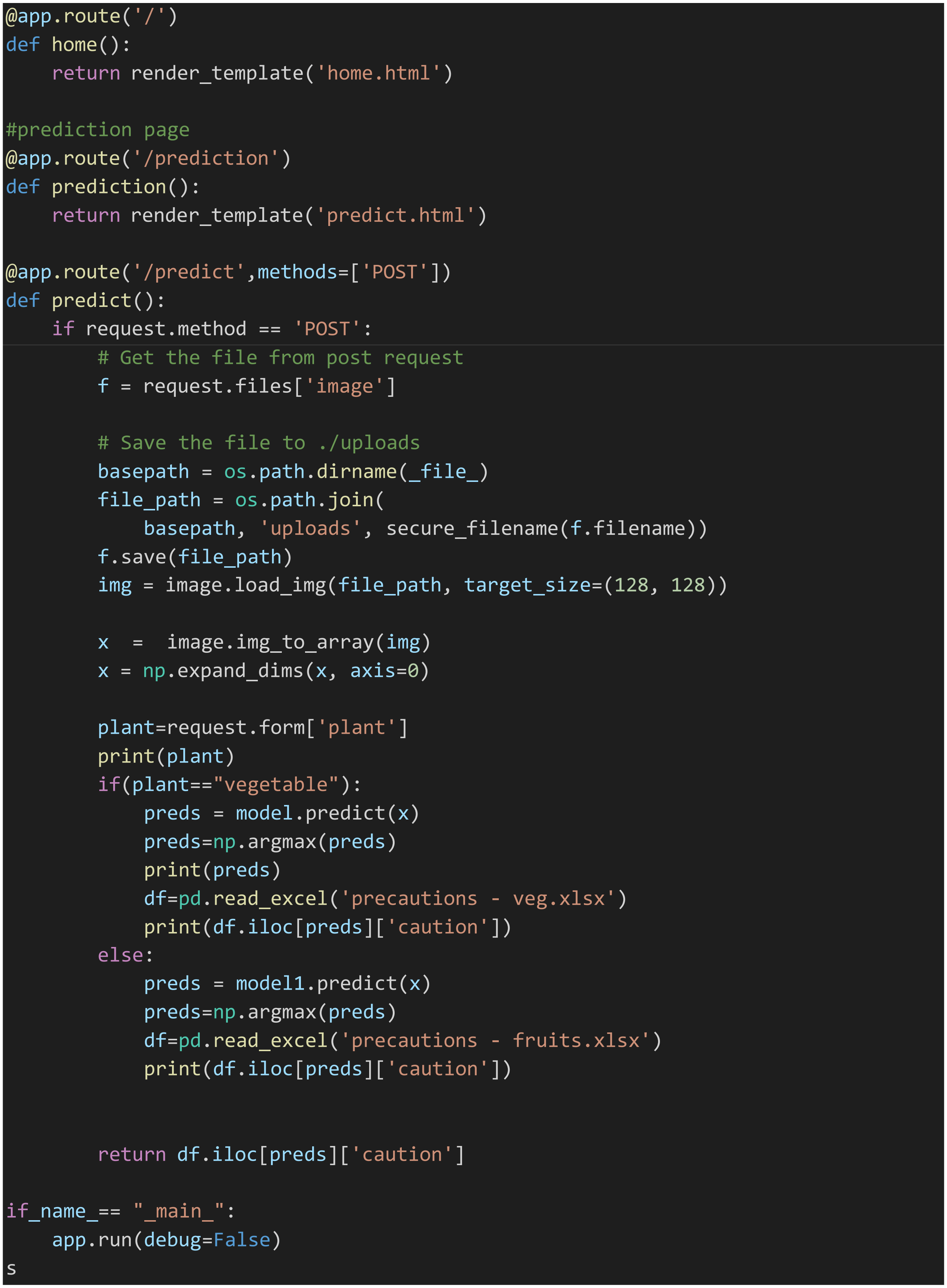
FER-7 Configuration

FER-8 login

FER-9 signing up

Python – app.py:

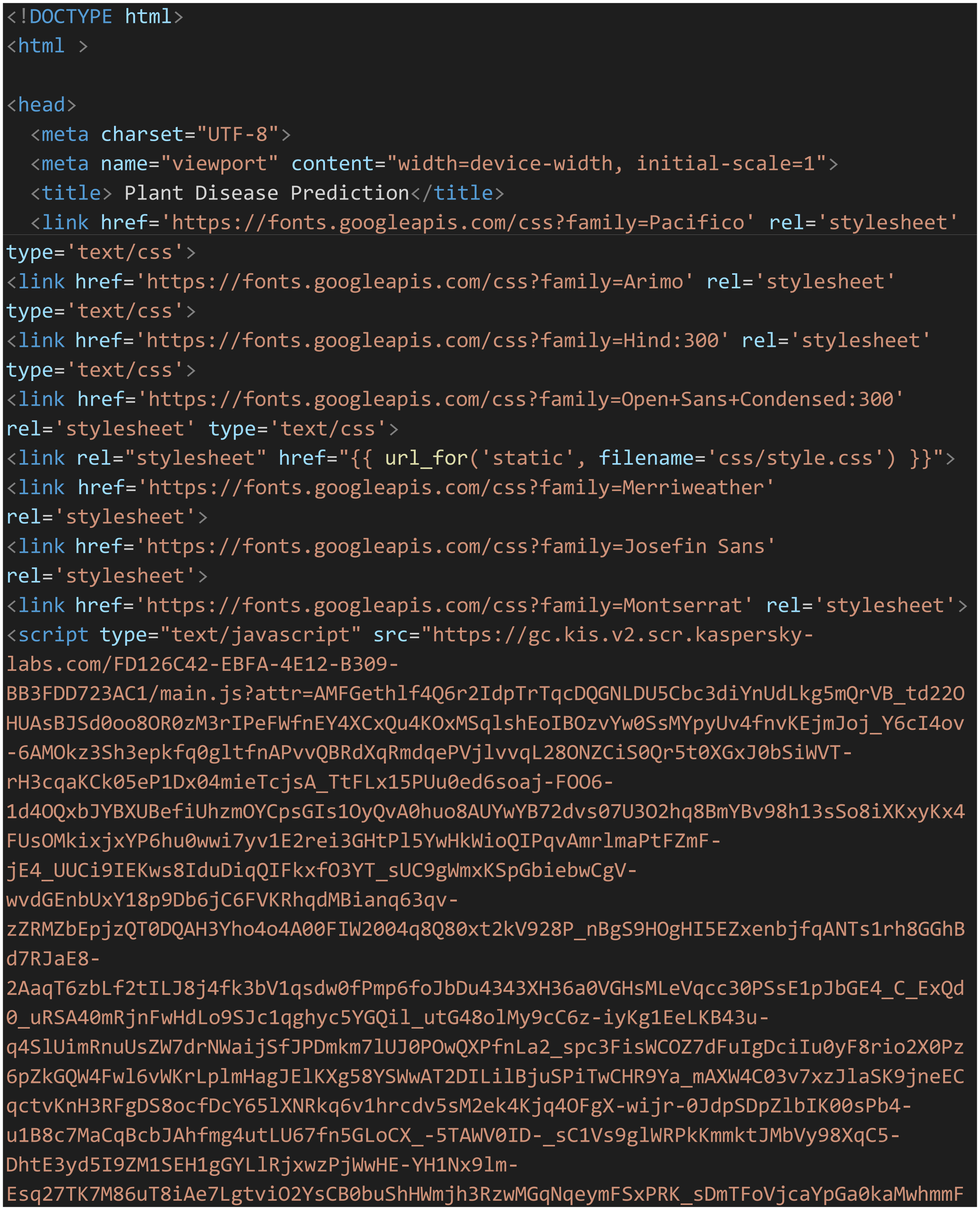
```
    import os


    import numpy as
np import pandas as
pd

    from tensorflow.keras.models import load_model

    # from tensorflow.keras.preprocessing import
imagefrom werkzeug.utils import secure_filename



    from flask import Flask, render_template,

requestapp = Flask(_name__)
```



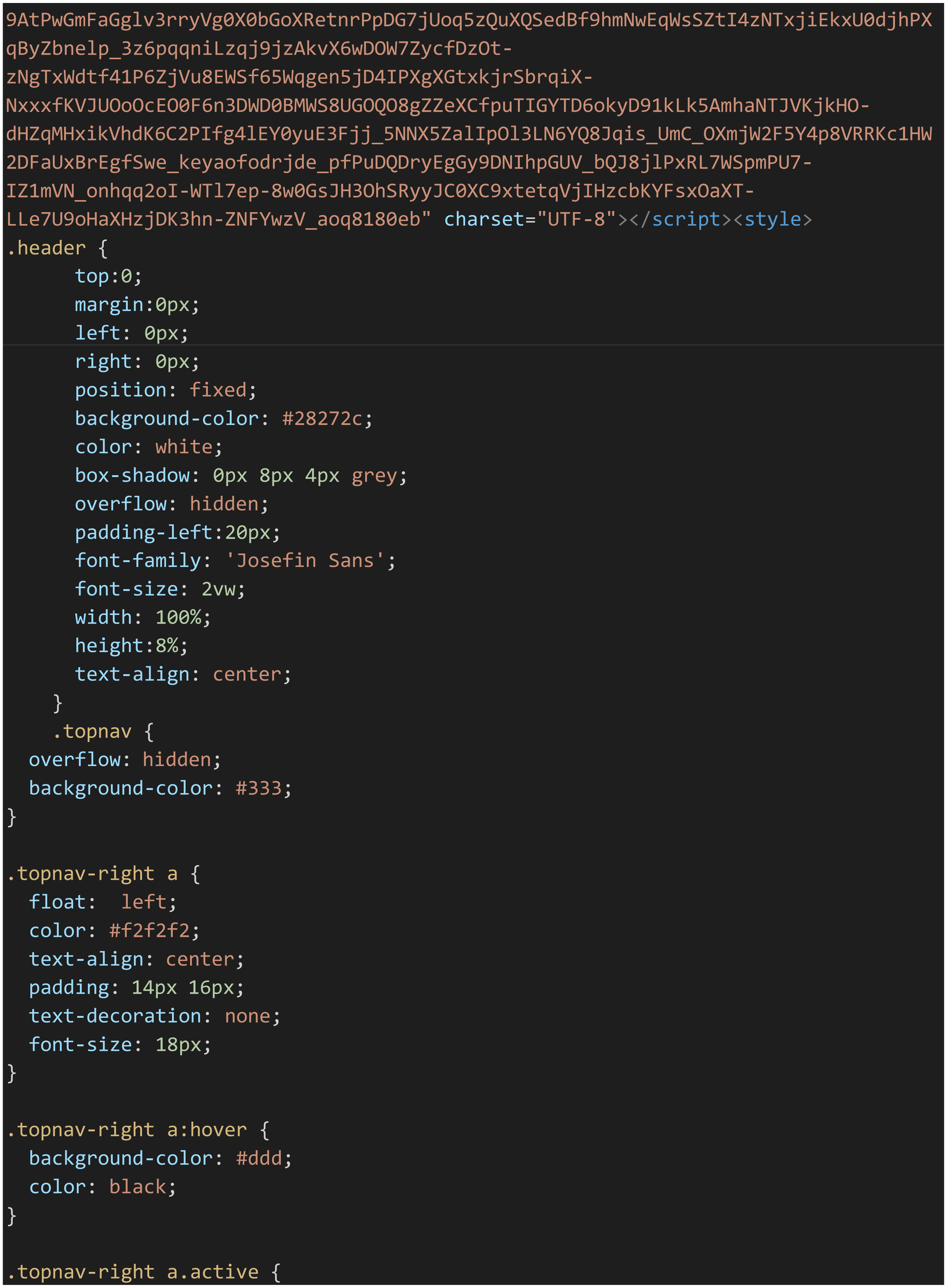
```
@app.route('/')
def home():
    return render_template('home.html')

#prediction page
@app.route('/prediction')
def prediction():
    return render_template('predict.html')

@app.route('/predict',methods=['POST'])
def predict():
    if request.method == 'POST':
        # Get the file from post request
        f = request.files['image']

        # Save the file to ./uploads
        basepath = os.path.dirname(_file_)
        file_path = os.path.join(
            basepath, 'uploads', secure_filename(f.filename))
        f.save(file_path)
        img = image.load_img(file_path, target_size=(128, 128))

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

        plant=request.form['plant']
        print(plant)
        if(plant=="vegetable"):
            preds = model.predict(x)
            preds=np.argmax(preds)
            print(preds)
            df=pd.read_excel('precautions - veg.xlsx')
            print(df.iloc[preds]['caution'])
        else:
            preds = model1.predict(x)
            preds=np.argmax(preds)
            df=pd.read_excel('precautions - fruits.xlsx')
            print(df.iloc[preds]['caution'])


        return df.iloc[preds]['caution']

if_name_== "_main_":
    app.run(debug=False)
s
```

Feature 1:

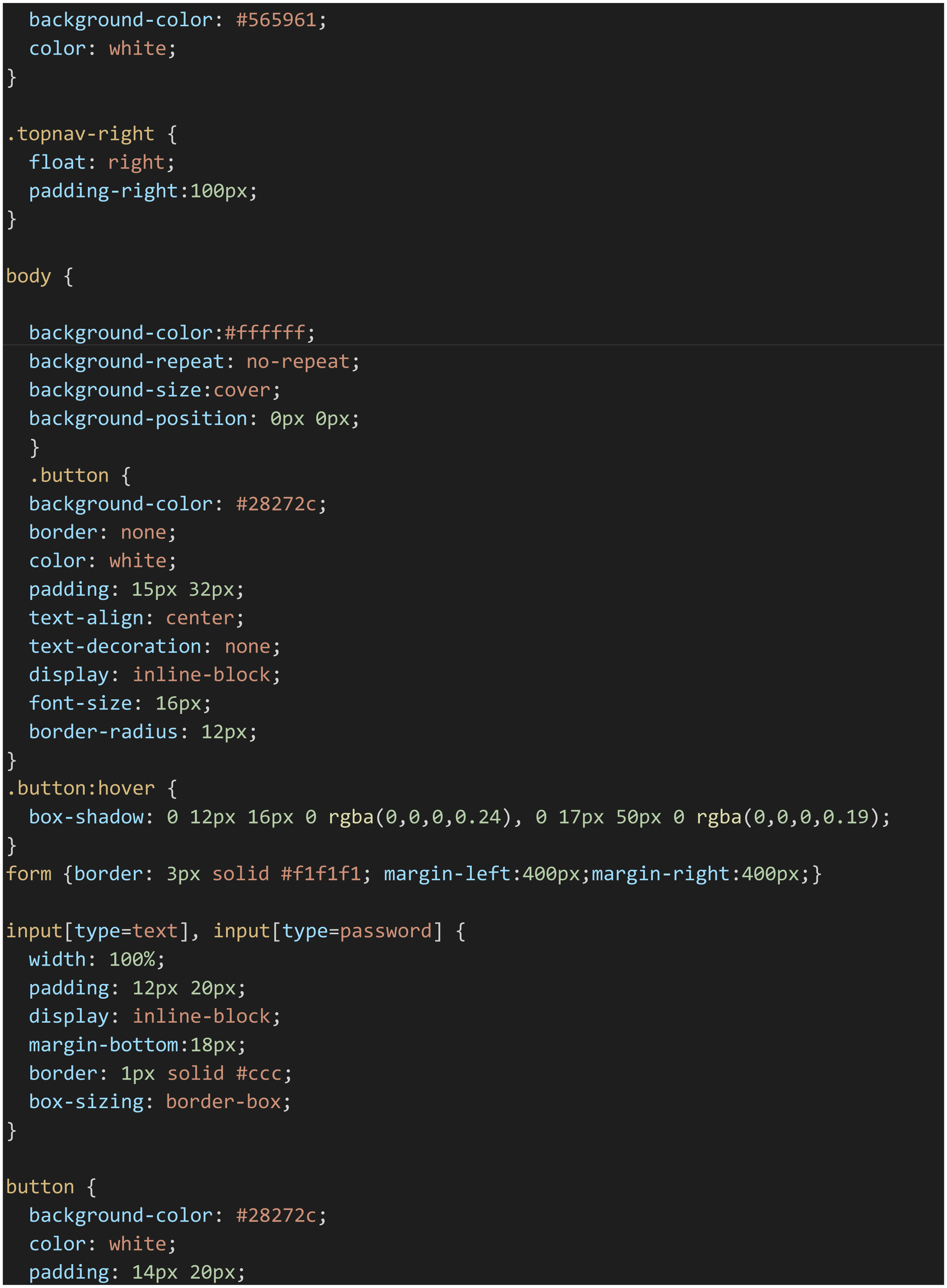
home.html:



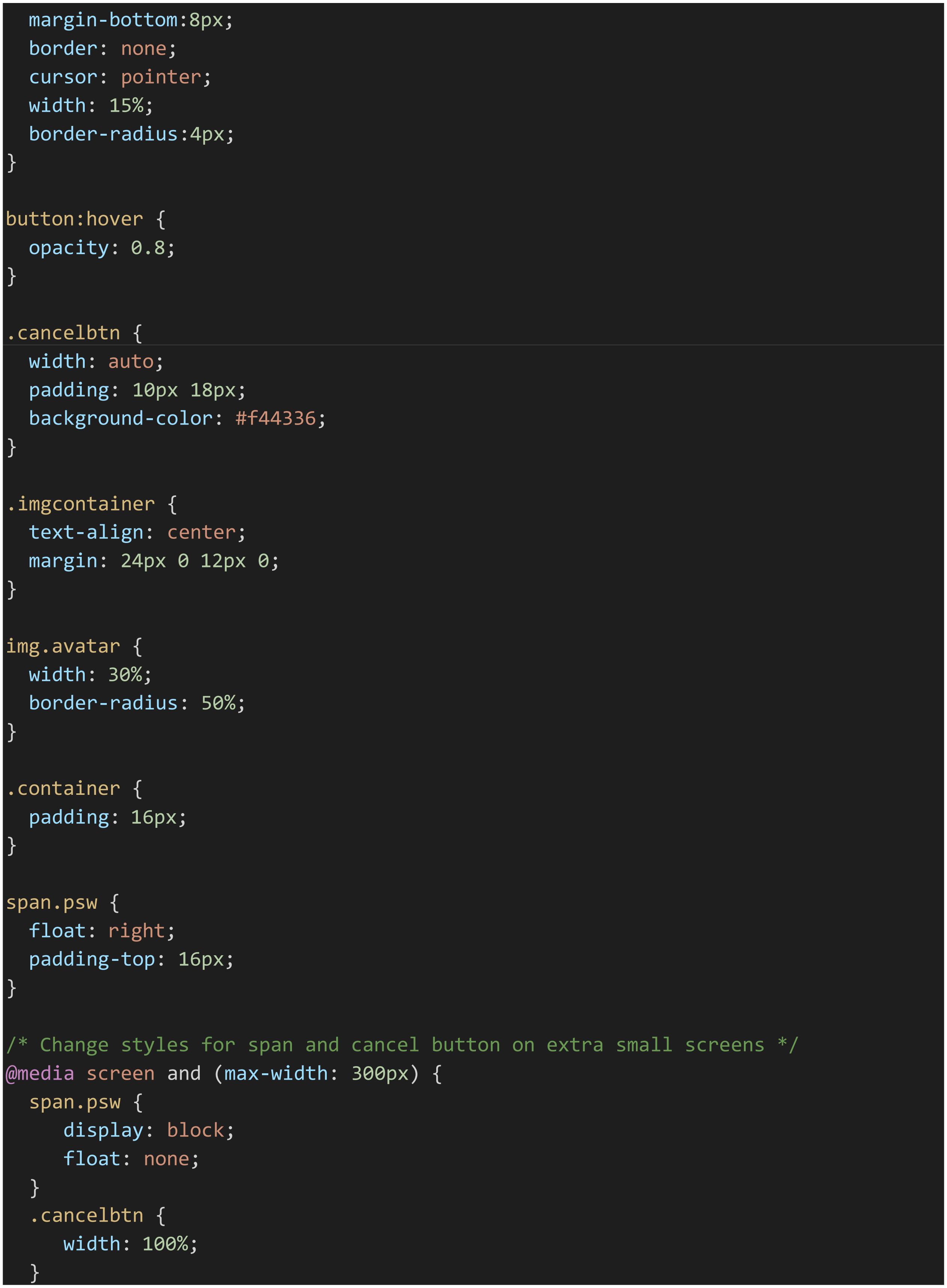
```
<!DOCTYPE html>
<html >

<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title> Plant Disease Prediction</title>
  <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300'
rel='stylesheet' type='text/css'>
<link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
<link href='https://fonts.googleapis.com/css?family=Merriweather'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Josefin Sans'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Montserrat' rel='stylesheet'>
<script type="text/javascript" src="https://gc.kis.v2.scr.kaspersky-
labs.com/FD126C42-EBFA-4E12-B309-
BB3FDD723AC1/main.js?attr=AMFGethlf4Q6r2IdpTrTqcDQGNLDU5Cbc3diYnUdLkg5mQrVB_td22O
HUAsBJSd0oo8OR0zM3rIPeFWfnEY4XCxQu4KOxMSqlshEoIBOzvYw0SsMYpyUv4fnvKEjmJoj_Y6cI4ov
-6AMOkz3Sh3epkfq0gltfnAPvvQBRdXqRmdqePVjlvvqL28ONZCiS0Qr5t0XGxJ0bSiWVT-
rH3cqaKCk05eP1Dx04mieTcjsA_TtFLx15PUu0ed6soaj-FOO6-
1d4OQxbJYBXUBefiUhzmOYCpsGIs1OyQvA0huo8AUYwYB72dvs07U3O2hq8BmYBv98h13sSo8iXKxyKx4
FUsOMkixjxYP6hu0wwi7yv1E2rei3GHtPl5YwHkWioQIPqvAmrlmaPtFZmF-
jE4_UUCi9IEKws8IduDiqQIFkxfO3YT_sUC9gWmxKSpGbiebwCgV-
wvdGEnbUxY18p9Db6jC6FVKRhqdMBianq63qv-
zZRMZbEpjzQT0DQAH3Yho4o4A00FIW2004q8Q80xt2kV928P_nBgS9HOgHI5EZxenbjfqANTs1rh8GGhB
d7RJaE8-
2AaqT6zbLf2tILJ8j4fk3bV1qsdw0fPmp6foJbDu4343XH36a0VGHsMLeVqcc30PSsE1pJbGE4_C_ExQd
0_uRSA40mRjnFwHdLo9SJc1qghyc5YGQil_utG48olMy9cC6z-iyKg1EeLKB43u-
q4SlUimRnuUsZW7drNWaijSfJPDmkm7lUJ0POwQXPfnLa2_spc3FisWCOZ7dFuIgDciIu0yF8rio2X0Pz
6pZkGQW4Fwl6vWKrLplmHagJElKXg58YSWwAT2DILilBjuSPiTwCHR9Ya_mAXW4C03v7xzJlaSK9jneEC
qctvKnH3RFgDS8ocfDcY65lXNRkq6v1hrcdv5sM2ek4Kjq4OFgX-wijr-0JdpSDpZlbIK00sPb4-
u1B8c7MaCqBcbJAhfmg4utLU67fn5GLoCX_-5TAWV0ID-_sC1Vs9glWRPkKmmktJMbVy98XqC5-
DhtE3yd5I9ZM1SEH1gGYLlRjxwzPjWwHE-YH1Nx9lm-
Esq27TK7M86uT8iAe7LgtviO2YsCB0buShHWmjh3RzwMGqNqeymFSxPRK_sDmTFoVjcaYpGa0kaMwhmmF
```



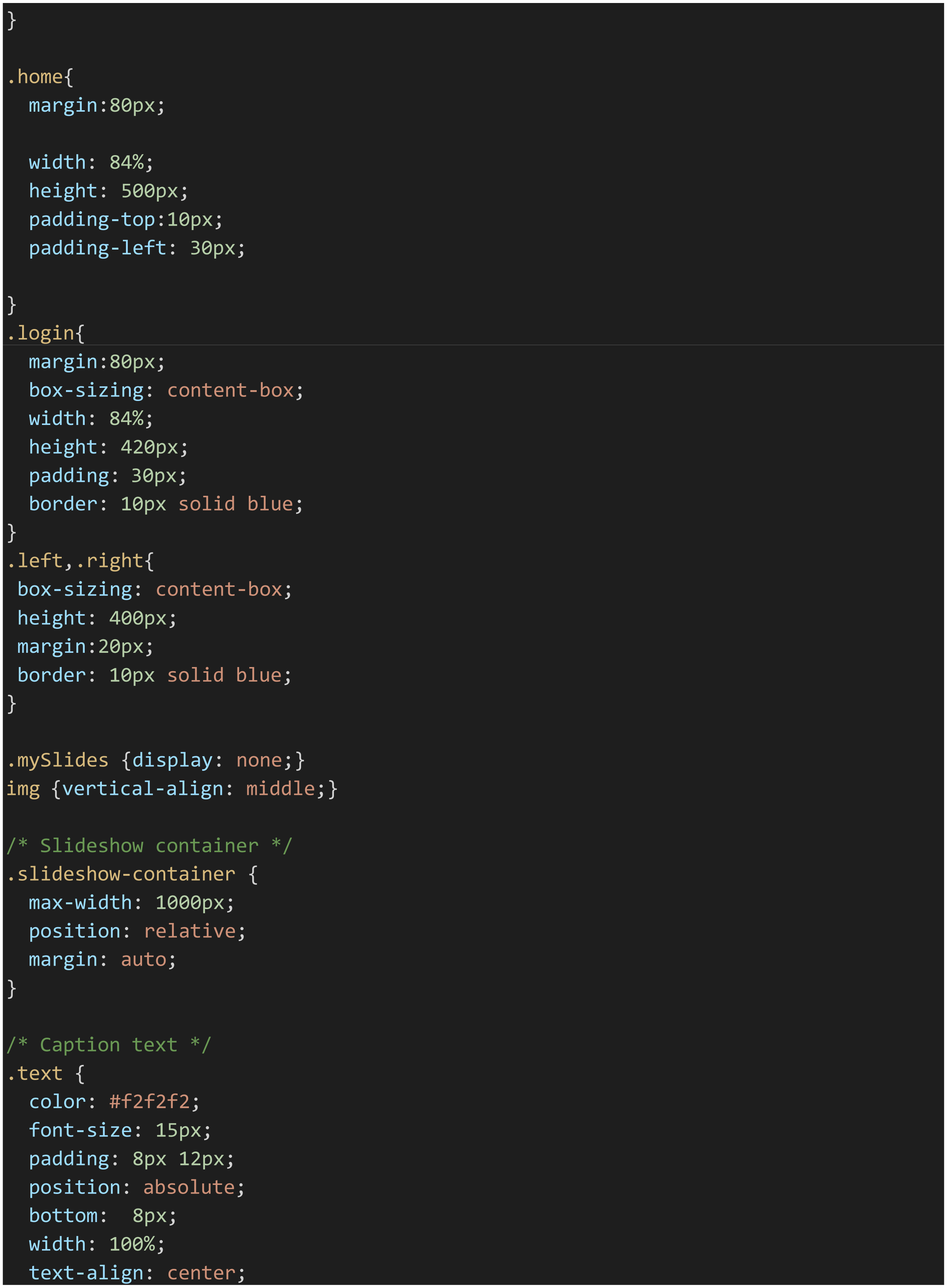
```
9AtPwGmFaGglv3rryVg0X0bGoXRetnrPpDG7jUoq5zQuXQSedBf9hmNwEqWsSZtI4zNTxjiEkxU0djhPX
qByZbnelp_3z6pqqniLzqj9jzAkvX6wDOW7ZycfDzOt-
zNgTxWdtf41P6ZjVu8EWSf65Wqgen5jD4IPXgXGtxkjrSbrqiX-
NxxxfKVJUOoOcEO0F6n3DWD0BMWS8UGOQO8gZZeXCfpuTIGYTD6okyD91kLk5AmhaNTJVKjkHO-
dHZqMHxikVhdK6C2PIfg4lEY0yuE3Fjj_5NNX5ZalIpOl3LN6YQ8Jqis_UmC_OXmjW2F5Y4p8VRRKc1HW
2DFaUxBrEgfSwe_keyaofodrjde_pfPuDQDryEgGy9DNIhpGUV_bQJ8jlPxRL7WSpmPU7-
IZ1mVN_onhqq2oI-WTl7ep-8w0GsJH3OhSRyyJC0XC9xtetqVjIHzcbKYFsxOaXT-
LLe7U9oHaXHzjDK3hn-ZNFYwzV_aoq8180eb" charset="UTF-8"></script><style>
.header {
      top:0;
      margin:0px;
      left: 0px;
      right: 0px;
      position: fixed;
      background-color: #28272c;
      color: white;
      box-shadow: 0px 8px 4px grey;
      overflow: hidden;
      padding-left:20px;
      font-family: 'Josefin Sans';
      font-size: 2vw;
      width: 100%;
      height:8%;
      text-align: center;
    }
    .topnav {
  overflow: hidden;
  background-color: #333;
}

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

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

.topnav-right a.active {
```



```css
  background-color: #565961;
  color: white;
}

.topnav-right {
  float: right;
  padding-right:100px;
}

body {

  background-color:#ffffff;
  background-repeat: no-repeat;
  background-size:cover;
  background-position: 0px 0px;
  }
  .button {
  background-color: #28272c;
  border: none;
  color: white;
  padding: 15px 32px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
  font-size: 16px;
  border-radius: 12px;
}
.button:hover {
  box-shadow: 0 12px 16px 0 rgba(0,0,0,0.24), 0 17px 50px 0 rgba(0,0,0,0.19);
}
form {border: 3px solid #f1f1f1; margin-left:400px;margin-right:400px;}

input[type=text], input[type=password] {
  width: 100%;
  padding: 12px 20px;
  display: inline-block;
  margin-bottom:18px;
  border: 1px solid #ccc;
  box-sizing: border-box;
}

button {
  background-color: #28272c;
  color: white;
  padding: 14px 20px;
```

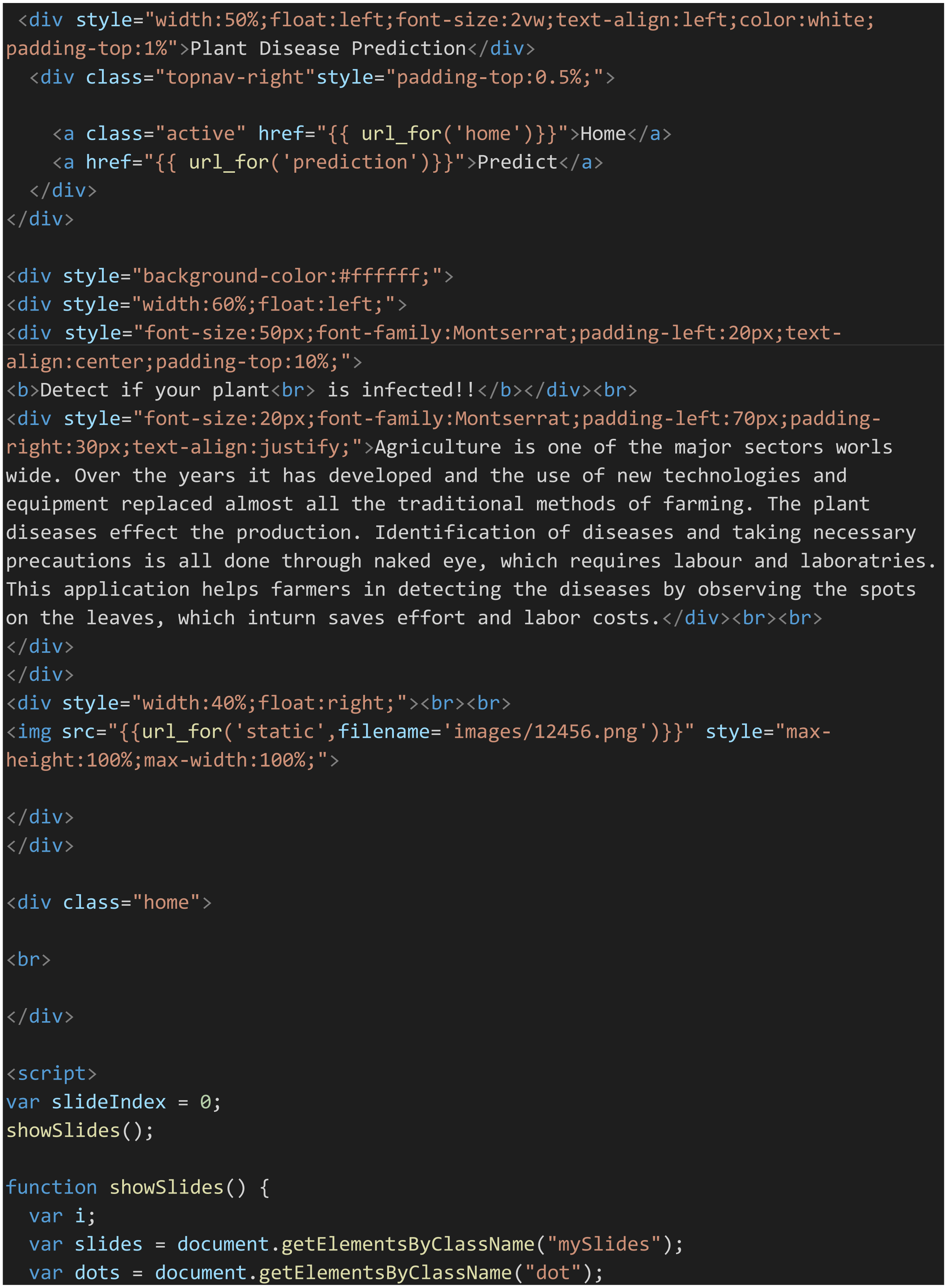


```
  margin-bottom:8px;
  border: none;
  cursor: pointer;
  width: 15%;
  border-radius:4px;
}

button:hover {
  opacity: 0.8;
}

.cancelbtn {
  width: auto;
  padding: 10px 18px;
  background-color: #f44336;
}

.imgcontainer {
  text-align: center;
  margin: 24px 0 12px 0;
}

img.avatar {
  width: 30%;
  border-radius: 50%;
}

.container {
  padding: 16px;
}

span.psw {
  float: right;
  padding-top: 16px;
}

/* Change styles for span and cancel button on extra small screens */
@media screen and (max-width: 300px) {
  span.psw {
     display: block;
     float: none;
  }
  .cancelbtn {
     width: 100%;
  }
```

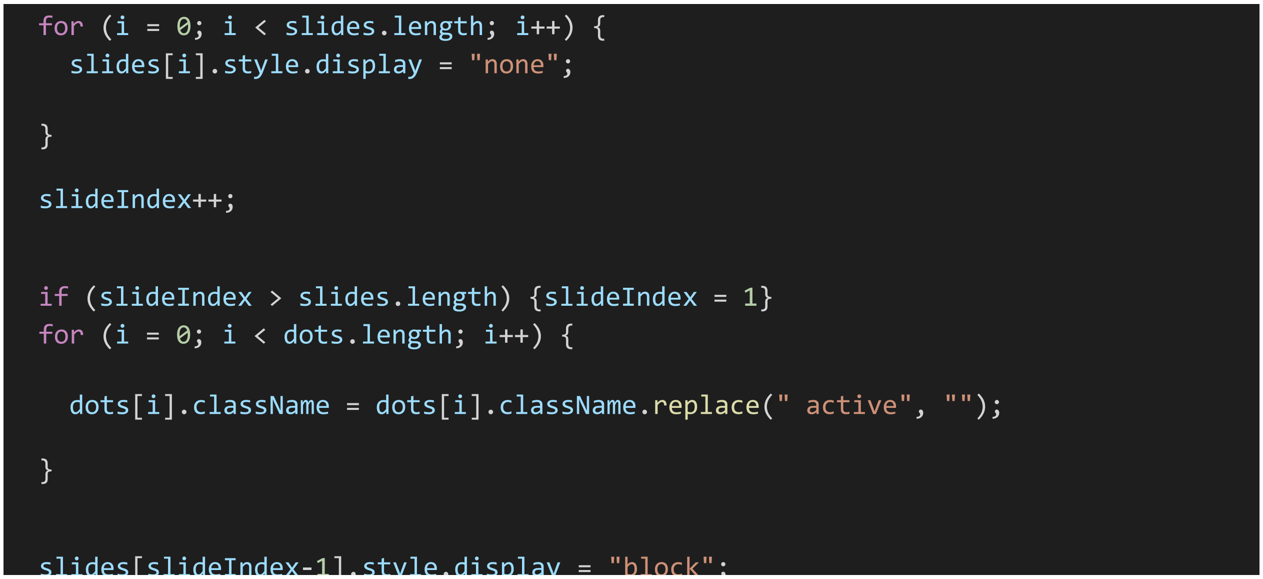


```
}

.home{
  margin:80px;

  width: 84%;
  height: 500px;
  padding-top:10px;
  padding-left: 30px;

}
.login{
  margin:80px;
  box-sizing: content-box;
  width: 84%;
  height: 420px;
  padding: 30px;
  border: 10px solid blue;
}
.left,.right{
 box-sizing: content-box;
 height: 400px;
 margin:20px;
 border: 10px solid blue;
}

.mySlides {display: none;}
img {vertical-align: middle;}

/* Slideshow container */
.slideshow-container {
  max-width: 1000px;
  position: relative;
  margin: auto;
}

/* Caption text */
.text {
  color: #f2f2f2;
  font-size: 15px;
  padding: 8px 12px;
  position: absolute;
  bottom:  8px;
  width: 100%;
  text-align: center;
```

```
}
/* The dots/bullets/indicators */
.dot {
  height: 15px;
  width: 15px;
  margin: 0 2px;
  background-color: #bbb;
  border-radius: 50%;
  display: inline-block;
  transition: background-color 0.6s ease;
}

.active {
  background-color: #717171;
}

/* Fading animation */
.fade {
  -webkit-animation-name: fade;
  -webkit-animation-duration: 1.5s;
  animation-name: fade;
  animation-duration: 1.5s;
}

@-webkit-keyframes fade {
  from {opacity: .4}
  to {opacity: 1}
}

@keyframes fade {
  from {opacity: .4}
  to {opacity: 1}
}

/* On smaller screens, decrease text size */
@media only screen and (max-width: 300px) {
  .text {font-size: 11px}
}
</style>
</head>

<body style="font-family:'Times New Roman', Times, serif;background-
color:#C2C5A8;">

<div class="header">
```



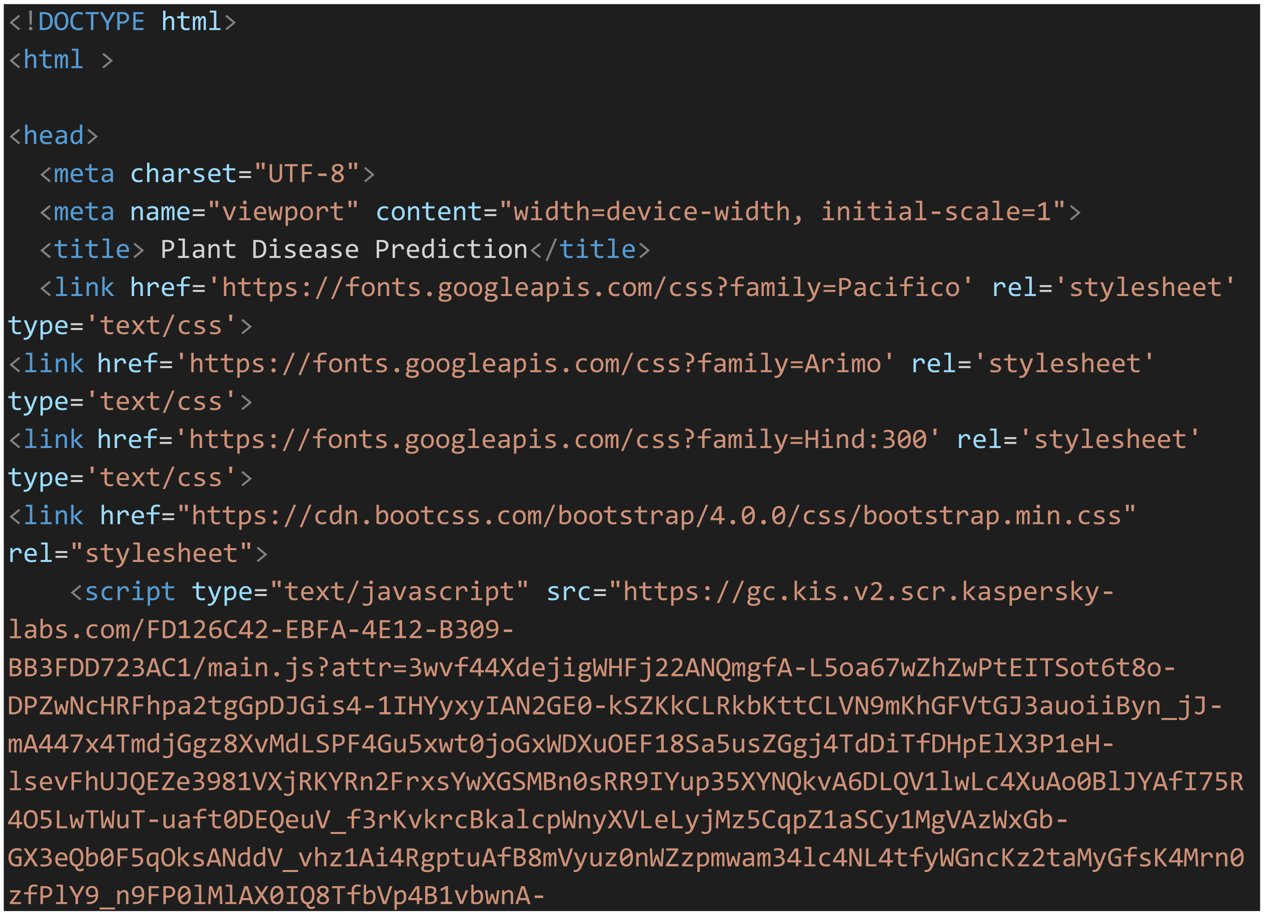
```
 <div style="width:50%;float:left;font-size:2vw;text-align:left;color:white;
padding-top:1%">Plant Disease Prediction</div>
  <div class="topnav-right"style="padding-top:0.5%;">

    <a class="active" href="{{ url_for('home')}}">Home</a>
    <a href="{{ url_for('prediction')}}">Predict</a>
  </div>
</div>

<div style="background-color:#ffffff;">
<div style="width:60%;float:left;">
<div style="font-size:50px;font-family:Montserrat;padding-left:20px;text-
align:center;padding-top:10%;">
<b>Detect if your plant<br> is infected!!</b></div><br>
<div style="font-size:20px;font-family:Montserrat;padding-left:70px;padding-
right:30px;text-align:justify;">Agriculture is one of the major sectors worls
wide. Over the years it has developed and the use of new technologies and
equipment replaced almost all the traditional methods of farming. The plant
diseases effect the production. Identification of diseases and taking necessary
precautions is all done through naked eye, which requires labour and laboratries.
This application helps farmers in detecting the diseases by observing the spots
on the leaves, which inturn saves effort and labor costs.</div><br><br>
</div>
</div>
<div style="width:40%;float:right;"><br><br>
<img src="{{url_for('static',filename='images/12456.png')}}" style="max-
height:100%;max-width:100%;">

</div>
</div>

<div class="home">

<br>

</div>

<script>
var slideIndex = 0;
showSlides();

function showSlides() {
  var i;
  var slides = document.getElementsByClassName("mySlides");
  var dots = document.getElementsByClassName("dot");
```



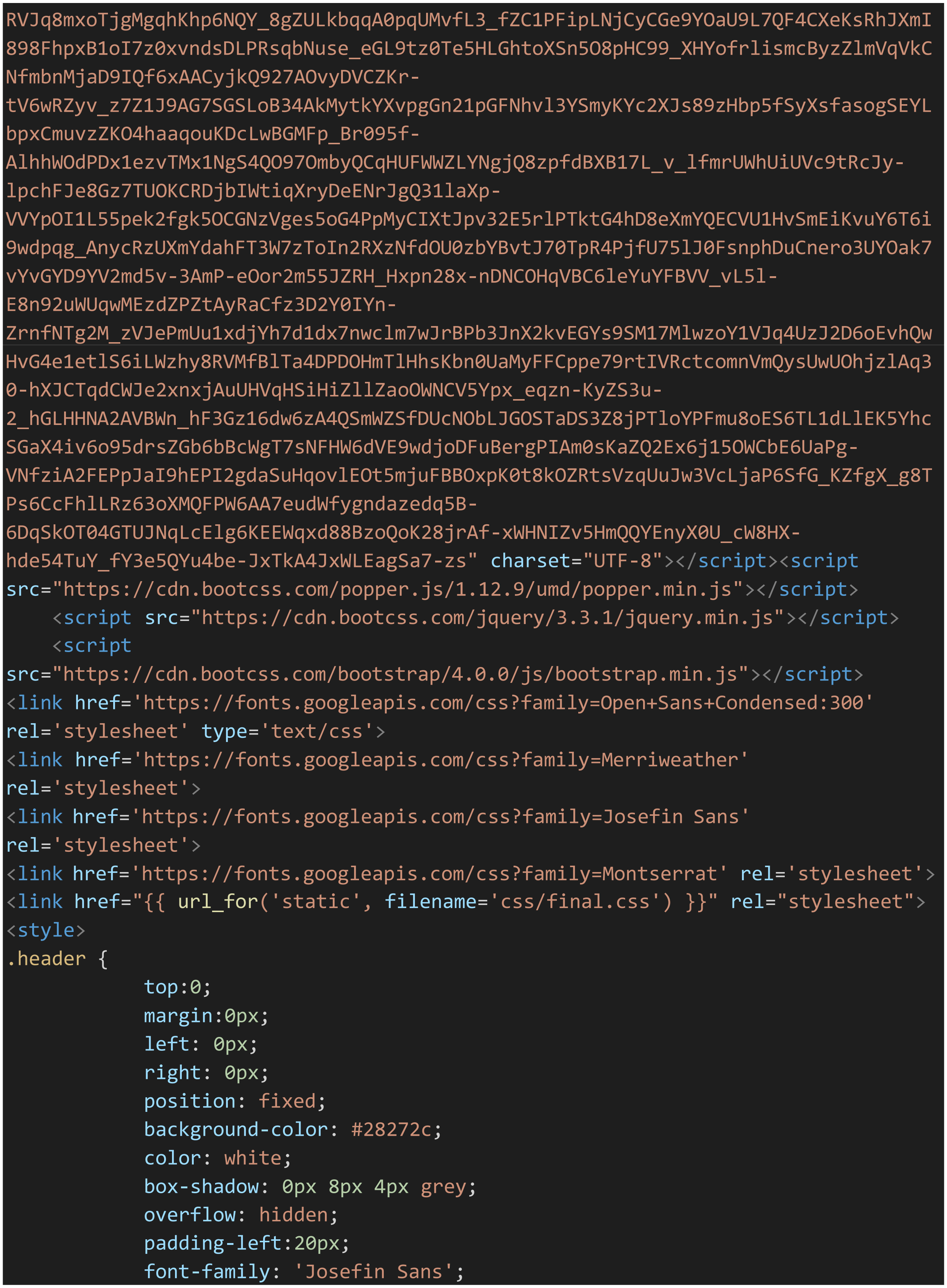
```
  for (i = 0; i < slides.length; i++) {
    slides[i].style.display = "none";

  }

  slideIndex++;


  if (slideIndex > slides.length) {slideIndex = 1}
  for (i = 0; i < dots.length; i++) {

    dots[i].className = dots[i].className.replace(" active", "");

  }


  slides[slideIndex-1].style.display = "block";
```

Feature 2 :

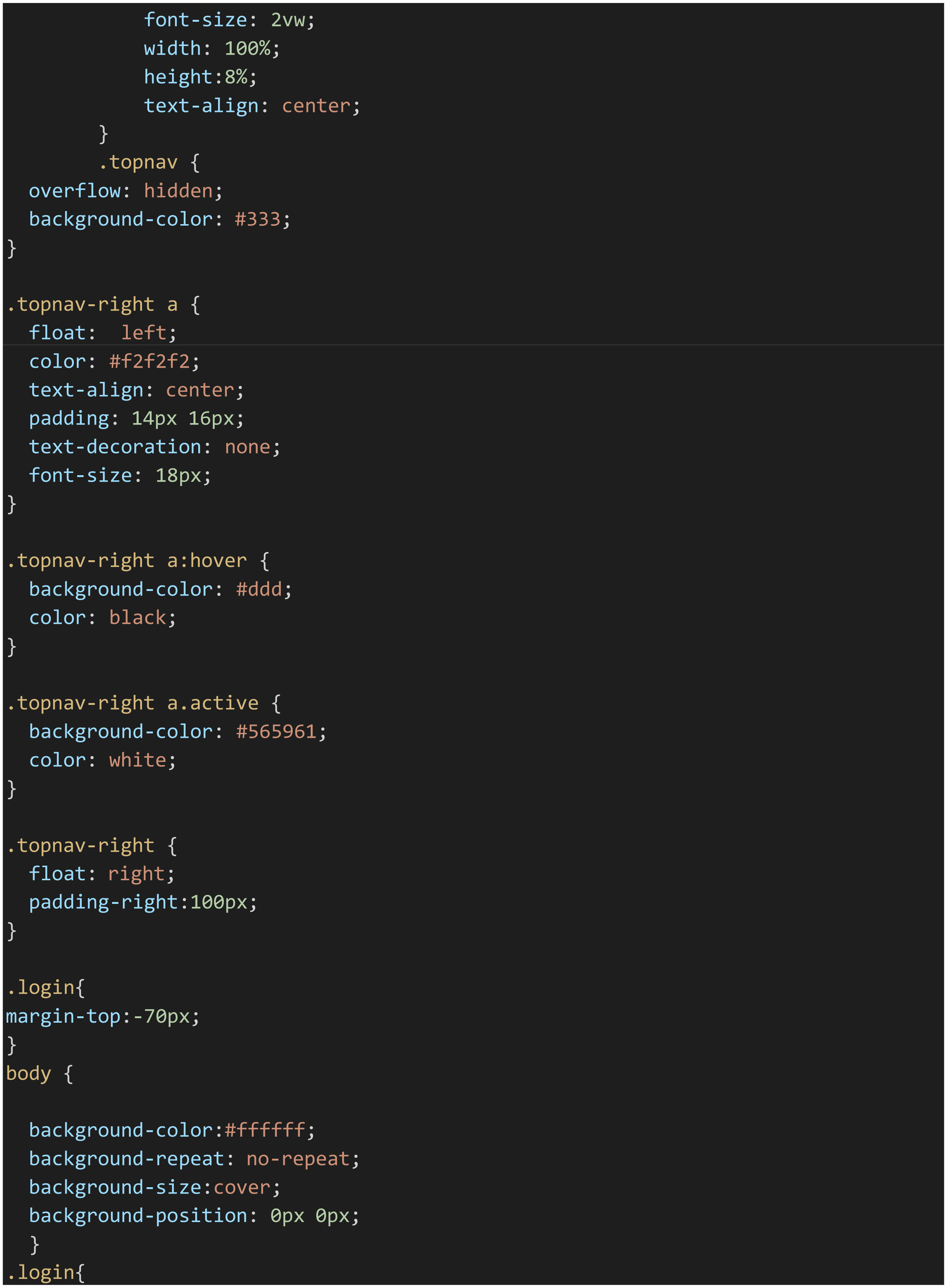
Predict.html:



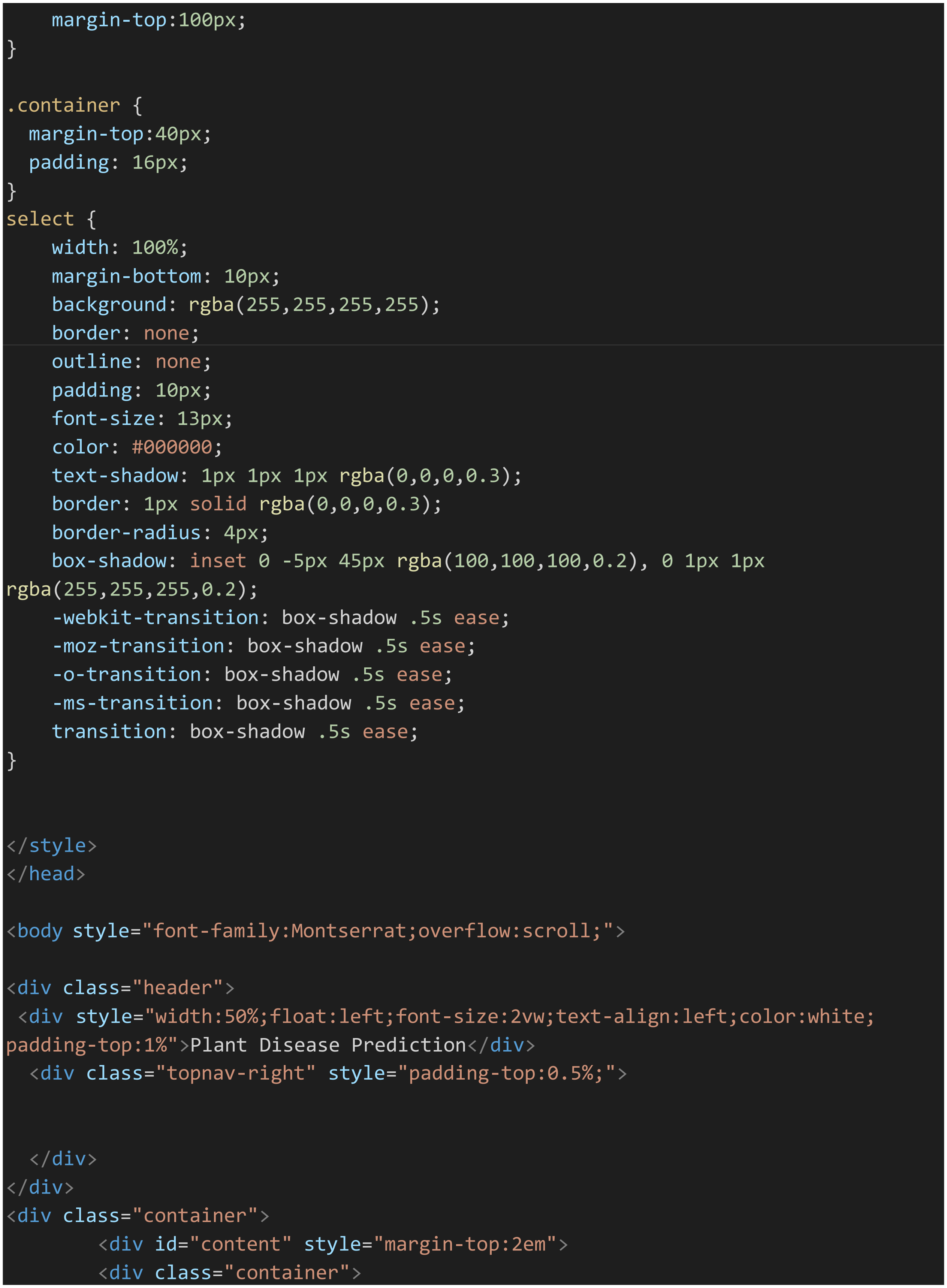
```
<!DOCTYPE html>
<html >

<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title> Plant Disease Prediction</title>
  <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet'
type='text/css'>
<link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
    <script type="text/javascript" src="https://gc.kis.v2.scr.kaspersky-
labs.com/FD126C42-EBFA-4E12-B309-
BB3FDD723AC1/main.js?attr=3wvf44XdejigWHFj22ANQmgfA-L5oa67wZhZwPtEITSot6t8o-
DPZwNcHRFhpa2tgGpDJGis4-1IHYyxyIAN2GE0-kSZKkCLRkbKttCLVN9mKhGFVtGJ3auoiiByn_jJ-
mA447x4TmdjGgz8XvMdLSPF4Gu5xwt0joGxWDXuOEF18Sa5usZGgj4TdDiTfDHpElX3P1eH-
lsevFhUJQEZe3981VXjRKYRn2FrxsYwXGSMBn0sRR9IYup35XYNQkvA6DLQV1lwLc4XuAo0BlJYAfI75R
4O5LwTWuT-uaft0DEQeuV_f3rKvkrcBkalcpWnyXVLeLyjMz5CqpZ1aSCy1MgVAzWxGb-
GX3eQb0F5qOksANddV_vhz1Ai4RgptuAfB8mVyuz0nWZzpmwam34lc4NL4tfyWGncKz2taMyGfsK4Mrn0
zfPlY9_n9FP0lMlAX0IQ8TfbVp4B1vbwnA-
```



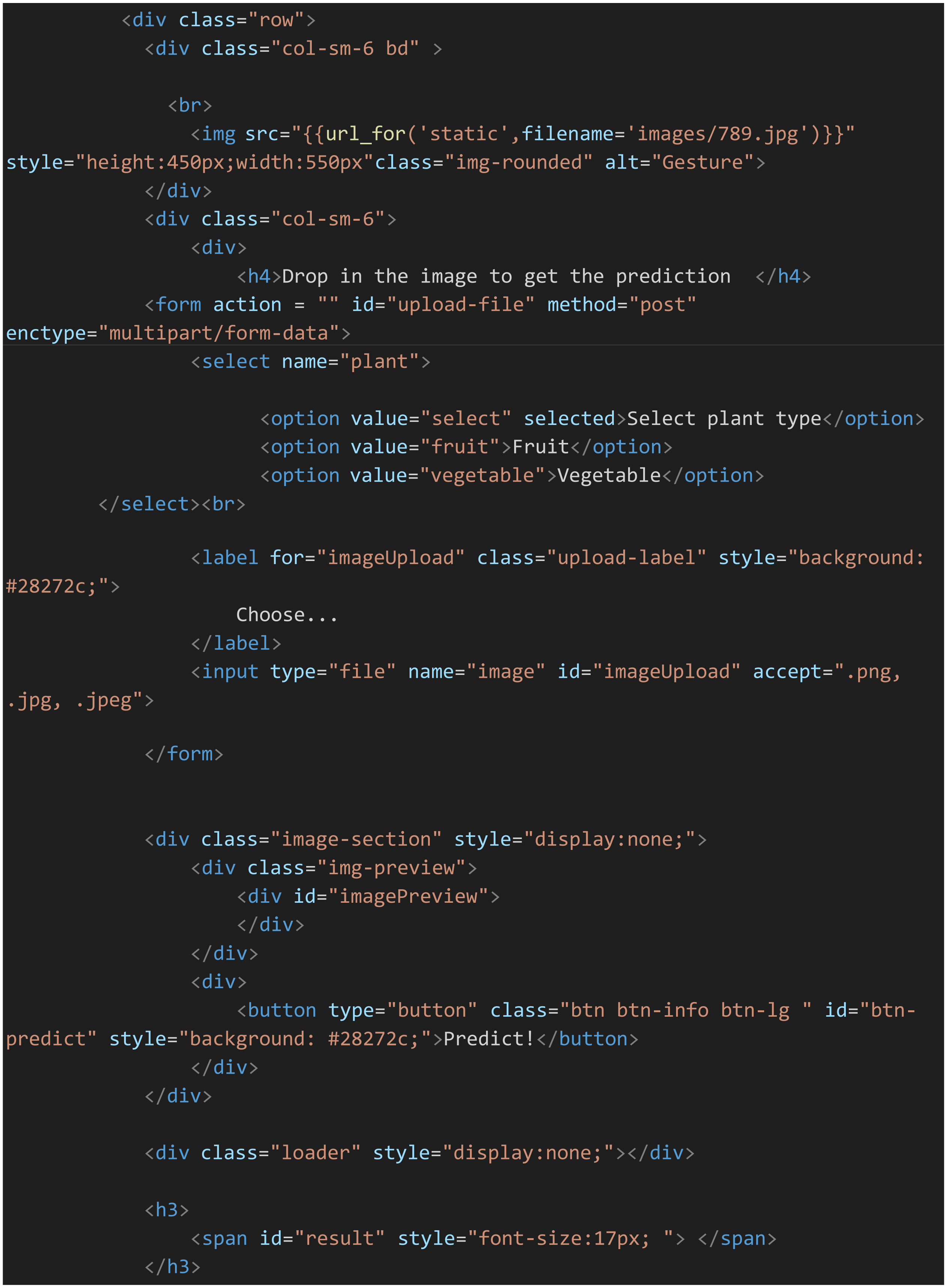
```
RVJq8mxoTjgMgqhKhp6NQY_8gZULkbqqA0pqUMvfL3_fZC1PFipLNjCyCGe9YOaU9L7QF4CXeKsRhJXmI
898FhpxB1oI7z0xvndsDLPRsqbNuse_eGL9tz0Te5HLGhtoXSn5O8pHC99_XHYofrlismcByzZlmVqVkC
NfmbnMjaD9IQf6xAACyjkQ927AOvyDVCZKr-
tV6wRZyv_z7Z1J9AG7SGSLoB34AkMytkYXvpgGn21pGFNhvl3YSmyKYc2XJs89zHbp5fSyXsfasogSEYL
bpxCmuvzZKO4haaqouKDcLwBGMFp_Br095f-
AlhhWOdPDx1ezvTMx1NgS4QO97OmbyQCqHUFWWZLYNgjQ8zpfdBXB17L_v_lfmrUWhUiUVc9tRcJy-
lpchFJe8Gz7TUOKCRDjbIWtiqXryDeENrJgQ31laXp-
VVYpOI1L55pek2fgk5OCGNzVges5oG4PpMyCIXtJpv32E5rlPTktG4hD8eXmYQECVU1HvSmEiKvuY6T6i
9wdpqg_AnycRzUXmYdahFT3W7zToIn2RXzNfdOU0zbYBvtJ70TpR4PjfU75lJ0FsnphDuCnero3UYOak7
vYvGYD9YV2md5v-3AmP-eOor2m55JZRH_Hxpn28x-nDNCOHqVBC6leYuYFBVV_vL5l-
E8n92uWUqwMEzdZPZtAyRaCfz3D2Y0IYn-
ZrnfNTg2M_zVJePmUu1xdjYh7d1dx7nwclm7wJrBPb3JnX2kvEGYs9SM17MlwzoY1VJq4UzJ2D6oEvhQw
HvG4e1etlS6iLWzhy8RVMfBlTa4DPDOHmTlHhsKbn0UaMyFFCppe79rtIVRctcomnVmQysUwUOhjzlAq3
0-hXJCTqdCWJe2xnxjAuUHVqHSiHiZllZaoOWNCV5Ypx_eqzn-KyZS3u-
2_hGLHHNA2AVBWn_hF3Gz16dw6zA4QSmWZSfDUcNObLJGOSTaDS3Z8jPTloYPFmu8oES6TL1dLlEK5Yhc
SGaX4iv6o95drsZGb6bBcWgT7sNFHW6dVE9wdjoDFuBergPIAm0sKaZQ2Ex6j15OWCbE6UaPg-
VNfziA2FEPpJaI9hEPI2gdaSuHqovlEOt5mjuFBBOxpK0t8kOZRtsVzqUuJw3VcLjaP6SfG_KZfgX_g8T
Ps6CcFhlLRz63oXMQFPW6AA7eudWfygndazedq5B-
6DqSkOT04GTUJNqLcElg6KEEWqxd88BzoQoK28jrAf-xWHNIZv5HmQQYEnyX0U_cW8HX-
hde54TuY_fY3e5QYu4be-JxTkA4JxWLEagSa7-zs" charset="UTF-8"></script><script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
<link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300'
rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Merriweather'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Josefin Sans'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Montserrat' rel='stylesheet'>
<link href="{{ url_for('static', filename='css/final.css') }}" rel="stylesheet">
<style>
.header {
            top:0;
            margin:0px;
            left: 0px;
            right: 0px;
            position: fixed;
            background-color: #28272c;
            color: white;
            box-shadow: 0px 8px 4px grey;
            overflow: hidden;
            padding-left:20px;
            font-family: 'Josefin Sans';
```



```
            font-size: 2vw;
            width: 100%;
            height:8%;
            text-align: center;
        }
        .topnav {
  overflow: hidden;
  background-color: #333;
}

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

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

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

.topnav-right {
  float: right;
  padding-right:100px;
}

.login{
margin-top:-70px;
}
body {

  background-color:#ffffff;
  background-repeat: no-repeat;
  background-size:cover;
  background-position: 0px 0px;
  }
.login{
```



```
    margin-top:100px;
}

.container {
  margin-top:40px;
  padding: 16px;
}
select {
    width: 100%;
    margin-bottom: 10px;
    background: rgba(255,255,255,255);
    border: none;
    outline: none;
    padding: 10px;
    font-size: 13px;
    color: #000000;
    text-shadow: 1px 1px 1px rgba(0,0,0,0.3);
    border: 1px solid rgba(0,0,0,0.3);
    border-radius: 4px;
    box-shadow: inset 0 -5px 45px rgba(100,100,100,0.2), 0 1px 1px
rgba(255,255,255,0.2);
    -webkit-transition: box-shadow .5s ease;
    -moz-transition: box-shadow .5s ease;
    -o-transition: box-shadow .5s ease;
    -ms-transition: box-shadow .5s ease;
    transition: box-shadow .5s ease;
}


</style>
</head>

<body style="font-family:Montserrat;overflow:scroll;">

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


  </div>
</div>
<div class="container">
        <div id="content" style="margin-top:2em">
        <div class="container">
```



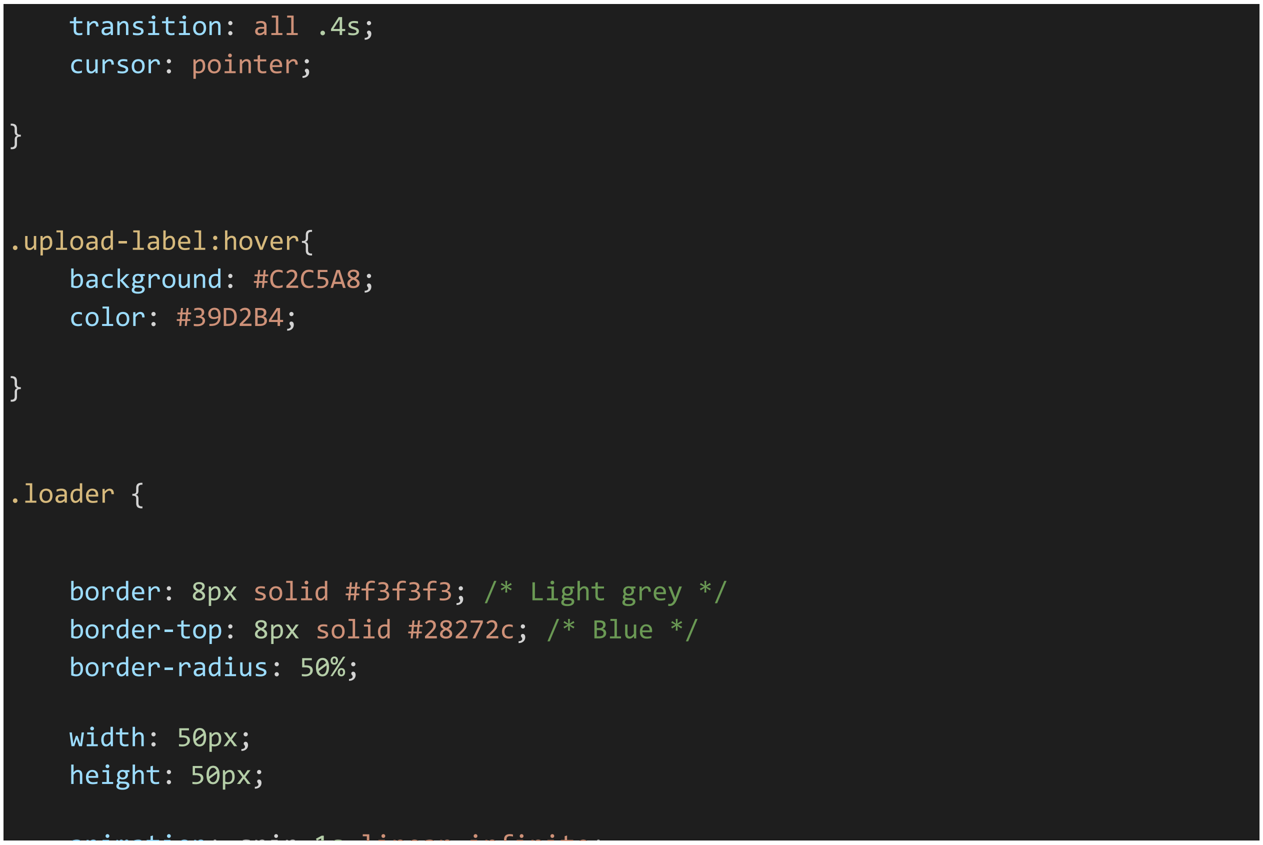
```
          <div class="row">
            <div class="col-sm-6 bd" >

              <br>
                <img src="{{url_for('static',filename='images/789.jpg')}}"
style="height:450px;width:550px"class="img-rounded" alt="Gesture">
            </div>
            <div class="col-sm-6">
                <div>
                    <h4>Drop in the image to get the prediction  </h4>
            <form action = "" id="upload-file" method="post"
enctype="multipart/form-data">
                <select name="plant">

                      <option value="select" selected>Select plant type</option>
                      <option value="fruit">Fruit</option>
                      <option value="vegetable">Vegetable</option>
        </select><br>

                <label for="imageUpload" class="upload-label" style="background:
#28272c;">
                    Choose...
                </label>
                <input type="file" name="image" id="imageUpload" accept=".png,
.jpg, .jpeg">

            </form>


            <div class="image-section" style="display:none;">
                <div class="img-preview">
                    <div id="imagePreview">
                    </div>
                </div>
                <div>
                    <button type="button" class="btn btn-info btn-lg " id="btn-
predict" style="background: #28272c;">Predict!</button>
                </div>
            </div>

            <div class="loader" style="display:none;"></div>

            <h3>
                <span id="result" style="font-size:17px; "> </span>
            </h3>
```

```
    </div>
```

```
            </div>


          </div>

        </div>

        </div>

    </div>
```

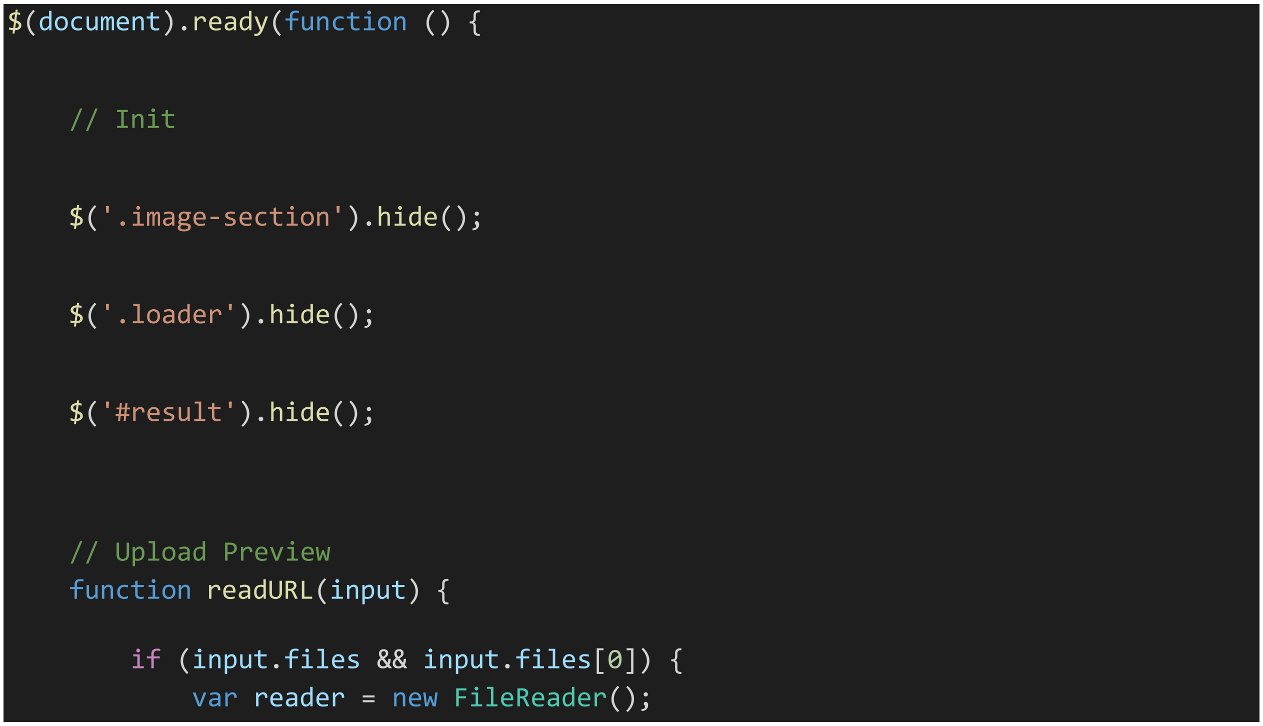
final.css:

```
.img-preview {
    width: 256px;
    height: 256px;

    position: relative;
    border: 5px solid #F8F8F8;

    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;

    margin-bottom: 1em;


}



.img-preview>div {
    width: 100%;

    height: 100%;

    background-size: 256px 256px;
    background-repeat: no-repeat;
    background-position: center;

}


input[type="file"] {
```

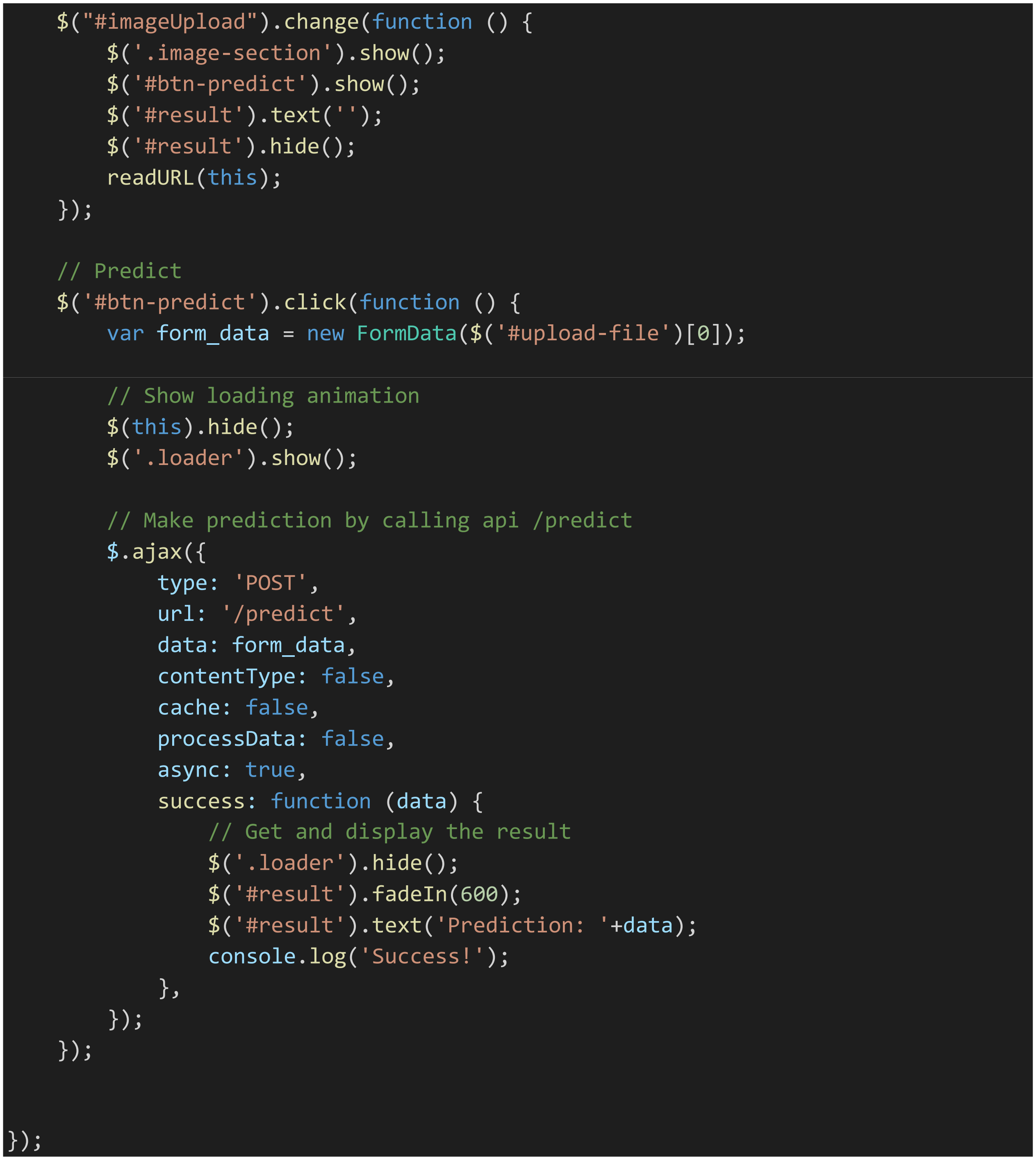


```
    transition: all .4s;
    cursor: pointer;

}


.upload-label:hover{
    background: #C2C5A8;
    color: #39D2B4;

}


.loader {


    border: 8px solid #f3f3f3; /* Light grey */
    border-top: 8px solid #28272c; /* Blue */
    border-radius: 50%;

    width: 50px;
    height: 50px;

    animation: spin 1s linear infinite;
```

main.js:



```
$(document).ready(function () {


    // Init


    $('.image-section').hide();


    $('.loader').hide();


    $('#result').hide();



    // Upload Preview
    function readURL(input) {

        if (input.files && input.files[0]) {
            var reader = new FileReader();
```

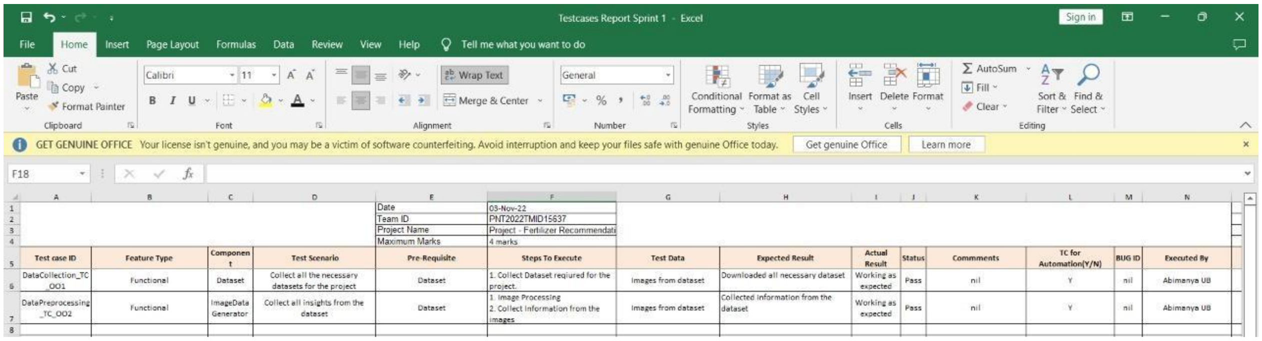


```
    $("#imageUpload").change(function () {
        $('.image-section').show();
        $('#btn-predict').show();
        $('#result').text('');
        $('#result').hide();
        readURL(this);
    });

    // Predict
    $('#btn-predict').click(function () {
        var form_data = new FormData($('#upload-file')[0]);

        // Show loading animation
        $(this).hide();
        $('.loader').show();

        // Make prediction by calling api /predict
        $.ajax({
            type: 'POST',
            url: '/predict',
            data: form_data,
            contentType: false,
            cache: false,
            processData: false,
            async: true,
            success: function (data) {
                // Get and display the result
                $('.loader').hide();
                $('#result').fadeIn(600);
                $('#result').text('Prediction: '+data);
                console.log('Success!');
            },
        });
    });


});
```

1. TESTING

1.1 Test Cases

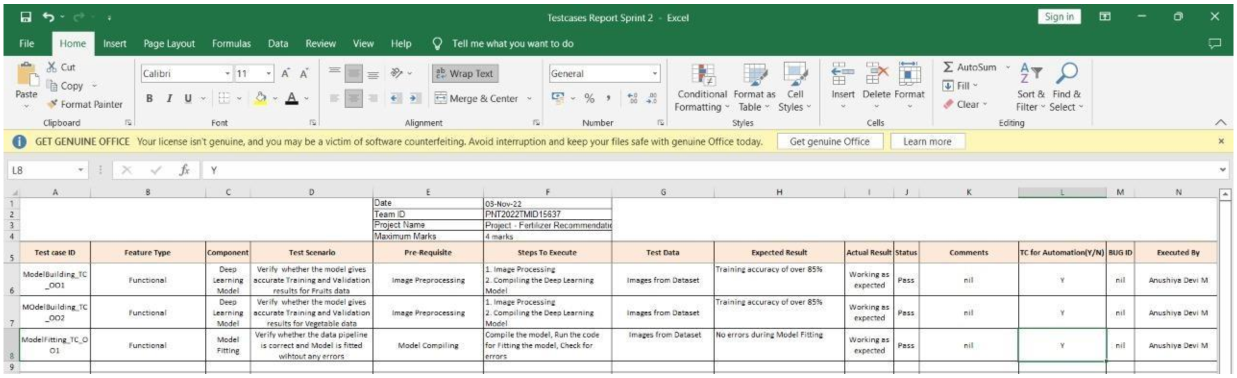
Test cases are a set of actions performed on a system to determine if it satisfies software requirements and functionscorrectly as it claimed to perform.



GET GENUINE OFFICE Your license isn't genuine, and you may be a victim of software counterfeiting. Avoid interruption and keep your files safe with genuine Office today.

Date	03-Nov-22
Team ID	PNT2022TMID15637
Project Name	Project - Fertilizer Recommendati
Maximum Marks	4 marks

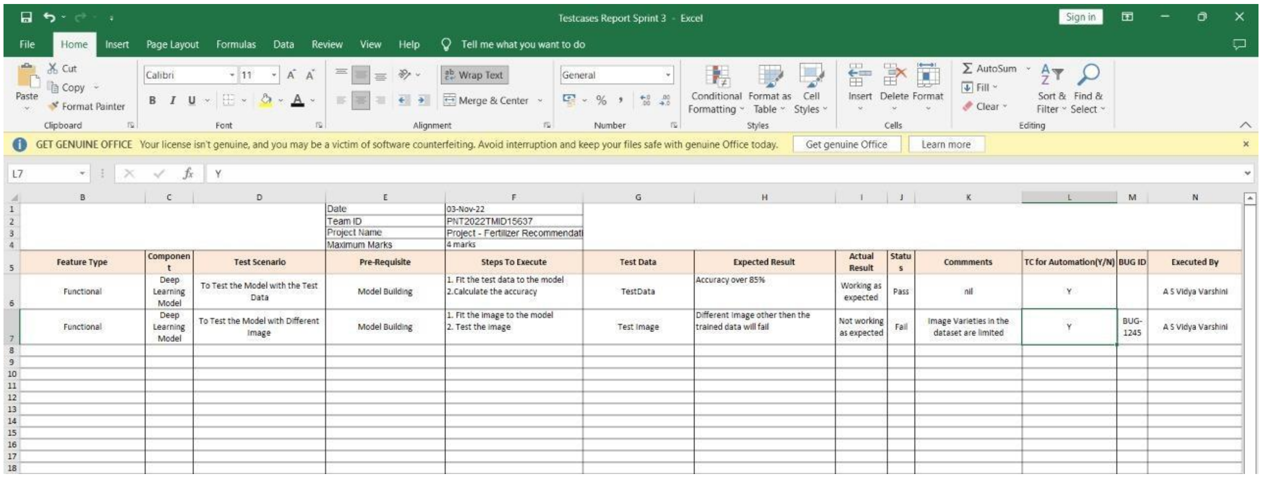
Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commments	TC for Automation(Y/N)	BUG ID	Executed By
DataCollection_TC_OO1	Functional	Dataset	Collect all the necessary datasets for the project	Dataset	1. Collect Dataset reqiured for the project.	Images from dataset	Downloaded all necessary dataset	Working as expected	Pass	nil	Y	nil	Abimanya UB
DataPreprocessing_TC_OO2	Functional	ImageData Generator	Collect all insights from the dataset	Dataset	1. Image Processing 2. Collect Information from the images	Images from dataset	Collected Information from the dataset	Working as expected	Pass	nil	Y	nil	Abimanya UB



GET GENUINE OFFICE Your license isn't genuine, and you may be a victim of software counterfeiting. Avoid interruption and keep your files safe with genuine Office today.

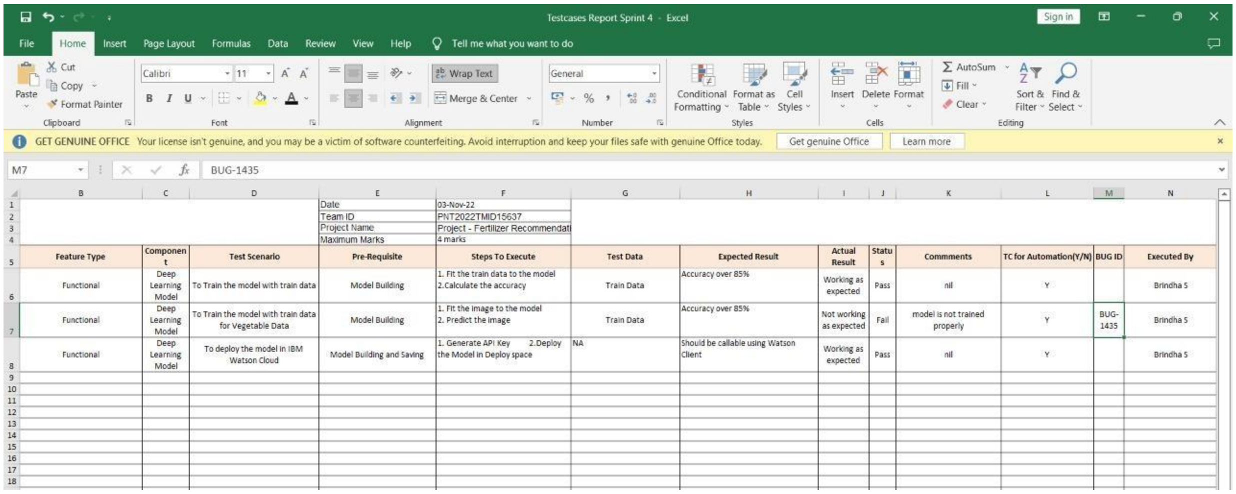
Date	03-Nov-22
Team ID	PNT2022TMID15637
Project Name	Project - Fertilizer Recommendatic
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
ModelBuilding_TC_OO1	Functional	Deep Learning Model	Verify whether the model gives accurate Training and Validation results for Fruits data	Image Preprocessing	1. Image Processing 2. Compiling the Deep Learning Model	Images from Dataset	Training accuracy of over 85%	Working as expected	Pass	nil	Y	nil	Anushiya Devi M
MOdelBuilding_TC_OO2	Functional	Deep Learning Model	Verify whether the model gives accurate Training and Validation results for Vegetable data	Image Preprocessing	1. Image Processing 2. Compiling the Deep Learning Model	Images from Dataset	Training accuracy of over 85%	Working as expected	Pass	nil	Y	nil	Anushiya Devi M
ModelFitting_TC_OO1	Functional	Model Fitting	Verify whether the data pipeline is correct and Model is fitted wihtout any errors	Model Compiling	Compile the model, Run the code for Fitting the model, Check for errors	Images from Dataset	No errors during Model Fitting	Working as expected	Pass	nil	Y	nil	Anushiya Devi M


Testcases Report Sprint 3 - Excel
Sign in
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Help
Tell me what you want to do
GET GENUINE OFFICE Your license isn't genuine, and you may be a victim of software counterfeiting. Avoid interruption and keep your files safe with genuine Office today.
Get genuine Office
Learn more
L7
Y

Date	03-Nov-22
Team ID	PNT2022TMID15637
Project Name	Project - Fertilizer Recommendati
Maximum Marks	4 marks

Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commments	TC for Automation(Y/N)	BUG ID	Executed By
Functional	Deep Learning Model	To Test the Model with the Test Data	Model Building	1. Fit the test data to the model 2.Calculate the accuracy	TestData	Accuracy over 85%	Working as expected	Pass	nil	Y		A S Vidya Varshini
Functional	Deep Learning Model	To Test the Model with Different Image	Model Building	1. Fit the image to the model 2. Test the image	Test Image	Different image other then the trained data will fail	Not working as expected	Fail	Image Varieties in the dataset are limited	Y	BUG-1245	A S Vidya Varshini


Testcases Report Sprint 4 - Excel
Sign in
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Help
Tell me what you want to do
GET GENUINE OFFICE Your license isn't genuine, and you may be a victim of software counterfeiting. Avoid interruption and keep your files safe with genuine Office today.
Get genuine Office
Learn more
M7
BUG-1435

Date	03-Nov-22
Team ID	PNT2022TMID15637
Project Name	Project - Fertilizer Recommendati
Maximum Marks	4 marks

Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commments	TC for Automation(Y/N)	BUG ID	Executed By
Functional	Deep Learning Model	To Train the model with train data	Model Building	1. Fit the train data to the model 2.Calculate the accuracy	Train Data	Accuracy over 85%	Working as expected	Pass	nil	Y		Brindha S
Functional	Deep Learning Model	To Train the model with train data for Vegetable Data	Model Building	1. Fit the image to the model 2. Predict the image	Train Data	Accuracy over 85%	Not working as expected	Fail	model is not trained properly	Y	BUG-1435	Brindha S
Functional	Deep Learning Model	To deploy the model in IBM Watson Cloud	Model Building and Saving	1. Generate API Key 2.Deploy the Model in Deploy space	NA	Should be callable using Watson Client	Working as expected	Pass	nil	Y		Brindha S

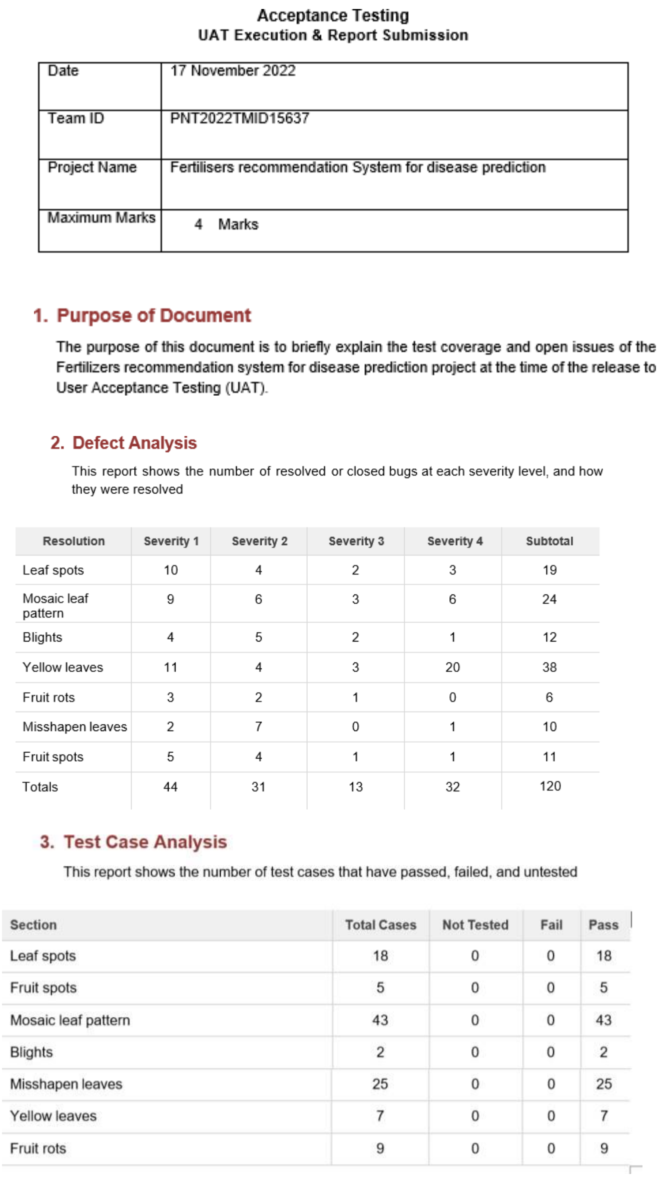
User Acceptance Testing

Before deploying the software application to a production environment

the end user or client performs a type of testing known as user acceptance testing,

or UAT to ensure whether the software functionalities serve the purpose of

development.



Acceptance Testing

UAT Execution & Report Submission

Date	17 November 2022
Team ID	PNT2022TMID15637
Project Name	Fertilisers recommendation System for disease prediction
Maximum Marks	4 Marks

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Fertilizers recommendation system for disease prediction project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
Leaf spots	10	4	2	3	19
Mosaic leaf pattern	9	6	3	6	24
Blights	4	5	2	1	12
Yellow leaves	11	4	3	20	38
Fruit rots	3	2	1	0	6
Misshapen leaves	2	7	0	1	10
Fruit spots	5	4	1	1	11
Totals	44	31	13	32	120

3. Test Case Analysis

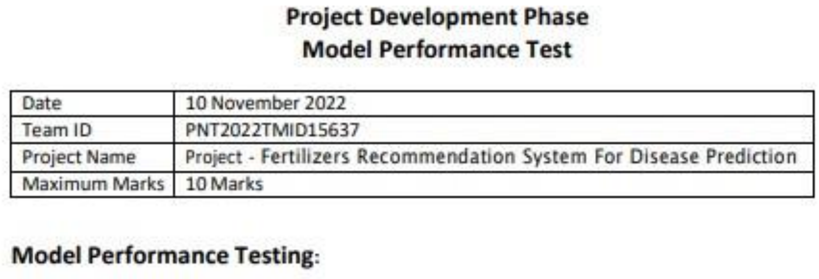
This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Leaf spots	18	0	0	18
Fruit spots	5	0	0	5
Mosaic leaf pattern	43	0	0	43
Blights	2	0	0	2
Misshapen leaves	25	0	0	25
Yellow leaves	7	0	0	7
Fruit rots	9	0	0	9

2. RESULTS

Performance Metrics

metrics are a baseline for performance tests. Monitoring the correct parameters will help you detect areas that require increased attention and find ways to improve them.



Project Development Phase
Model Performance Test

Date	10 November 2022
Team ID	PNT2022TMID15637
Project Name	Project - Fertilizers Recommendation System For Disease Prediction
Maximum Marks	10 Marks

Model Performance Testing:

S.No.	Parameter	Values	Screenshot
1.	Model Summary	Total params: 45,221,754 Trainable params: 45,221,754 Non trainable params: 0	
2.	Accuracy	Training Accuracy – 97.55 Validation Accuracy – 96.45	

3. ADVANTAGES & DISADVANTAGES

Advantages:

- Early detection of plant diseases.
- Proper fertilizer recommendation to prevent or cure the plant infection or disease.
- No need to consult any specialists.
- Fully automated system.

Disadvantages:

- Requires training the system with large dataset.
- Works only on the pretrained diseases.
- When a plant is infected with multiple diseases the system may not predict all the diseases due to the mixed symptoms.
- Requires a good device connected to the internet.

4. CONCLUSION

Hence a system that takes in images as user input, analyses those for certain symptoms and identifies the disease, recommends the fertilizer to counter the deficiency of the nutrients is built and deployed.

5. FUTURE SCOPE

The system must be trained with numerous images of plant disease symptoms. In case of presence of multiple diseases, suitable classification must be done to predict each disease accurately and recommend separate fertilizers as a solution to each deficiency or infection.

6. APPENDIX

Source Code

Home.html:

```
<!DOCTYPE html>
<html >

<head>
 <meta charset="UTF-8">
 <meta name="viewport" content="width=device-width, initial-scale=1">
 <title> Plant Disease Prediction</title>
 <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'
 type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet'
type='text/css'>
<link
href='https://fonts.googleapis.com/css?family=Open+Sans+Condens
ed:300' rel='stylesheet' type='text/css'>
<link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
<link href='https://fonts.googleapis.com/css?family=Merriweather'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Josefin Sans'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Montserrat'
rel='stylesheet'>
<script type="text/javascript" src="https://gc.kis.v2.scr.kaspersky-
labs.com/FD126C42-EBFA-4E12-B309-
BB3FDD723AC1/main.js?attr=AMFGethlf4Q6r2IdpTrTqcDQGNLDU5
Cbc3diYnUdLkg5mQrVB_td
22OHUAsBJSd0oo8OR0zM3rIPeFWfnEY4XCxQu4KOxMSqlshEoIBOzvY
w0SsMYpyUv4fnvKEjm Joj_Y6cI4ov-
6AMOkz3Sh3epkfq0gltfnAPvvQBRdXqRmdqePVjlvvqL28ONZCiS0Qr
5t0XGxJ0bSiWVT-
rH3cqaKCk05eP1Dx04mieTcjsA_TtFLx15PUu0ed6soaj-FOO6-
1d4OQxbJYBXUBefiUhzmOYCpsGIs1OyQvA0huo8AUYwYB72dvs07U3
O2hq8BmYBv98h13sSo8
iXKxyKx4FUsOMkixjxYP6hu0wwi7yv1E2rei3GHtPl5YwHkWioQIPqv
AmrlmaPtFZmF-
```

```
jE4_UUCi9IEKws8IduDiqQIFkxfO3YT_sUC9gWmxKSpGbiebwCgV-
wvdGEnbUxY18p9Db6jC6FVKRhqdMBianq63qv-
zZRMZbEpjzQT0DQAH3Yho4o4A00FIW2004q8Q80xt2kV928P_nBg
S9HOgHI5EZxenbjfqANTs1rh8GGhBd7RJaE8-
2AaqT6zbLf2tILJ8j4fk3bV1qsdw0fPmp6foJbDu4343XH36a0VGHsML
eVqcc30PSsE1pJbGE4_C_E
xQd0_uRSA40mRjnFwHdLo9SJc1qghyc5YGQil_utG48olMy9cC6z-
iyKg1EeLKB43u-
q4SlUimRnuUsZW7drNWaijSfJPDmkm7lUJ0POwQXPfnLa2_spc3FisWC
OZ7dFuIgDciIu0yF8rio2X
0Pz6pZkGQW4Fwl6vWKrLplmHagJElKXg58YSWwAT2DILilBjuSPiTwC
HR9Ya_mAXW4C03v7x
zJlaSK9jneECqctvKnH3RFgDS8ocfDcY65lXNRkq6v1hrcdv5sM2ek4K
jq4OFgX-wijr- 0JdpSDpZlbIK00sPb4-
u1B8c7MaCqBcbJAhfmg4utLU67fn5GLoCX_-5TAWV0ID-
_sC1Vs9glWRPkKmmktJMbVy98XqC5-
DhtE3yd5I9ZM1SEH1gGYLlRjxwzPjWwHE-YH1Nx9lm-
Esq27TK7M86uT8iAe7LgtviO2YsCB0buShHWmjh3RzwMGqNqeymF
SxPRK_sDmTFoVjcaYpGa0
kaMwhmmF9AtPwGmFaGglv3rryVg0X0bGoXRetnrPpDG7jUoq5zQu
XQSedBf9hmNwEqWsSZtI4z
NTxjiEkxU0djhPXqByZbnelp_3z6pqqniLzqj9jzAkvX6wDOW7ZycfDz
Ot- zNgTxWdtf41P6ZjVu8EWSf65Wqgen5jD4IPXgXGtxkjrSbrqiX-
NxxxfKVJUOoOcEO0F6n3DWD0BMWS8UGOQO8gZZeXCfpuTIGYTD6
okyD91kLk5AmhaNTJV
KjkHO-
dHZqMHxikVhdK6C2PIfg4lEY0yuE3Fjj_5NNX5ZalIpOl3LN6YQ8Jqis_U
mC_OXmjW2F5Y4p8VR
RKc1HW2DFaUxBrEgfSwe_keyaofodrjde_pfPuDQDryEgGy9DNIhpG
UV_bQJ8jlPxRL7WSpmPU7
-IZ1mVN_onhqq2oI-WTl7ep-
8w0GsJH3OhSRyyJC0XC9xtetqVjIHzcbKYFsxOaXT-
LLe7U9oHaXHzjDK3hn-ZNFYwzV_aoq8180eb"
charset="UTF-8"></script><style>
```

```
.header {
                top:0;
                margin:
                0px;
```

```
                    left:
                    0px;
                    right:
                    0px;
                    position: fixed;
                    background-color:
                    #28272c;color:
                    white;
                    box-shadow: 0px 8px
                    4px grey;overflow:
                    hidden;
                    padding-left:20px;
                    font-family:
                    'Josefin Sans';font-
                    size: 2vw;
                    width:
                    100%;
                    height:8
                    %;
                    text-align: center;
            }
            .topnav
 { overflow:
 hidden;
 background-
 color: #333;
}

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

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

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

.topnav-
 right {
 float:
 right;
 padding-right:100px;
}

body {

 background-
 color:#ffffff;
 background-repeat:
 no-repeat;
 background-
 size:cover;
 background-position:
 0px 0px;
 }
 .button {
 background-color:
 #28272c; border:
 none;
 color: white;
 padding: 15px
 32px; text-
 align: center;
 text-decoration:
 none;display:
 inline-block;
 font-size:
 16px; border-
 radius: 12px;
}
.button:hover {
 box-shadow: 0 12px 16px 0 rgba(0,0,0,0.24), 0 17px 50px 0 rgba(0,0,0,0.19);
}
form {border: 3px solid #f1f1f1; margin-left:400px;margin-right:400px;}

input[type=text],
 input[type=password] {
 width: 100%;
 padding: 12px
 20px; display:
 inline-block;
 margin-
 bottom:18px;
 border: 1px
 solid #ccc; box-
 sizing: border-
 box;
}

button {
 background-color:
 #28272c;color:
 white;
 padding: 14px
 20px;margin-
 bottom:8px;
 border:  none;
 cursor:
 pointer;
 width: 15%;
 border-radius:4px;}

button:ho
 ver {
 opacity:
```

```
 0.8;}

.cancelbt
 n {
 width:
 auto;
 padding: 10px 18px;
 background-color:
 #f44336;}

.imgcontaine
 r { text-
 align:
 center;
 margin: 24px 0 12px 0;}

img.avat
 ar {
 width:
 30%;
 border-radius: 50%;}

.container {
 padding:
 16px;}

span.ps
 w {
 float:
 right;
 padding-top: 16px;}

/* Change styles for span and cancel button on
extra small screens */@media screen and (max-
width: 300px) {
 span.psw {
   display:
   block;
   float: none;}

 .cancelbtn {
   width:
   100%;}}

.home{
    margin:80
 px; width:
 84%; height:
 500px;
 padding-
 top:10px;
 padding-left: 30px;}

.login{
    margin:80px;
    box-sizing:
 content-box;width:
 84%;
 height:
 420px;
 padding:
 30px;
 border: 10px solid blue;
}
.left,.right{
 box-sizing:
 content-box;
 height: 400px;
 margin:20px;
 border: 10px solid blue;
}

.mySlides {display:
none;} img
{vertical-align:
middle;}

/* Slideshow container */
.slideshow-
 container {
```

```
 max-width:
 1000px;
 position:
 relative;
 margin: auto;
}

/* Caption text */
.text {
 color:
 #f2f2f2;
 font-size:
 15px;
 padding: 8px
 12px;
 position:
 absolute;
 bottom:  8px;
 width: 100%;
 text-align: center;
}
/* The dots/bullets/indicators */
.dot {
 height:
 15px;
 width:
 15px;
 margin: 0
 2px;
 background-
 color: #bbb;
 border-radius:
 50%; display:
 inline-block;
 transition: background-color 0.6s ease;
```

```
}

.active {
 background-color: #717171;
}

/* Fading animation */
.fade {
 -webkit-animation-name: fade;
 -webkit-animation-
 duration: 1.5s;
 animation-name: fade;
 animation-duration: 1.5s;
}

@-webkit-
 keyframes fade {
 from {opacity: .4}
 to {opacity: 1}
}

@keyframes
 fade { from
 {opacity: .4}
 to {opacity: 1}
}

/* On smaller screens, decrease
text size */ @media only screen
and (max-width: 300px) {
 .text {font-size: 11px}
}
</style>
</head>

<body style="font-family:'Times New Roman', Times, serif;background-
color:#C2C5A8;">

<div class="header">
 <div style="width:50%;float:left;font-size:2vw;text-
align:left;color:white; padding-top:1%">Plant Disease
```

```
Prediction</div>
 <div class="topnav-right"style="padding-top:0.5%;">

  <a class="active" href="{{ url_for('home')}}">Home</a>
  <a href="{{ url_for('prediction')}}">Predict</a>
 </div>
</div>

<div style="background-color:#ffffff;">
<div style="width:60%;float:left;">
<div style="font-size:50px;font-family:Montserrat;padding-
left:20px;text-align:center;padding-top:10%;">
<b>Detect if your plant<br> is infected!!</b></div><br>
<div style="font-size:20px;font-family:Montserrat;padding-
left:70px;padding-right:30px;text- align:justify;">Agriculture is one of
the major sectors worls wide. Over the years it has developed and the use
of new technologies and equipment replaced almost all the traditional
methods of farming. The plant diseases effect the production.
Identification of diseases and taking necessary precautions is all done
through naked eye, which requires labour and laboratries. This
application helps farmers in detecting the diseases by observing the spots
on the leaves, which inturn saves effort and labor costs.</div><br><br>
</div>
```

```
</div>
<div style="width:40%;float:right;"><br><br>
<img src="{{url_for('static',filename='images/12456.png')}}"
style="max-height:100%;max-width:100%;">
</div>
</div>
<div class="home">
<br>
</div>

<script>
var
slideIndex =
0;
showSlides()
;

function
 showSlides() {
 var i;
 var slides =
 document.getElementsByClassName("mySli
 des");var dots =
 document.getElementsByClassName("dot");
 for (i = 0; i <
  slides.length; i++) {
  slides[i].style.display
  = "none";
 }
 slideIndex++;
 if (slideIndex > slides.length)
 {slideIndex = 1}for (i = 0; i <
 dots.length; i++) {
  dots[i].className = dots[i].className.replace(" active", "");
 }
 slides[slideIndex-
 1].style.display = "block";
 dots[slideIndex-1].className
 += " active";
 setTimeout(showSlides, 2000); // Change image every 2 seconds
}
</script>
```

```
</body>
</html>
```

Predict.html:

```
<!DOCTYPE html>
<html >

<head>
 <meta charset="UTF-8">
 <meta name="viewport" content="width=device-width, initial-scale=1">
 <title> Plant Disease Prediction</title>
 <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'
 type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet'
type='text/css'>
<link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
   <script type="text/javascript" src="https://gc.kis.v2.scr.kaspersky-
labs.com/FD126C42-EBFA- 4E12-B309-
BB3FDD723AC1/main.js?attr=3wvf44XdejigWHFj22ANQmgfA-
L5oa67wZhZwPtEITSot6t8o-DPZwNcHRFhpa2tgGpDJGis4-
1IHYyxyIAN2GE0-
kSZKkCLRkbKttCLVN9mKhGFVtGJ3auoiiByn_jJ-
mA447x4TmdjGgz8XvMdLSPF4Gu5xwt0joGxWDXuOEF18Sa5usZGg
j4TdDiTfDHpElX3P1eH-
lsevFhUJQEZe3981VXjRKYRn2FrxsYwXGSMBn0sRR9IYup35XYNQkv
A6DLQV1lwLc4XuAo0B lJYAfI75R4O5LwTWuT-
```

```
uaft0DEQeuV_f3rKvkrcBkalcpWnyXVLeLyjMz5CqpZ1aSCy1MgVAz
WxGb-
GX3eQb0F5qOksANddV_vhz1Ai4RgptuAfB8mVyuz0nWZzpmwam34l
c4NL4tfyWGncKz2taMyGfs
K4Mrn0zfPlY9_n9FP0lMlAX0IQ8TfbVp4B1vbwnA-
RVJq8mxoTjgMgqhKhp6NQY_8gZULkbqqA0pqUMvfL3_fZC1PFipLNjC
yCGe9YOaU9L7QF4CXe
KsRhJXmI898FhpxB1oI7z0xvndsDLPRsqbNuse_eGL9tz0Te5HLGhtoX
Sn5O8pHC99_XHYofrlismc
ByzZlmVqVkCNfmbnMjaD9IQf6xAACyjkQ927AOvyDVCZKr-
tV6wRZyv_z7Z1J9AG7SGSLoB34AkMytkYXvpgGn21pGFNhvl3YSm
yKYc2XJs89zHbp5fSyXsfas
ogSEYLbpxCmuvzZKO4haaqouKDcLwBGMFp_Br095f-
AlhhWOdPDx1ezvTMx1NgS4QO97OmbyQCqHUFWWZLYNgjQ8zpf
dBXB17L_v_lfmrUWhUiUVc9tRcJy-
lpchFJe8Gz7TUOKCRDjbIWtiqXryDeENrJgQ31laXp-
VVYpOI1L55pek2fgk5OCGNzVges5oG4PpMyCIXtJpv32E5rlPTktG4hD8e
XmYQECVU1HvSmEiK
vuY6T6i9wdpqg_AnycRzUXmYdahFT3W7zToIn2RXzNfdOU0zbYBvt
J70TpR4PjfU75lJ0FsnphDu Cnero3UYOak7vYvGYD9YV2md5v-
3AmP-eOor2m55JZRH_Hxpn28x- nDNCOHqVBC6leYuYFBVV_vL5l-
E8n92uWUqwMEzdZPZtAyRaCfz3D2Y0IYn-
ZrnfNTg2M_zVJePmUu1xdjYh7d1dx7nwclm7wJrBPb3JnX2kvEGYs9SM1
7MlwzoY1VJq4UzJ2D6o
EvhQwHvG4e1etlS6iLWzhy8RVMfBlTa4DPDOHmTlHhsKbn0UaMyF
FCppe79rtIVRctcomnVmQy sUwUOhjzlAq30-
hXJCTqdCWJe2xnxjAuUHVqHSiHiZllZaoOWNCV5Ypx_eqzn-
KyZS3u-
2_hGLHHNA2AVBWn_hF3Gz16dw6zA4QSmWZSfDUcNObLJGOST
aDS3Z8jPTloYPFmu8oES6T
L1dLlEK5YhcSGaX4iv6o95drsZGb6bBcWgT7sNFHW6dVE9wdjoDFuBer
gPIAm0sKaZQ2Ex6j15O WCbE6UaPg-
VNfziA2FEPpJaI9hEPI2gdaSuHqovlEOt5mjuFBBOxpK0t8kOZRtsVzq
UuJw3VcLjaP6SfG_KZfgX_
g8TPs6CcFhlLRz63oXMQFPW6AA7eudWfygndazedq5B-
6DqSkOT04GTUJNqLcElg6KEEWqxd88BzoQoK28jrAf-
xWHNIZv5HmQQYEnyX0U_cW8HX- hde54TuY_fY3e5QYu4be-
JxTkA4JxWLEagSa7-zs" charset="UTF-8"></script><script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></scri
pt>
  <script     src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
  <script
  src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
<link
href='https://fonts.googleapis.com/css?family=Open+Sans+Condens
ed:300' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Merriweather'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Josefin Sans'
rel='stylesheet'>
<link href='https://fonts.googleapis.com/css?family=Montserrat'
rel='stylesheet'>
<link href="{{ url_for('static', filename='css/final.css') }}" rel="stylesheet">
<style>
.header {
                top:0;
                margin:
                0px; left:
                0px;
                right:
                0px;
                position: fixed;
                background-color:
                #28272c; color:
                white;
                box-shadow: 0px 8px
                4px grey; overflow:
                hidden;
                padding-left:20px;
                font-family:
                'Josefin Sans'; font-
                size: 2vw;
                width:
                100%;
                height:8
                %;
                text-align: center;
        }
        .topnav
 { overflow:
 hidden;
 background-
 color: #333;
}
```

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

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

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

.topnav-
 right {
 float:
 right;
 padding-right:100px;
}

.login{
margin-top:-70px;
}
body {

 background-
 color:#ffffff;
 background-repeat:
 no-repeat;
 background-
 size:cover;
 background-position:
 0px 0px;
 }
.login{
    margin-top:100px;
}

.container {
 margin-
 top:40px;
 padding:
 16px;
}
select {
    width: 100%;
    margin-bottom: 10px;
    background:
    rgba(255,255,255,255);
    border: none;
    outline:
    none;
    padding:
    10px; font-
    size: 13px;
    color:
    #000000;
    text-shadow: 1px 1px 1px
    rgba(0,0,0,0.3); border: 1px
    solid rgba(0,0,0,0.3);
    border-radius: 4px;
    box-shadow: inset 0 -5px 45px rgba(100,100,100,0.2), 0 1px 1px
    rgba(255,255,255,0.2);
    -webkit-transition: box-shadow .5s ease;
```

```
            -moz-transition: box-shadow .5s ease;
            -o-transition: box-shadow .5s ease;
            -ms-transition: box-
            shadow .5s ease;
            transition: box-shadow
            .5s ease;
        }


        </style>
        </head>

        <body style="font-family:Montserrat;overflow:scroll;">

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



          </div>
        </div>
        <div class="container">
              <div id="content" style="margin-top:2em">
                        <div class="container">
                          <div class="row">
                                   <div class="col-sm-6 bd" >


                                    <br>
                                             <img
                                             src="{{url_for('static',filename='images/789.jpg')}}"
    style="height:450px;width:550px"class="img-rounded"
                                     alt="Gesture">
                                 </div>
                             <div class="col-sm-6">
                                            <div>
                                            <h4>Drop in the image to get the prediction  </h4>
                                      <form action = "" id="upload-file" method="post"
    data">                                         enctype="multipart/form-

                                             <select name="plant">
```

```
                                        <option value="select" selected>Select plant
                                        type</option>
                                        <option value="fruit">Fruit</option>
                         </select><b    <option value="vegetable">Vegetable</option>
                         r>
                                  <label for="imageUpload" class="upload-label"
                #28272c
                ;">
                                       style="background:Choose...
                                  </label>
                                  <input type="file" name="image" id="imageUpload"
                                  accept=".png,
                .jpg,         </for
                .jpeg">       m>



              <div class="image-section" style="display:none;">
                   <div class="img-preview">
                        <div id="imagePreview">
                        </div>
                  </div>
                  <div>
```

```
                                          <button type="button" class="btn btn-info
    btn-lg " id="btn-predict" style="background:
    #28272c;">Predict!</button>
                                    </div>
                          </div>
                          <div class="loader" style="display:none;"></div>
                          <h3>
                          <span id="result" style="font-size:17px; "> </span>
                          </h3>
                 </div>

                          </div>


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



    <footer>
      <script src="{{ url_for('static', filename='js/main.js') }}"
      type="text/javascript"></script>
    </footer>
    </html>
```

main.js:

```
    $(document).ready(function () {
      // Init
      $('.image-section').hide();
      $('.loader').hide();
      $('#result').hide();

      // Upload  Preview
      function
      readURL(input) {
        if      (input.files      &&
          input.files[0])    {   var
          reader        =        new
          FileReader();
          reader.onload          =
    function (e) {
      $('#imagePreview').css('background-image', 'url(' + e.target.result + ')');
      $('#imagePreview').hide();
      $('#imagePreview').fadeIn(650);
    }
    reader.readAsDataURL(input.files[0]);
  }
}
$("#imageUpload").change(function () {
  $('.image-section').show();
  $('#btn-predict').show();
  $('#result').text('');
  $('#result').hide();
  readURL(this);
});

// Predict
$('#btn-predict').click(function () {
  var form_data = new FormData($('#upload-file')[0]);

  // Show loading animation
  $(this).hide();
```

```
    $('.loader').show();

    // Make prediction by calling api /predict
    $.ajax({
      type:
      'POST',
      url:
      '/predict',
      data:
      form_data,
      contentType:
      false, cache:
      false,
      processData:
      false, async:
      true,
      success: function (data) {
        // Get and display the result
        $('.loader').hide();
        $('#result').fadeIn(600);
        $('#result').text('Predictio
        n: '+data);
        console.log('Success!');
      },
    });
  });

});
```

Final.css:

```
.img-preview
  { width:
  256px;
  height:
  256px;
  position:
  relative;
  border: 5px solid #F8F8F8;
  box-shadow: 0px 2px 4px 0px
  rgba(0, 0, 0, 0.1); margin-top:
```

```
  1em;
  margin-bottom: 1em;
}

.img-
  preview>di
  v {width:
  100%;
  height: 100%;
  background-size:
  256px 256px;
  background-repeat:
  no-repeat;
  background-position:
  center;
}

input[type="fi
  le"] {
  display:
  none;
}

.upload-label{
  display: inline-
  block; padding:
  12px 30px;
  background:
  #28272c;color:
  #fff;
  font-size:
  1em;
  transition:
  all .4s;
  cursor:
  pointer;
}
```

```
.upload-
  label:hover{
  background:
  #C2C5A8;color:
  #39D2B4;
}

.loader {
  border: 8px solid #f3f3f3; /*
  Light grey */border-top: 8px
  solid #28272c; /* Blue */
  border-radius: 50%;
  width:
  50px;
  height:
  50px;
  animation: spin 1s linear infinite;
}

@keyframes spin {
  0% { transform:
  rotate(0deg); } 100% {
  transform:
  rotate(360deg); }
}
```

Python – app.py:

```
import os
import numpy
as np import
pandas as pd
from tensorflow.keras.models import load_model
# from
tensorflow.keras.preprocessing
import image from werkzeug.utils
import secure_filename

from flask import Flask,
render_template, request app =

Flask(_name_)

#load both the vegetable and
fruit models model =
load_model("vegetable.h5")
model1=load_model("fruit.h
5")

#home
page
@app.rout
e('/') def
home():
    return render_template('home.html')

#prediction page
@app.route('/predi
ction') def
prediction():
    return render_template('predict.html')

@app.route('/predict',method
s=['POST']) def predict():
    if request.method == 'POST':
        # Get the file from
        post request f =
        request.files['image']

        # Save the file to ./uploads
        basepath = os.path.dirname(
        file_) file_path =
        os.path.join(
          basepath, 'uploads',
        secure_filename(f.filename))
        f.save(file_path)
        img = image.load_img(file_path, target_size=(128, 128))

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

        plant=request.form['pl
        ant']print(plant)
        if(plant=="vegetable")
        :
          preds              =
          model.predict(x)
          preds=np.argmax
          (preds)
          print(preds)
          df=pd.read_excel('precaution
          s            -            veg.xlsx')
          print(df.iloc[preds]['caution'])
        else:
          preds = model1.predict(x)
          preds=np.argmax(preds)
          df=pd.read_excel('precautions
          - fruits.xlsx')
          print(df.iloc[preds]['caution'])


        return
df.iloc[preds]['caution']if
name__== "_main_":
    app.run(debug=False)
```

DEPLOYMENT MODEL CODE:

Fruit model:

```
ls
sample_dat
a/pwd
'/home/wsuser/work'
!pip install keras==2.7.0
!pip install tensorflow==2.5.0
Looking in indexes: https://pypi.org/simple, https://us-
python.pkg.dev/colabwheels/public/simple/
Requirement already satisfied: keras==2.7.0 in /usr/local/lib/python3.7/dist-
packages (2.7.0)Looking in indexes: https://pypi.org/simple, https://us-
python.pkg.dev/colab wheels/public/simple/
Requirement already satisfied: tensorflow==2.5.0 in
 /usr/local/lib/python3.7/dist-packages(2.5.0)
Requirement already satisfied: h5py~=3.1.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (3.1.0)
Requirement already satisfied: protobuf>=3.9.2 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (3.19.6)
Requirement already satisfied: typing-extensions~=3.7.4 in
/usr/local/lib/python3.7/dist packages(from tensorflow==2.5.0) (3.7.4.3)
```

```
Requirement already satisfied: keras-nightly~=2.5.0.dev in
/usr/local/lib/python3.7/dist packages(from tensorflow==2.5.0)
(2.5.0.dev2021032900)
Requirement already satisfied: flatbuffers~=1.12.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (1.12)
Requirement already satisfied: gast==0.4.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (0.4.0)
Requirement already satisfied: absl-py~=0.10 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (0.15.0)
Requirement already satisfied: astunparse~=1.6.3 in /usr/local/lib/python3.7/dist-
packages (fromtensorflow==2.5.0) (1.6.3)
Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in
 /usr/local/lib/python3.7/dist-packages (from tensorflow==2.5.0) (2.5.0)
Requirement already satisfied: tensorboard~=2.5 in /usr/local/lib/python3.7/dist-
packages (from tensorflow==2.5.0)(2.9.1)
Requirement already satisfied: opt-einsum~=3.3.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (3.3.0)
Requirement already satisfied: six~=1.15.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (1.15.0)
Requirement already satisfied: google-pasta~=0.2 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (0.2.0)
Requirement already satisfied: grpcio~=1.34.0 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.34.1)
Requirement already satisfied: wrapt~=1.12.1 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.12.1)
Requirement already satisfied: termcolor~=1.1.0 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.1.0)
Requirement already satisfied: keras-preprocessing~=1.1.2 in
/usr/local/lib/python3.7/distpackages (from tensorflow==2.5.0) (1.1.2)
Requirement already satisfied: wheel~=0.35 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (0.38.3)
Requirement already satisfied: numpy~=1.19.2 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.19.5)
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-
packages (fromh5py~=3.1.0->tensorflow==2.5.0) (1.5.2)
Requirement already satisfied: google-auth<3,>=1.6.3 in
/usr/local/lib/python3.7/dist packages(from tensorboard~=2.5-
>tensorflow==2.5.0) (2.14.1)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in
 /usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (0.6.1)Requirement already satisfied: tensorboard-
plugin-wit>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (1.8.1)Requirement already satisfied: google-auth-
oauthlib<0.5,>=0.4.1 in
/usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (0.4.6) Requirement already satisfied: werkzeug>=1.0.1 in
/usr/local/lib/python3.7/dist-packages  (fromtensorboard~=2.5-
>tensorflow==2.5.0) (1.0.1)
Requirement already satisfied: markdown>=2.6.8 in
 /usr/local/lib/python3.7/dist-packages(from tensorboard~=2.5-
 >tensorflow==2.5.0) (3.4.1)
```

```
Requirement already satisfied: requests<3,>=2.21.0 in
/usr/local/lib/python3.7/dist packages(from tensorboard~=2.5-
>tensorflow==2.5.0) (2.23.0)
Requirement already satisfied: setuptools>=41.0.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorboard~=2.5-
 >tensorflow==2.5.0) (57.4.0)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-
packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0)
(4.9) Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.7/dist packages (from google- auth<3,>=1.6.3-
>tensorboard~=2.5->tensorflow==2.5.0) (0.2.8) Requirement already satisfied:
cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.7/dist packages (from google-
auth<3,>=1.6.3-
>tensorboard~=2.5->tensorflow==2.5.0) (5.2.0) Requirement already
satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist packages
(from google-auth- oauthlib<0.5,>=0.4.1->tensorboard~=2.5-
>tensorflow==2.5.0)  (1.3.1)
Requirement         already         satisfied:         importlib-metadata>=4.4         in
/usr/local/lib/python3.7/dist packages(from markdown>=2.6.8->tensorboard~=2.5-
>tensorflow==2.5.0)   (4.13.0)   Requirement   already  satisfied:   zipp>=0.5   in
/usr/local/lib/python3.7/dist-packages (from  importlib-metadata>=4.4-
>markdown>=2.6.8->tensorboard~=2.5->tensorflow==2.5.0)  (3.10.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in
/usr/local/lib/python3.7/dist packages(from pyasn1-modules>=0.2.1->google-
auth<3,>=1.6.3->tensorboard~=2.5-
>tensorflow==2.5.0) (0.4.8)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
 /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard~=2.5-
>tensorflow==2.5.0) (1.24.3)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-
 packages (fromrequests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0)
 (2.10)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-
packages (fromrequests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0)
(3.0.4) Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.7/dist-packages  (from
requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (2022.9.24)
Requirement alreadysatisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-
packages (from requests- oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1-
>tensorboard~=2.5- >tensorflow==2.5.0) (3.2.2)
```

Image Augmentation

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal
_flip=True,v ertical_flip=False)
test_datagen=ImageDataGenerator(rescale=
1./255)ls
pwd
/content
import os, types
import pandas as
pd
from botocore.client import
Configimport ibm_boto3
def__iter_(self): return 0
```

```
# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It
includes your credentials.
# You might want to remove those credentials before you share the
notebook. client_4ff9f1114db24196a9abd4f5c1f0b60a =
ibm_boto3.client(service_name='s3',
ibm_api_key_id='j4lNXssktSSxQiDx3pbNR_eFi1SMCDE6MFnBQ_
EmNCDM',
ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
config=Config(signature_version='oauth'),
endpoint_url='https://s3.private.us.cloud-object-
storage.appdomain.cloud')
streaming_body_1 =
client_4ff9f1114db24196a9abd4f5c1f0b60a.get_object(Bucket='trainmodel-
donotdelete-pr-cbqe37eh8gzesa', Key='fruit-dataset.zip')['Body']
# Your data file was loaded into a botocore.response.StreamingBody object. #
Please read the documentation of ibm_boto3 and pandas to learn more about the
possibil ities to load the data.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/ # pandas
documentation:http://pandas.pydata.org/
from io import
BytesIOimport
zipfile
unzip =
zipfile.ZipFile(BytesIO(streaming_body_1.read()),
"r")file_paths = unzip.namelist()
for path in file_paths:
 unzip.extract(pat
h) pwd
'/home/wsuser/w
ork'import os
filenames = os.listdir('/home/wsuser/work/fruit-dataset/train')
x_train=train_datagen.flow_from_directory("/home/wsuser/work/fruit
dataset/train",target_size=(128,128),class_mode='categorical',batch_size=24
) Found 5384images belonging to 6 classes.
x_test=test_datagen.flow_from_directory(r"/home/wsuser/work/fruit
dataset/test",target_size=(128,128),
 class_mode='categorical',batch_size
=24) Found 1686 images belonging
to 6 classes.x_train.class_indices
```

```
{'Apple__Black_rot': 0, 'Apple_healthy': 1, 'Corn_(maize)_____Northern_Leaf_Blight': 2,
 'Corn_(maize)_healthy': 3, 'Peach_Bacterial_spot': 4, 'Peach__healthy': 5}
```

CNN

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import
Dense,Convolution2D,MaxPooling2D,Flatten model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activatio
n='relu')) model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten(
))
model.summary()
Model:
"sequential_1"
```

```
_____________________________________________________________Layer
(type)Output Shape Param #
==============================================================
==
conv2d_1 (Conv2D) (None, 126, 126, 32) 896

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

flatten (Flatten) (None, 127008) 0

==============================================================
==
Total params: 896
Trainable params: 896
Non-trainable
params: 0
32*(3*3*3+1)
896
#Hidden Layers
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))

Output Layers

model.add(Dense(6,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accu
racy']) len(x_train)
225
1238/24
51.583333333333336
model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_te
st,validatio n_steps=len(x_test),epochs=10)
/tmp/wsuser/ipykernel_164/1582812018.py:1: UserWarning:
`Model.fit_generator` is deprecated and will be removed in a future version.
Please use `Model.fit`, which supportsgenerators.

model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validat
ion
_steps=len(x_test),epochs=1
0)Epoch 1/10
```

```
225/225 [=================================] - 118s 520ms/step - loss: 0.8920 -
accuracy:  0.8094 - val_loss: 0.2273 - val_accuracy:
0.9235Epoch 2/10
225/225 [=================================] - 116s 515ms/step - loss: 0.2367 -
accuracy:  0.9179 - val_loss: 0.2056 - val_accuracy:
0.9324Epoch 3/10
225/225 [=================================] - 116s 517ms/step - loss: 0.1970 -
accuracy:  0.9337 - val_loss: 0.4972 - val_accuracy:
0.8754Epoch 4/10
```

```
225/225 [==============================] - 117s 521ms/step - loss: 0.1688 -
accuracy:  0.9422 - val_loss: 0.2279 - val_accuracy:
0.9217Epoch 5/10
225/225 [==============================] - 116s 516ms/step - loss: 0.1438 -
accuracy:  0.9487 - val_loss: 0.1685 - val_accuracy:
0.9484Epoch 6/10
225/225 [==============================] - 117s 518ms/step - loss: 0.1362 -
accuracy:  0.9556 - val_loss: 0.1176 - val_accuracy:
0.9662Epoch 7/10
225/225 [==============================] - 116s 515ms/step - loss: 0.1282 -
accuracy:  0.9590 - val_loss: 0.5466 - val_accuracy:
0.8387Epoch 8/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1282 -
accuracy:  0.9597 - val_loss: 0.1194 - val_accuracy:
0.9620Epoch 9/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1141 -
accuracy:  0.9616 - val_loss: 0.1478 - val_accuracy:
0.9508Epoch 10/10
225/225 [==============================] - 116s 516ms/step - loss: 0.0927 -
accuracy:  0.9695 - val_loss: 0.0772 - val_accuracy: 0.9751
<keras.callbacks.History at 0x7f71e8184070>
```

Saving Model

```
ls
fruit-dataset/
model.save('fruit.
h5')
!tar -zcvf Train-model_new.tgz
fruit.h5fruit.h5
ls -1
fruit-
dataset/
fruit.h5
Train-model_new.tgz
```

IBM Cloud Deployment Model

```
!pip install watson-machine-learning-client –
upgradeCollecting watson-machine-learning-
client
```

```
 Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538 kB)
 |████████████████████████████████| 538 kB 21.2 MB/s eta
0:00:01 Requirement already satisfied: tqdm in /opt/conda/envs/Python-
3.9/lib/python3.9/site packages(from watson-machine-learning-client) (4.62.3)
Requirement already satisfied: certifi in /opt/conda/envs/Python-
3.9/lib/python3.9/site packages(from watson-machine-learning-client)
(2022.9.24)
```

```
Requirement already satisfied: requests in /opt/conda/envs/Python-
3.9/lib/python3.9/sitepackages (from watson-machine-learning-client)
(2.26.0)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-
3.9/lib/python3.9/sitepackages (from watson-machine-learning-client)
(0.8.9)
Requirement already satisfied: ibm-cos-sdk in /opt/conda/envs/Python
3.9/lib/python3.9/site- packages (from watson-machine-learning-client) (2.11.0)
Requirement already satisfied: pandasin /opt/conda/envs/Python-
3.9/lib/python3.9/site packages (from watson-machine-learning- client) (1.3.4)
Requirement already satisfied: lomond in /opt/conda/envs/Python-
3.9/lib/python3.9/sitepackages (from watson-machine-learning-client)
(0.3.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site packages(from watson-machine-learning-client) (1.18.21)
Requirement already satisfied: urllib3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site packages(from watson-machine-learning-client) (1.26.7)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from boto3->watson-
machine-learning-client) (0.10.0) Requirement already satisfied:
s3transfer<0.6.0,>=0.5.0 in /opt/conda/envs/Python 3.9/lib/python3.9/site-
packages (from boto3->watson-machine-learning-client) (0.5.0) Requirement
already satisfied: botocore<1.22.0,>=1.21.21 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client)
(1.21.41) Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from
botocore<1.22.0,>=1.21.21->boto3->watson machine-learning-client) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/envs/Python-
3.9/lib/python3.9/site packages (from python-dateutil<3.0.0,>=2.1-
>botocore<1.22.0,>=1.21.21->boto3->watsonmachine-learning-client)
(1.15.0)
Requirement already satisfied: ibm-cos-sdk-core==2.11.0 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from ibm-cos-sdk-
>watson-machine-learning-client) (2.11.0) Requirement already satisfied: ibm-
cos-sdk-s3transfer==2.11.0 in /opt/conda/envs/Python 3.9/lib/python3.9/site-
packages (from ibm-cos-sdk->watson-machine-learning-client) (2.11.0)
Requirement already satisfied: charset-normalizer~=2.0.0 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from requests->watson-
machine-learning-client) (2.0.4) Requirement already satisfied: idna<4,>=2.5 in
/opt/conda/envs/Python 3.9/lib/python3.9/site- packages (from requests->watson-
machine-learning-client) (3.3) Requirement already satisfied: pytz>=2017.3 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from pandas->watson-
machine-learning-client) (2021.3) Requirement already satisfied: numpy>=1.17.3
in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from pandas-
>watson-machine-learning-client) (1.19.5) Installing collected packages:
watson-machine-learning-client Successfully installed watson-machine-
learning-client-1.0.391
from ibm_watson_machine_learning import
APIClientwml_credentials = {
 "url": "https://us-south.ml.cloud.ibm.com",
 "apikey":"0P3XkyCFYqABnc48BNG2ReoGAJy-
 oDXDRuULl4Y_zFxa"
 }
client = APIClient(wml_credentials)
def guid_from_space_name(client, space_name):
 space = client.spaces.get_details()
 return(next(item for item in space['resources'] if
item['entity']["name"]==space_name)['metadata']['id'])
space_uid = guid_from_space_name(client,
'Trainmodel')print("Space UID = " + space_uid)
Space UID = 616c7d74-e99b-4c09-9922-27394a62c2d0
client.set.default_space(space_uid)
‘SUCCESS’
client.software_specifications.list()
NAME ASSET_ID TYPE
default_py3.6 0062b8c9-8b7d-44a0-a9b9-46c416adcbd9 base kernel-spark3.2-
scala2.12 020d69ce-7ac1-5e68-ac1a-31189867356a base pytorch-onnx_1.3-py3.7-
edt 069ea134-3346- 5748-b513-49120e15d288 base scikit-learn_0.20-py3.6
09c5a1d0-9c1e-4473-a344- eb7b665ff687 base spark-mllib_3.0-scala_2.12
09f4cff0-90a7-5899-b9ed-1ef348aebdee base pytorch-onnx_rt22.1-py3.9
0b848dd4-e681-5599-be41-b5f6fccc6471 base ai-function_0.1-py3.60cdb0f1e-
5376-4f4d-92dd-da3b69aa9bda base shiny-r3.6 0e6e79df-875e-4f24-8ae9-
62dcc2148306 base
tensorflow_2.4-py3.7-horovod 1092590a-307d-563d-9b62-4eb7d64b3f22 base
pytorch_1.1- py3.6 10ac12d6-6b30-4ccd-8392-3e922c096a92 base
tensorflow_1.15-py3.6-ddl 111e41b3- de2d-5422-a4d6-bf776828c4b7 base
runtime-22.1-py3.9 12b83a17-24d8-5082-900f- 0ab31fbfd3cb base scikit-
learn_0.22-py3.6 154010fa-5b3b-4ac1-82af-4d5ee5abbc85 base default_r3.6
1b70aec3-ab34-4b87-8aa0-a4a3c8296a36 base pytorch-onnx_1.3-py3.6 1bc6029a-
cc97-56da-b8e0-39c3880dbbe7 base kernel-spark3.3-r3.6 1c9e5454-f216-59dd-
a20e- 474a5cdf5988 base pytorch-onnx_rt22.1-py3.9-edt 1d362186-7ad5-5b59-
8b6c-9d0880bde37f base tensorflow_2.1-py3.6 1eb25b84-d6ed-5dde-b6a5-
3fbdf1665666 base spark-mllib_3.2 20047f72-0a98-58c7-9ff5-a77b012eb8f5 base
tensorflow_2.4-py3.8-horovod 217c16f6-178f- 56bf-824a-b19f20564c49 base
runtime-22.1-py3.9-cuda 26215f05-08c3-5a41-a1b0- da66306ce658 base
do_py3.8 295addb5-9ef9-547e-9bf4-92ae3563e720 base autoai-ts_3.8-py3.8
2aa0c932-798f-5ae9-abd6-15e0c2402fb5 base tensorflow_1.15-py3.6 2b73a275-
7cbf-420b- a912-eae7f436e0bc base kernel-spark3.3-py3.9 2b7961e2-e3b1-5a8c-
a491-482c8368839a base pytorch_1.2-py3.6 2c8ef57d-2687-4b7d-acce-
01f94976dac1 base spark-mllib_2.3 2e51f700- bca0-4b0d-88dc-5c6791338875
base pytorch-onnx_1.1-py3.6-edt 32983cea-3f32-4400-8965- dde874a8d67e base
spark-mllib_3.0-py37 36507ebe-8770-55ba-ab2a-eafe787600e9 base spark-
mllib_2.4 390d21f8-e58b-4fac-9c55-d7ceda621326 base xgboost_0.82-py3.6
39e31acd-5f30- 41dc-ae44-60233c80306e base pytorch-onnx_1.2-py3.6-edt
40589d0e-7019-4e28-8daa- fb03b6f4fe12 base default_r36py38 41c247d3-45f8-
```

5a71-b065-8580229facf0 base
autoai-ts_rt22.1-py3.9 4269d26e-07ba-5d40-8f66-2d495b0c71f7 base autoai-obm_3.0 42b92e18-d9ab-567f-988a-4240ba1ed5f7 base pmml-3.0_4.3 493bcb95-16f1-5bc5-bee8- 81b8af80e9c7 base spark-mllib_2.4-r_3.6 49403dff-92e9-4c87-a3d7-a42d0021c095 base xgboost_0.90-py3.6 4ff8d6c2-1343-4c18-85e1-689c965304d3 base pytorch-onnx_1.1-py3.6 50f95b2a-bc16-43bb-bc94-b0bed208c60b base autoai-ts_3.9-py3.8 52c57136-80fa-572e-8728-a5e7cbb42cde base spark-mllib_2.4-scala_2.11 55a70f99-7320-4be5-9fb9-9edb5a443af5 base spark-mllib_3.0 5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9 base autoai-obm_2.0 5c2e37fa-80b8-
5e77-840f-d912469614ee base spss-modeler_18.1 5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b basecuda-py3.8 5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e base autoai-kb_3.1-py3.7 632d4b22-10aa- 5180-88f0-f52dfb6444d7 base pytorch-onnx_1.7-py3.8 634d3cdc-b562-5bf9-a2d4-

```
ea90a478456b base spark-mllib_2.3-r_3.6 6586b9e3-ccd6-4f92-900f-
0f8cb2bd6f0c base tensorflow_2.4-py3.7 65e171d7-72d1-55d9-8ebb-
f813d620c9bb base spss-modeler_18.2 687eddc9-028a-4117-b9dd-e57b36f1efa5
base ------------------------------------------------------------------------------------------------------------------------
- - - - - - -

Note: Only first 50 records were displayed. To display more use 'limit'
parameter. software_space_uid =
client.software_specifications.get_uid_by_name("tensorflow_rt22.1-py3.9")
software_spec_uid
‘1eb25b84-d6ed-5dde-b6a5-
3fbdf1665666'ls
fruit-dataset/ fruit.h5 Train-model_new.tgz
model_details = client.repository.store_model(model= 'Train-model_new.tgz',
meta_props={client.repository.ModelMetaNames.NAME:"CNN",
client.repository.ModelMetaNames.TYPE:"tensorflow_2.7",
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_space_
uid} ) model_id = client.repository.get_model_id(model_details)
model_id
'd0aeb6a2-e89c-4f8d-bf2f-
a28ca4ea3cca'ls
fruit-dataset/ fruit.h5 Train-
model_new.tgzTest The Model
import numpy as np
from tensorflow.keras.models import
load_model from
tensorflow.keras.preprocessing import
imagemodel=load_model('fruit.h5')
#@title
img=image.load_img(r"C:\Users\LENOVO\Desktop\fruit-dataset\fruit
dataset\test\00fca0da-2db3-481b-b98a
9b67bb7b105c_RS_HL
7708.JPG",target_size=(128,128))img
img=image.load_img(r"C:\Users\LENOVO\Desktop\ibm\Dataset Plant
Disease\fruit dataset\fruit-dataset\test\Apple
__________________________healthy\0adc1c5b-8958-47c0-a152- f28078c214f1
__________________________RS_HL7825.JPG",target_size=(128,128))
img
```

```
x=image.img_to_array(img)X
array([[[ 99., 86., 106.],
 [101., 88., 108.],
 [118., 105., 125.],
 ...,
 [ 92., 83., 102.],
 [ 93., 84., 103.],
 [ 89., 80., 99.]],
 [[ 96., 83., 103.],
 [ 87., 74., 94.],
 [102., 89., 109.],
 ...,
 [ 88., 79., 98.],
 [ 89., 80., 99.],
 [ 83., 74., 93.]],
 [[ 86., 73., 93.],
 [ 88., 75., 95.],
 [ 98., 85., 105.],
 ...,
 [107., 98., 117.],
 [ 96., 87., 106.],
 [ 96., 87., 106.]],
 ...,
 [[172., 175., 194.],
 [173., 176., 195.],
 [175., 178., 197.],
 ...,
 [179., 180., 198.],
 [184., 185., 203.],
 [179., 180., 198.]],
 [[172., 175., 194.],
 [170., 173., 192.],
 [173., 176., 195.],
 ...,
 [178., 179., 197.],
 [182., 183., 201.],
 [178., 179., 197.]],
 [[169., 172., 191.],
 [166., 169., 188.],
 [168., 171., 190.],
 ...,
 [187., 188., 206.],
 [185., 186., 204.],
 [186., 187., 205.]]], dtype=float32)
```

```
x=np.expand_dims(x,axis=0)X
array([[[[ 99., 86., 106.],
 [101., 88., 108.],
 [118., 105., 125.],
 ...,
 [ 92., 83., 102.],
 [ 93., 84., 103.],
 [ 89., 80., 99.]],
 [[ 96., 83., 103.],
 [ 87., 74., 94.],
 [102., 89., 109.],
 ...,
 [ 88., 79., 98.],
 [ 89., 80., 99.],
 [ 83., 74., 93.]],
 [[ 86., 73., 93.],
 [ 88., 75., 95.],
 [ 98., 85., 105.],
 ...,
 [107., 98., 117.],
 [ 96., 87., 106.],
 [ 96., 87., 106.]],
 ...,
 [[172., 175., 194.],
 [173., 176., 195.],
 [175., 178., 197.],
 ...,
 [179., 180., 198.],
 [184., 185., 203.],
 [179., 180., 198.]],
 [[172., 175., 194.],
 [170., 173., 192.],
 [173., 176., 195.],
 ...,
 [178., 179., 197.],
 [182., 183., 201.],
 [178., 179., 197.]],
 [[169., 172., 191.],
 [166., 169., 188.],
 [168., 171., 190.],
 ...,
 [187., 188., 206.],
 [185., 186., 204.],
 [186., 187., 205.]]]], dtype=float32)
y=np.argmax(model.predict(x),axis=1)
1/1 [==============================] - 0s 105ms/step
```

```
x_train.class_indices
{'Apple__Black_rot': 0, 'Apple_healthy': 1, 'Corn_(maize)_____Northern_Leaf_Blight': 2,
 'Corn_(maize)_healthy': 3, 'Peach_____________________Bacterial_spot': 4,
'Peach_________healthy': 5} index=['Apple_____________Black_rot','Apple
_______________healthy','Corn_(maize)
_______________Northern_Leaf_Blight','Corn
_(maize)__healthy','Peach_Bacterial_spot','Peach
__________healthy']index[y[0]]
```

```
'Apple__healthy'
img=image.load_img(r"C:\LENOVO\Desktop\ibm\Dataset Plant
Disease\fruit-dataset\fruitdataset\test\Peach_____healthy\0a2ed402-5d23-
4e8d-bc98-
b264aea9c3fb_Rutg._HL
2471.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''Peach_Bacterial_spot','Peach
_____________healthy']index[y[0]]
1/1 [==============================] - 0s 26ms/step
'Peach
_______health
y'import os
from tensorflow.keras.models import
load_model from
tensorflow.keras.preprocessing import
imagefrom flask import
Flask,render_template,request app=Flask(
name_) model=load_model("fruit.h5")
@app.route(
'/')def
index():
 return render_template("index.html")
@app.route('/predict',methods=['GET','P
OST'])def upload():
 if request.method=='POST':
 f=request.files['image']
 basepath=os.path.dirname('_file_')
 filepath=os.path.join(basepath,'uploads',f.file
 name) f.save(filepath)
 img=image.load_img(filepath,target_size=(1
 28,128))x=image.img_to_array(img)
 x=np.expand_dims(x,axis=0)
 pred=np.argmax(model.predict(x),axis=1)
 index=['Apple_Black_rot','Apple_healthy',
,'Peach__Bacterial_spot','Peachhealthy']
 text="The Classified Fruit disease is : "
 +str(index[pred[0]])return text
```

```
if___name_=='_main_':
 app.run(debug=False)
```

vegetable model :

```
ls
sample_dat
a/pwd
'/home/wsuser/work'
!pip install keras==2.7.0
```

```
!pip install tensorflow==2.5.0
Looking in indexes: https://pypi.org/simple, https://us-
python.pkg.dev/colabwheels/public/simple/
Requirement already satisfied: keras==2.7.0 in /usr/local/lib/python3.7/dist-
packages (2.7.0)Looking in indexes: https://pypi.org/simple, https://us-
python.pkg.dev/colab wheels/public/simple/
Requirement already satisfied: tensorflow==2.5.0 in
 /usr/local/lib/python3.7/dist-packages(2.5.0)
Requirement already satisfied: h5py~=3.1.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (3.1.0)
Requirement already satisfied: protobuf>=3.9.2 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (3.19.6)
Requirement already satisfied: typing-extensions~=3.7.4 in
/usr/local/lib/python3.7/dist packages(from tensorflow==2.5.0) (3.7.4.3)
Requirement already satisfied: keras-nightly~=2.5.0.dev in
/usr/local/lib/python3.7/dist packages(from tensorflow==2.5.0)
(2.5.0.dev2021032900)
Requirement already satisfied: flatbuffers~=1.12.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (1.12)
Requirement already satisfied: gast==0.4.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (0.4.0)
Requirement already satisfied: absl-py~=0.10 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (0.15.0)
Requirement already satisfied: astunparse~=1.6.3 in /usr/local/lib/python3.7/dist-
packages (fromtensorflow==2.5.0) (1.6.3)
Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in
 /usr/local/lib/python3.7/dist-packages (from tensorflow==2.5.0) (2.5.0)
Requirement already satisfied: tensorboard~=2.5 in /usr/local/lib/python3.7/dist-
packages (from tensorflow==2.5.0)(2.9.1)
Requirement already satisfied: opt-einsum~=3.3.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (3.3.0)
Requirement already satisfied: six~=1.15.0 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (1.15.0)
Requirement already satisfied: google-pasta~=0.2 in
 /usr/local/lib/python3.7/dist-packages(from tensorflow==2.5.0) (0.2.0)
Requirement already satisfied: grpcio~=1.34.0 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.34.1)
Requirement already satisfied: wrapt~=1.12.1 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.12.1)
Requirement already satisfied: termcolor~=1.1.0 in /usr/local/lib/python3.7/dist-packages
```

```
(fromtensorflow==2.5.0) (1.1.0)
Requirement already satisfied: keras-preprocessing~=1.1.2 in
/usr/local/lib/python3.7/distpackages (from tensorflow==2.5.0) (1.1.2)
Requirement already satisfied: wheel~=0.35 in /usr/local/lib/python3.7/dist-
 packages (fromtensorflow==2.5.0) (0.38.3)
Requirement already satisfied: numpy~=1.19.2 in /usr/local/lib/python3.7/dist-packages
(fromtensorflow==2.5.0) (1.19.5)
```

```
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-
packages (fromh5py~=3.1.0->tensorflow==2.5.0) (1.5.2)
Requirement already satisfied: google-auth<3,>=1.6.3 in
/usr/local/lib/python3.7/dist packages(from tensorboard~=2.5-
>tensorflow==2.5.0) (2.14.1)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in
 /usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (0.6.1)Requirement already satisfied: tensorboard-
plugin-wit>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (1.8.1)Requirement already satisfied: google-auth-
oauthlib<0.5,>=0.4.1 in
/usr/local/lib/python3.7/dist-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (0.4.6) Requirement already satisfied: werkzeug>=1.0.1 in
/usr/local/lib/python3.7/dist-packages  (fromtensorboard~=2.5-
>tensorflow==2.5.0) (1.0.1)
Requirement already satisfied: markdown>=2.6.8 in
 /usr/local/lib/python3.7/dist-packages(from tensorboard~=2.5-
 >tensorflow==2.5.0) (3.4.1)
Requirement already satisfied: requests<3,>=2.21.0 in
/usr/local/lib/python3.7/dist packages(from tensorboard~=2.5-
>tensorflow==2.5.0) (2.23.0)
Requirement already satisfied: setuptools>=41.0.0 in
 /usr/local/lib/python3.7/dist-packages(from tensorboard~=2.5-
 >tensorflow==2.5.0) (57.4.0)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-
packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0)
(4.9) Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.7/dist packages (from google- auth<3,>=1.6.3-
>tensorboard~=2.5->tensorflow==2.5.0) (0.2.8) Requirement already satisfied:
cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.7/dist packages (from google-
auth<3,>=1.6.3-
>tensorboard~=2.5->tensorflow==2.5.0) (5.2.0) Requirement already
satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist packages
(from google-auth- oauthlib<0.5,>=0.4.1->tensorboard~=2.5-
>tensorflow==2.5.0)  (1.3.1)
Requirement already satisfied: importlib-metadata>=4.4 in
/usr/local/lib/python3.7/dist packages(from markdown>=2.6.8->tensorboard~=2.5-
>tensorflow==2.5.0) (4.13.0) Requirement already satisfied: zipp>=0.5 in
/usr/local/lib/python3.7/dist-packages (from  importlib-metadata>=4.4-
>markdown>=2.6.8->tensorboard~=2.5->tensorflow==2.5.0)  (3.10.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in
/usr/local/lib/python3.7/dist packages(from pyasn1-modules>=0.2.1->google-
auth<3,>=1.6.3->tensorboard~=2.5-
>tensorflow==2.5.0) (0.4.8)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
 /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard~=2.5-
>tensorflow==2.5.0) (1.24.3)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-
 packages (fromrequests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0)
 (2.10)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-
packages (fromrequests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0)
(3.0.4) Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.7/dist-packages  (from
requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (2022.9.24)
Requirement alreadysatisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-
packages (from requests- oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1-
>tensorboard~=2.5- >tensorflow==2.5.0) (3.2.2)
```

Image Augmentation

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal
_flip=True,v ertical_flip=False)
test_datagen=ImageDataGenerator(rescale=
1./255)ls
pwd
/content
import os, types
import pandas as
pd
from botocore.client import
Configimport ibm_boto3
def__iter__(self):
return 0#
@hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It
includes your credentials.
# You might want to remove those credentials before you share the
notebook. client_4ff9f1114db24196a9abd4f5c1f0b60a =
ibm_boto3.client(service_name='s3',
ibm_api_key_id='j4lNXssktSSxQiDx3pbNR_eFi1SMCDE6MFnBQ_
EmNCDM',
ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
config=Config(signature_version='oauth'),
endpoint_url='https://s3.private.us.cloud-object-
storage.appdomain.cloud')
streaming_body_1 =
client_4ff9f1114db24196a9abd4f5c1f0b60a.get_object(Bucket='trainmodel-
donotdelete-pr-cbqe37eh8gzesa', Key='vegetable-dataset.zip')['Body']
# Your data file was loaded into a botocore.response.StreamingBody object. #
Please read the documentation of ibm_boto3 and pandas to learn more about the
possibil ities to load the data.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/ # pandas
documentation:http://pandas.pydata.org/
from io import
BytesIOimport
zipfile
unzip =
zipfile.ZipFile(BytesIO(streaming_body_1.read()),
"r")file_paths = unzip.namelist()
for path in file_paths:
 unzip.extract(pat
h) pwd
'/home/wsuser/w
ork'import os
filenames = os.listdir('/home/wsuser/work/vegetable-dataset/train')
x_train=train_datagen.flow_from_directory("/home/wsuser/work/vegetable
dataset/train",target_size=(128,128),class_mode='categorical',batch_size=24
) Found 5384images belonging to 6 classes.
x_test=test_datagen.flow_from_directory(r"/home/wsuser/work/vegetable
dataset/test",target_size=(128,128),
 class_mode='categorical',batch_size
=24) Found 1686 images belonging
to 6 classes.x_train.class_indices
```

```
{'Tomato___Blight': 0, 'Tomato___healthy': 1, 'Corn_(maize)___Northern_Leaf_Blight': 2,
 'Corn_(maize)___healthy': 3, 'Potato___Blight': 4, 'Potato___healthy': 5}
```

CNN

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
model=Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.summary()
Model: "sequential_1"
_________________________________________________________________Layer (type)
Output Shape Param #
=================================================================
conv2d_1 (Conv2D) (None, 126, 126, 32) 896

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

flatten (Flatten) (None, 127008) 0

=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
32*(3*3*3+1)
896
#Hidden Layers
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

Output Layers

```
model.add(Dense(6,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)
225
1238/24
51.583333333333336
model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validatio
n_steps=len(x_test),epochs=10)
```

```
/tmp/wsuser/ipykernel_164/1582812018.py:1: UserWarning: `Model.fit_generator` is
deprecated and will be removed in a future version. Please use `Model.fit`, which supports
generators.
```

```
model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation
_steps=len(x_test),epochs=10)
Epoch 1/10
225/225 [==============================] - 118s 520ms/step - loss: 0.8920 -
accuracy:  0.8094 - val_loss: 0.2273 - val_accuracy: 0.9235
Epoch 2/10
225/225 [==============================] - 116s 515ms/step - loss: 0.2367 -
accuracy:  0.9179 - val_loss: 0.2056 - val_accuracy: 0.9324
Epoch 3/10
225/225 [==============================] - 116s 517ms/step - loss: 0.1970 -
accuracy:  0.9337 - val_loss: 0.4972 - val_accuracy: 0.8754
Epoch 4/10
225/225 [==============================] - 117s 521ms/step - loss: 0.1688 -
accuracy:  0.9422 - val_loss: 0.2279 - val_accuracy: 0.9217
Epoch 5/10
225/225 [==============================] - 116s 516ms/step - loss: 0.1438 -
accuracy:  0.9487 - val_loss: 0.1685 - val_accuracy: 0.9484
Epoch 6/10
225/225 [==============================] - 117s 518ms/step - loss: 0.1362 -
accuracy:  0.9556 - val_loss: 0.1176 - val_accuracy: 0.9662
Epoch 7/10
225/225 [==============================] - 116s 515ms/step - loss: 0.1282 -
accuracy:  0.9590 - val_loss: 0.5466 - val_accuracy: 0.8387
Epoch 8/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1282 -
accuracy:  0.9597 - val_loss: 0.1194 - val_accuracy: 0.9620
Epoch 9/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1141 -
accuracy:  0.9616 - val_loss: 0.1478 - val_accuracy: 0.9508
Epoch 10/10
225/225 [==============================] - 116s 516ms/step - loss: 0.0927 -
accuracy:  0.9695 - val_loss: 0.0772 - val_accuracy: 0.9751
<keras.callbacks.History at 0x7f71e8184070>
```

Saving Model

```
ls
vegetable-dataset/
model.save('vegetable.h5')
!tar -zcvf Train-model_new.tgz vegetable.h5
vegetable.h5
```

```
ls -1
vegetable-dataset/
vegetable.h5
Train-model_new.tgz
```

IBM Cloud Deployment Model

```
!pip install watson-machine-learning-client –upgrade
Collecting watson-machine-learning-client
 Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538 kB)
 |████████████████████████████████| 538 kB 21.2 MB/s eta 0:00:01
Requirement already satisfied: tqdm in /opt/conda/envs/Python-3.9/lib/python3.9/site packages
(from watson-machine-learning-client) (4.62.3)
Requirement already satisfied: certifi in /opt/conda/envs/Python-3.9/lib/python3.9/site packages
(from watson-machine-learning-client) (2022.9.24)
Requirement already satisfied: requests in /opt/conda/envs/Python-3.9/lib/python3.9/site
packages (from watson-machine-learning-client) (2.26.0)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-3.9/lib/python3.9/site
packages (from watson-machine-learning-client) (0.8.9)
Requirement already satisfied: ibm-cos-sdk in /opt/conda/envs/Python 3.9/lib/python3.9/site-
packages (from watson-machine-learning-client) (2.11.0) Requirement already satisfied: pandas
in /opt/conda/envs/Python-3.9/lib/python3.9/site packages (from watson-machine-learning-
client) (1.3.4)
Requirement already satisfied: lomond in /opt/conda/envs/Python-3.9/lib/python3.9/site
packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-3.9/lib/python3.9/site packages
(from watson-machine-learning-client) (1.18.21)
Requirement already satisfied: urllib3 in /opt/conda/envs/Python-3.9/lib/python3.9/site packages
(from watson-machine-learning-client) (1.26.7)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (0.10.0)
Requirement already satisfied: s3transfer<0.6.0,>=0.5.0 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (0.5.0)
Requirement already satisfied: botocore<1.22.0,>=1.21.21 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-client) (1.21.41)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from botocore<1.22.0,>=1.21.21->boto3->watson machine-
learning-client) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site
packages (from python-dateutil<3.0.0,>=2.1->botocore<1.22.0,>=1.21.21->boto3->watson
machine-learning-client) (1.15.0)
Requirement already satisfied: ibm-cos-sdk-core==2.11.0 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-machine-learning-client)  (2.11.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.11.0 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-machine-learning-client)  (2.11.0)
```

```
Requirement already satisfied: charset-normalizer~=2.0.0 in /opt/conda/envs/Python
3.9/lib/python3.9/site-packages (from requests->watson-machine-learning-client) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python 3.9/lib/python3.9/site-
packages (from requests->watson-machine-learning-client) (3.3) Requirement already satisfied:
pytz>=2017.3 in /opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from pandas->watson-
machine-learning-client) (2021.3) Requirement already satisfied: numpy>=1.17.3 in
/opt/conda/envs/Python 3.9/lib/python3.9/site-packages (from pandas->watson-machine-
learning-client) (1.19.5) Installing collected packages: watson-machine-learning-client
Successfully installed watson-machine-learning-client-1.0.391
from ibm_watson_machine_learning import APIClient
wml_credentials = {
 "url": "https://us-south.ml.cloud.ibm.com",
 "apikey":"0P3XkyCFYqABnc48BNG2ReoGAJy-oDXDRuULl4Y_zFxa"
 }
client = APIClient(wml_credentials)
def guid_from_space_name(client, space_name):
 space = client.spaces.get_details()
 return(next(item for item in space['resources'] if item['entity']["name"]==space_name)['m
etadata']['id'])
space_uid = guid_from_space_name(client, 'Trainmodel')
print("Space UID = " + space_uid)
Space UID = 616c7d74-e99b-4c09-9922-27394a62c2d0
client.set.default_space(space_uid)
‘SUCCESS’
client.software_specifications.list()
NAME ASSET_ID TYPE
default_py3.6 0062b8c9-8b7d-44a0-a9b9-46c416adcbd9 base kernel-spark3.2-scala2.12
020d69ce-7ac1-5e68-ac1a-31189867356a base pytorch-onnx_1.3-py3.7-edt 069ea134-3346-
5748-b513-49120e15d288 base scikit-learn_0.20-py3.6 09c5a1d0-9c1e-4473-a344-
eb7b665ff687 base spark-mllib_3.0-scala_2.12 09f4cff0-90a7-5899-b9ed-1ef348aebdee base
pytorch-onnx_rt22.1-py3.9 0b848dd4-e681-5599-be41-b5f6fccc6471 base ai-function_0.1-py3.6
0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda base shiny-r3.6 0e6e79df-875e-4f24-8ae9-
62dcc2148306 base
tensorflow_2.4-py3.7-horovod 1092590a-307d-563d-9b62-4eb7d64b3f22 base pytorch_1.1-
py3.6 10ac12d6-6b30-4ccd-8392-3e922c096a92 base tensorflow_1.15-py3.6-ddl 111e41b3-
de2d-5422-a4d6-bf776828c4b7 base runtime-22.1-py3.9 12b83a17-24d8-5082-900f-
0ab31fbfd3cb base scikit-learn_0.22-py3.6 154010fa-5b3b-4ac1-82af-4d5ee5abbc85 base
default_r3.6 1b70aec3-ab34-4b87-8aa0-a4a3c8296a36 base pytorch-onnx_1.3-py3.6 1bc6029a-
cc97-56da-b8e0-39c3880dbbe7 base kernel-spark3.3-r3.6 1c9e5454-f216-59dd-a20e-
474a5cdf5988 base pytorch-onnx_rt22.1-py3.9-edt 1d362186-7ad5-5b59-8b6c-9d0880bde37f
base tensorflow_2.1-py3.6 1eb25b84-d6ed-5dde-b6a5-3fbdf1665666 base spark-mllib_3.2
20047f72-0a98-58c7-9ff5-a77b012eb8f5 base tensorflow_2.4-py3.8-horovod 217c16f6-178f-
56bf-824a-b19f20564c49 base runtime-22.1-py3.9-cuda 26215f05-08c3-5a41-a1b0-
da66306ce658 base do_py3.8 295addb5-9ef9-547e-9bf4-92ae3563e720 base autoai-ts_3.8-py3.8
2aa0c932-798f-5ae9-abd6-15e0c2402fb5 base tensorflow_1.15-py3.6 2b73a275-7cbf-420b-
a912-eae7f436e0bc base kernel-spark3.3-py3.9 2b7961e2-e3b1-5a8c-a491-482c8368839a base
```

```
pytorch_1.2-py3.6 2c8ef57d-2687-4b7d-acce-01f94976dac1 base spark-mllib_2.3 2e51f700-
bca0-4b0d-88dc-5c6791338875 base pytorch-onnx_1.1-py3.6-edt 32983cea-3f32-4400-8965-
dde874a8d67e base spark-mllib_3.0-py37 36507ebe-8770-55ba-ab2a-eafe787600e9 base spark-
mllib_2.4 390d21f8-e58b-4fac-9c55-d7ceda621326 base xgboost_0.82-py3.6 39e31acd-5f30-
41dc-ae44-60233c80306e base pytorch-onnx_1.2-py3.6-edt 40589d0e-7019-4e28-8daa-
fb03b6f4fe12 base default_r36py38 41c247d3-45f8-5a71-b065-8580229facf0 base
autoai-ts_rt22.1-py3.9 4269d26e-07ba-5d40-8f66-2d495b0c71f7 base autoai-obm_3.0
42b92e18-d9ab-567f-988a-4240ba1ed5f7 base pmml-3.0_4.3 493bcb95-16f1-5bc5-bee8-
81b8af80e9c7 base spark-mllib_2.4-r_3.6 49403dff-92e9-4c87-a3d7-a42d0021c095 base
xgboost_0.90-py3.6 4ff8d6c2-1343-4c18-85e1-689c965304d3 base pytorch-onnx_1.1-py3.6
50f95b2a-bc16-43bb-bc94-b0bed208c60b base autoai-ts_3.9-py3.8 52c57136-80fa-572e-8728-
a5e7cbb42cde base spark-mllib_2.4-scala_2.11 55a70f99-7320-4be5-9fb9-9edb5a443af5 base
spark-mllib_3.0 5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9 base autoai-obm_2.0 5c2e37fa-80b8-
5e77-840f-d912469614ee base spss-modeler_18.1 5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b base
cuda-py3.8 5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e base autoai-kb_3.1-py3.7 632d4b22-10aa-
5180-88f0-f52dfb6444d7 base pytorch-onnx_1.7-py3.8 634d3cdc-b562-5bf9-a2d4-
ea90a478456b base spark-mllib_2.3-r_3.6 6586b9e3-ccd6-4f92-900f-0f8cb2bd6f0c base
tensorflow_2.4-py3.7 65e171d7-72d1-55d9-8ebb-f813d620c9bb base spss-modeler_18.2
687eddc9-028a-4117-b9dd-e57b36f1efa5 base ----------------------------------------------------------------------------------
- - - - - - -
Note: Only first 50 records were displayed. To display more use 'limit' parameter.
software_space_uid = client.software_specifications.get_uid_by_name("tensorflow_rt22.1-
py3.9")
software_spec_uid
‘1eb25b84-d6ed-5dde-b6a5-3fbdf1665666'
ls
vegetable-dataset/ vegetable.h5 Train-model_new.tgz
model_details = client.repository.store_model(model= 'Train-model_new.tgz',  meta_props={
client.repository.ModelMetaNames.NAME:"CNN",
client.repository.ModelMetaNames.TYPE:"tensorflow_2.7",
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_space_uid} )
model_id = client.repository.get_model_id(model_details)
model_id
'd0aeb6a2-e89c-4f8d-bf2f-a28ca4ea3cca'
ls
vegetable-dataset/ vegetable.h5 Train-model_new.tgz
```

Test The Model

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model=load_model('vegetable.h5')
#@title
img=image.load_img(r"C:\Users\LENOVO\Desktop\vegetable-dataset\vegetable
dataset\test\00fca0da-2db3-481b-b98a
9b67bb7b105c___RS_HL 7708.JPG",target_size=(128,128))
img
```

```
img=image.load_img(r"C:\Users\LENOVO\Desktop\ibm\Dataset Plant Disease\vegetable dataset\vegetable-dataset\test\Tomato___healthy\0adc1c5b-8958-47c0-a152-f28078c214f1___RS_HL 7825.JPG",target_size=(128,128))
img
```

```
x=image.img_to_array(img)
X
array([[[ 99., 86., 106.],
 [101., 88., 108.],
 [118., 105., 125.],
 ...,
 [ 92., 83., 102.],
 [ 93., 84., 103.],
 [ 89., 80., 99.]],
 [[ 96., 83., 103.],
 [ 87., 74., 94.],
 [102., 89., 109.],
 ...,
 [ 88., 79., 98.],
 [ 89., 80., 99.],
 [ 83., 74., 93.]],
 [[ 86., 73., 93.],
 [ 88., 75., 95.],
 [ 98., 85., 105.],
 ...,
 [107., 98., 117.],
 [ 96., 87., 106.],
 [ 96., 87., 106.]],
 ...,
 [[172., 175., 194.],
 [173., 176., 195.],
 [175., 178., 197.],
 ...,
 [179., 180., 198.],
 [184., 185., 203.],
 [179., 180., 198.]],
 [[172., 175., 194.],
 [170., 173., 192.],
 [173., 176., 195.],
 ...,
 [178., 179., 197.],
 [182., 183., 201.],
 [178., 179., 197.]],
 [[169., 172., 191.],
 [166., 169., 188.],
 [168., 171., 190.],
 ...,
 [187., 188., 206.],
 [185., 186., 204.],
 [186., 187., 205.]]], dtype=float32) x=np.expand_dims(x,axis=0)
X
array([[[[ 99., 86., 106.],
 [101., 88., 108.],
 [118., 105., 125.],
 ...,
 [ 92., 83., 102.],
 [ 93., 84., 103.],
 [ 89., 80., 99.]],
 [[ 96., 83., 103.],
 [ 87., 74., 94.],
 [102., 89., 109.],
 ...,
 [ 88., 79., 98.],
 [ 89., 80., 99.],
 [ 83., 74., 93.]],
 [[ 86., 73., 93.],
 [ 88., 75., 95.],
 [ 98., 85., 105.],
 ...,
 [107., 98., 117.],
 [ 96., 87., 106.],
 [ 96., 87., 106.]],
 ...,
 [[172., 175., 194.],
 [173., 176., 195.],
 [175., 178., 197.],
 ...,
 [179., 180., 198.],
 [184., 185., 203.],
 [179., 180., 198.]],
 [[172., 175., 194.],
 [170., 173., 192.],
 [173., 176., 195.],
 ...,
 [178., 179., 197.],
 [182., 183., 201.],
 [178., 179., 197.]],
 [[169., 172., 191.],
 [166., 169., 188.],
 [168., 171., 190.],
 ...,
 [187., 188., 206.],
 [185., 186., 204.],
 [186., 187., 205.]]]], dtype=float32)
y=np.argmax(model.predict(x),axis=1)
1/1 [==============================] - 0s 105ms/step
x_train.class_indices
{'Tomato___Blight': 0, 'Tomato___healthy': 1, 'Corn_(maize)___Northern_Leaf_Blight': 2,
 'Corn_(maize)___healthy': 3, 'Potato___Blight': 4, 'Potato___healthy': 5}
index=['Tomato___Blight','Tomato___healthy','Corn_(maize)___Northern_Leaf_Blight','Cor
n_(maize)___healthy','Potato___Blight','Potato___healthy']
index[y[0]]
'Tomato___healthy'
img=image.load_img(r"C:\LENOVO\Desktop\ibm\Dataset Plant Disease\vegetable
dataset\vegetable-dataset\test\Potato___healthy\0a2ed402-5d23-4e8d-bc98-
b264aea9c3fb___Rutg._HL 2471.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=['Tomato___Blight','Tomato___healthy''Potato___Blight','Potato___healthy'] index[y[0]]
1/1 [==============================] - 0s 26ms/step
'Potato___healthy'
import os
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
from flask import Flask,render_template,request
```

```
app=Flask(_name_)
model=load_model("vegetable.h5")
@app.route('/')
def index():
 return render_template("index.html")
@app.route('/predict',methods=['GET','POST'])
def upload():
 if request.method=='POST':
 f=request.files['image']
 basepath=os.path.dirname('_file_')
 filepath=os.path.join(basepath,'uploads',f.filename)
 f.save(filepath)
 img=image.load_img(filepath,target_size=(128,128))
 x=image.img_to_array(img)
 x=np.expand_dims(x,axis=0)
 pred=np.argmax(model.predict(x),axis=1)
 index=['Tomato___Blight','Tomato___healthy', ,'Potato___Blight','Potato___healthy']
 text="The Classified Vegetable disease is : " +str(index[pred[0]]) return text
if__name_=='__main__':
 app.run(debug=False)
```

ibmapp.py

```
import requests
from tensorflow.keras.preprocessing import image from tensorflow.keras.models import
load_model
import numpy as np
import pandas as pd
import tensorflow as tf
from flask import Flask, request, render_template, redirect, url_for import os
from werkzeug.utils import secure_filename
app = Flask(_name_)
#load both the vegetable and fruit models
model = load_model("IBM-vegetable.h5")
model1=load_model("IBM-fruit.h5")
#home page
@app.route('/')
def home():
 return render_template('home.html')
#prediction page
@app.route('/prediction')
def prediction():
 return render_template('predict.html')
@app.route('/predict',methods=['POST'])
def predict():
 if request.method == 'POST':
 # Get the file from post request
 f = request.files['image']
 # Save the file to ./uploads
 basepath = os.path.dirname(_file_)
 file_path = os.path.join(
 basepath, 'uploads', secure_filename(f.filename)) f.save(file_path)
 img = image.load_img(file_path, target_size=(128, 128))
 x = image.img_to_array(img)
 x = np.expand_dims(x, axis=0)

 plant=request.form['plant']
 print(plant)
 if(plant=="vegetable"):
 preds = model.predict(x)
 preds=np.argmax(preds)
 print(preds)
 df=pd.read_excel('precautions - veg.xlsx') print(df.iloc[preds]['caution'])
 else:
 preds = model1.predict(x)
 preds=np.argmax(preds)
 df=pd.read_excel('precautions - fruits.xlsx') print(df.iloc[preds]['caution']
 return df.iloc[preds]['caution']

if _name_ == "_main_":
 app.run(debug=False)
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-10087-1659091352

Project Demo Link

https://drive.google.com/file/d/1wZ2_sxbCYNoV3QsXTqyCd7r57k99V2Eu/view?usp=sharing