Fertilizers Recommendation System For Disease Prediction

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

COMPUTER SCIENCE ENGINEERING

RVS COLLEGE OF ENGINEERING AND TECHNOLOGY,

COIMBATORE

ANNA UNIVERSITY:CHENNAI 600 025

NOVEMBER 2022

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INTRODUCTION:.....

Detection and recognition of plant diseases using machine learning are very efficient in providing symptoms of identifying diseases at its earliest. Plant pathologists can analyze the digital images using digital image processing for diagnosis of plant diseases. Application of computer vision and image processing strategies simply assist farmers in all of the regions of agriculture. Generally, the plant diseases are caused by the abnormal physiological functionalities of plants.

Therefore, the characteristic symptoms are generated based on the differentiation between normal physiological functionalities and abnormal physiological functionalities of the plants. Mostly, the plant leaf diseases are caused by Pathogens which are positioned on the stems of the plants.

PURPOSE:

Leaves are affected by bacteria, fungi, virus, and other insects. Support Vector Machine (SVM) algorithm classifies the leaf image as normal or affected. Vectors are constructed based on leaf features such as color, shape, textures. Then hyperplane constructed with conditions to categorize the preprocessed leaves and also implement multiclass classifier, to predict diseases in leaf image with improved accuracy.

Literature Review.....

[1] The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.

- Advantage:

  The prediction and diagnosing of leaf diseases are depending on the segmenta- tion such as segmenting the healthy tissues from diseased tissues of leaves.

- Disadvantages :

  This further research is implementing the proposed algorithm with the ex- isting public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.

[2] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems(ICIIECS), IEEE, 2017

- Advantages:

  The system detects the diseases on citrus leaves with 90%

accuracy.

- Disadvantages:

  System only able to detect the disease from citrus leaves. The main objective of this paper is image analysis & classification techniques for detection of leaf diseases and classification. The leaf image is firstly preprocessed and then does the further work. K-Means Clustering used for image segmentation and then system extract the GLCM features from disease detected images. The disease classification done through the SVM classifier.

- Algorithm used:

  Gray-Level Co-Occurrence Matrix (GLCM) features, SVM, KMeans Clustering .

[3] Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018

- Advantages:

  The system helps to compute the disease severity.

- Disadvantages:

  The system uses leaf images taken from an online dataset, so cannot¬ implement in real time. This paper mainly focuses on the detecting and classifying the leaf disease of soybean plant. Using SVM the proposed system classifies the leaf disease in 3 classes like i.e. downy mildew, frog eye, and septoria leaf blight etc. The proposed system gives maximum average classification accuracyreported is ~90% using a big dataset of 4775 images.

- Algorithm used: SVM.

[4] Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.

- Advantages:

  It is simple and cost effective system for plant leaf disease detection.

- Disadvantages:

  Any H/w failures may affect the system performance.

The current paper proposesan android application for irrigation and plant leaf disease detection with cloud and IoT. For monitoring irrigation system they use soil moisture and temperature sensor and sensor data send to the cloud. The user can also detect the plant leaf disease. K-means clustering used for feature extraction.

- Algorithm used:

  K-means clustering, Other than this there are some other levels which can be used for sentimental analysis these are- document level, sentence level, entity and aspect level to study positive and negative, interrogative, sarcastic, good and bad functionality, sentiment without sentiment, conditional sentence and author and reader understanding points.

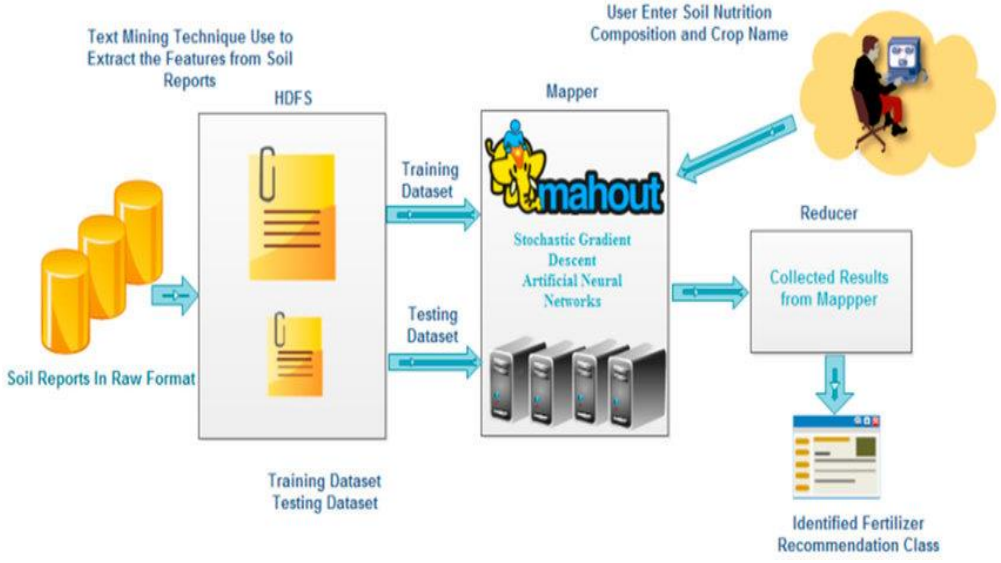
[5] The author proposes a method which helps us predict crop yield by suggesting the best crops. It also focuses on soil types in order to identify which crop should be planted in the field to increase productivity. In terms of crop yield, soil types are vital. By incorporating the weather details of the previous year into the equation, soil information can be obtained.

- Advantages :

  It allows us to predict which crops would be appropriate for a given¬ climate.Using the weather and disease related data sets, the crop quality can also be improved. Pre-diction algorithms help us to classify the data based on the disease, and data extracted fromthe classifier is used to predict soil and crop.

- Disadvantages :

  Due to the changing climatic conditions, accurate results cannot be predictedby this system.



PROBLEM STATEMENT:.....

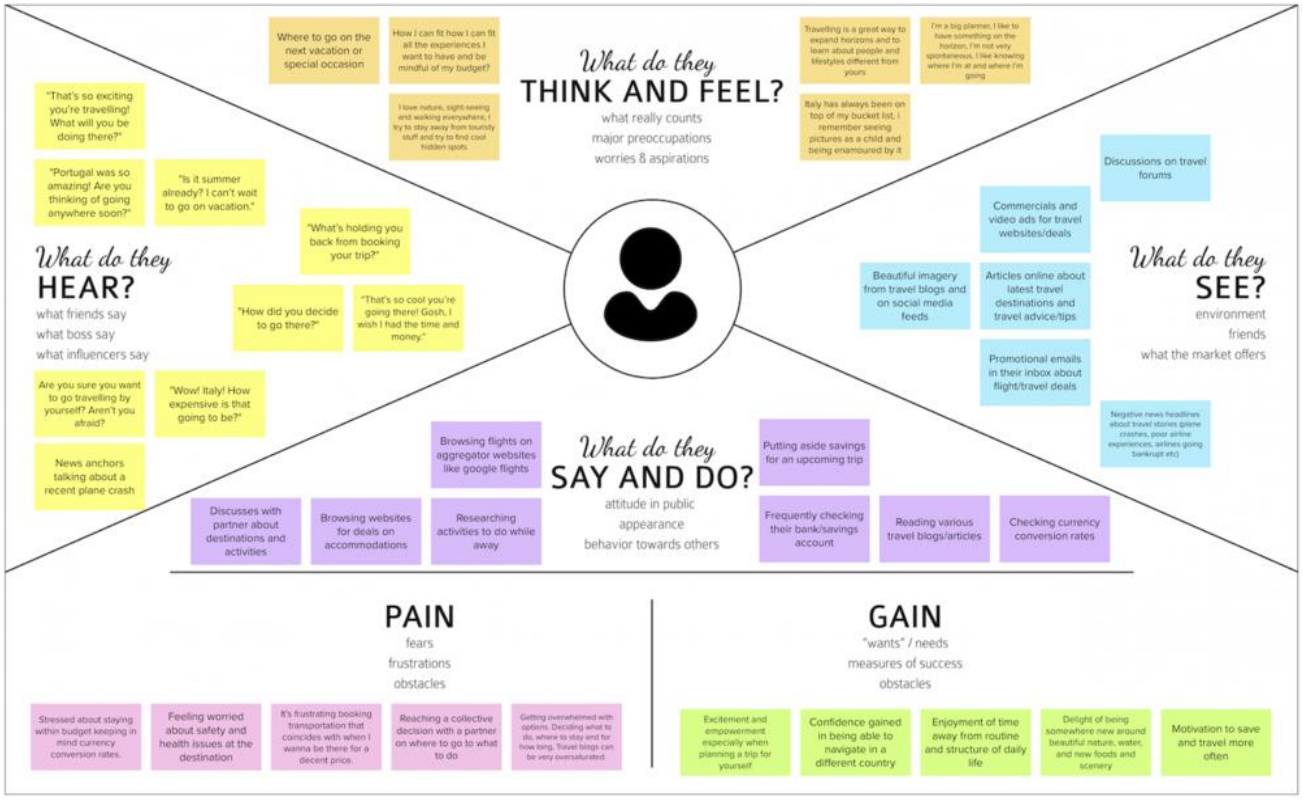
Mr.Narasimma Rao is a 65 years old man. He had a own farmingland and do Agriculture for past 30 Years , In this 30 Years he Faced a problem in Choosing Fertilizers and Controlling of Plant Disease. Narasimma Rao wants to know the better recommendation for

- fertilizers for plants with the disease. He has faced huge losses for a long time.
- This problem is usually faced by most farmers.
- Mr. Narasimma Rao needs to know the result immediately.

Who does the problem affect?	Persons who do Agriculture
What are the boundaries of theproblem?	People who Grow Crops and facing Issues of Plant Disease
What is the issue?	In agricultural aspects, if the plantis affected by leaf disease, then it reduces the growth and productiveness. Generally, the plant diseases are caused by the abnormal physiological functionalities of plants.
When does the issue occur?	During the development of the crops as they will be affected by various diseases.
What methodology used to solvethe issue?	Deep learning techniques are usedto identify the diseases and suggestthe precautions that can be taken for those diseases

EMPATHY MAP:……

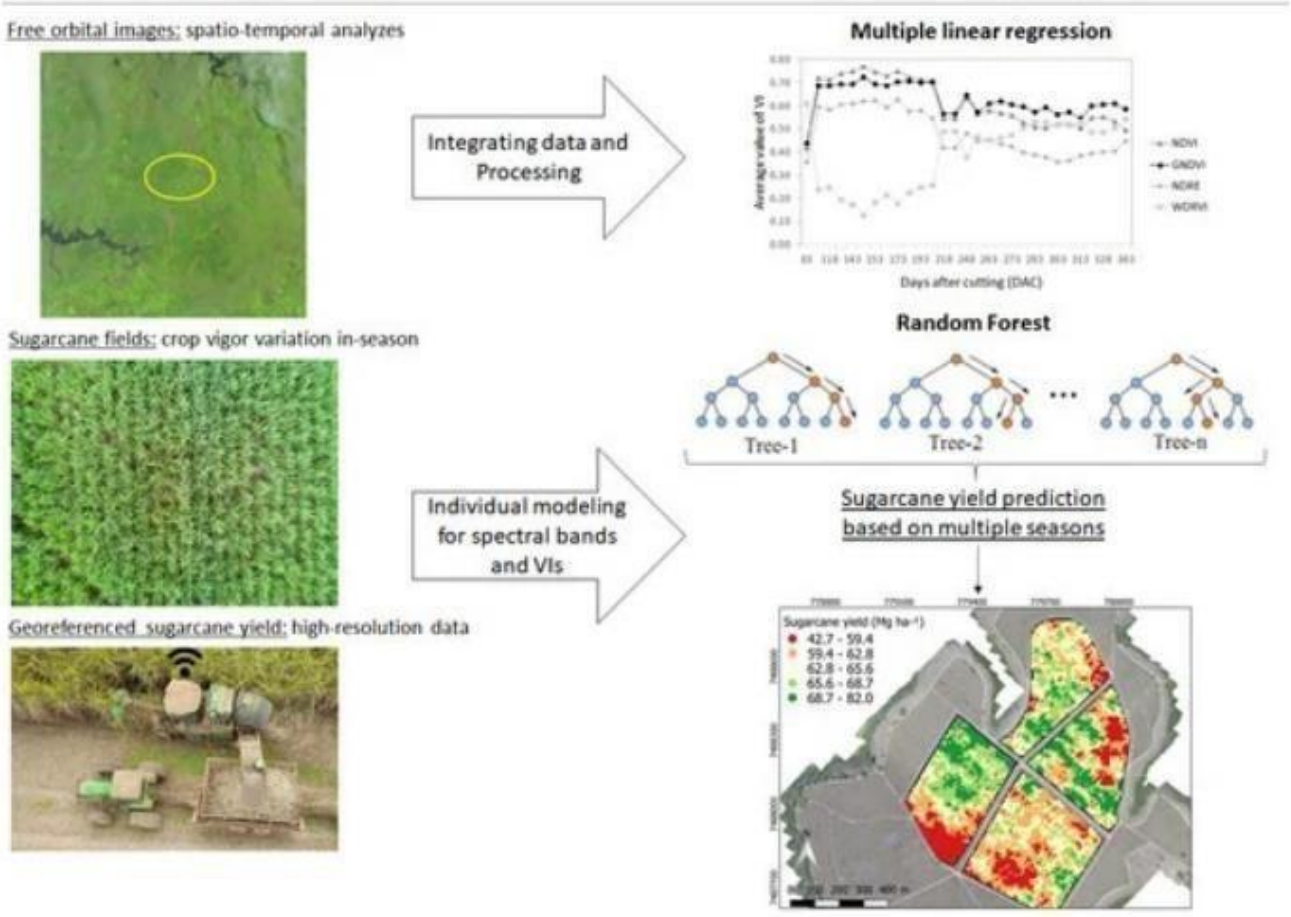
Agriculture is the main aspect of the economic development of a country. Agriculture is the heart and life of most Indians. By understanding their feelings and problems, we can create a better product and contribute to their lives. For our project, we are getting surveys from farmers to understand what they truly require and desire.

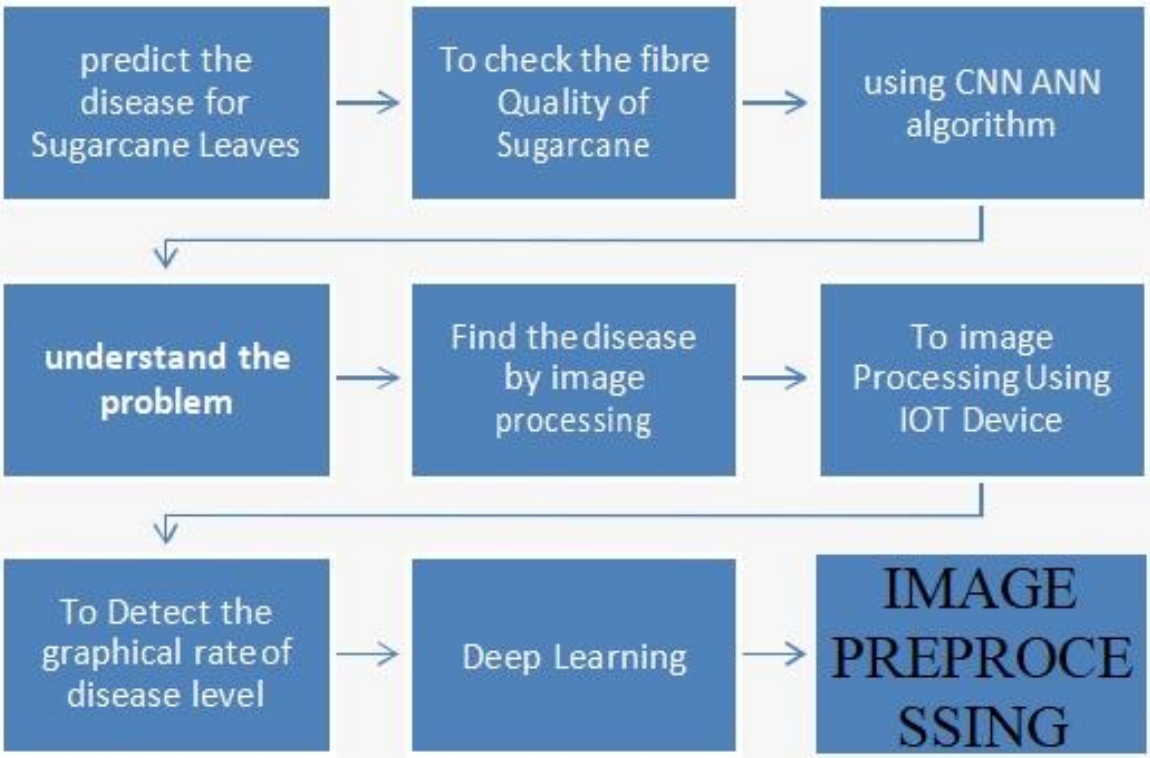


PROPOSED SOLUTION:

In this proposed System, we are going to recommend the fertilizers for the diseased plants. Here we take Sugarcane as a model for this solution. Sugarcane (Saccharumofficinarum) is a tropical plant, and it is the most important sugar extracting crop in Sri Lanka. Sugarcane white leaf disease (WLD) is one of the most economically important diseases in Sri Lanka's sugarcane industry and WLD severely progresses in ratoon sugarcane, which ultimately affects yield. This system is used to determine the nutrient quantity of soil and predict various diseases crops may be infected with. As we know all the nutrients present in the soil but what amount of nutrients are present in the particular field. Every soil has different micronutrient. But to measure the amount of nutrient available in the soil we are going to design a device which will give proper reading of the micronutrient and that can be used to predict crop disease.

PROPOSED SOLUTION FIT:.....





REQUIRMENT ANAYLSIS:.....

FUNCTIONAL REQUIRMENT:

Following are the functional requirements of the proposed solution.

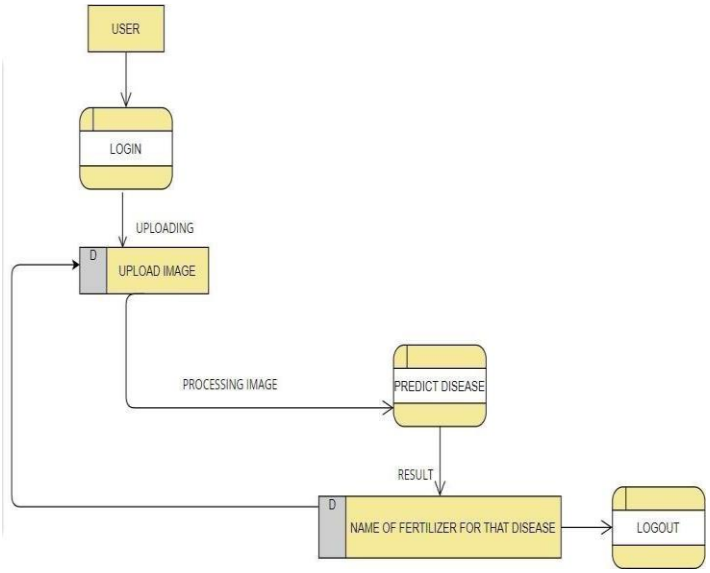
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Image Processing	Upload the image ofthe leaf for detectingThe diseases that is present in a leaf
FR-4	Leaf Prediction	Determine the parameter that shouldbe taken into account for disease identification for identifying the leafand predicting the disease in it
FR-5	Image Description	Show the prescribed fertilizer thathas to be used for the diseased leaf
FR-6	Adding Datasets.	Datasets for fruits and vegetables are added

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	In bio-fertilizer it extremely easy In organic fertilizer it difficult to use In chemical fertilizer Difficult to use
NFR-2	Security.	Store fertilizers in dry and cool places, away from direct UV rays exposure
NFR-3	Reliability	Precision measurement cluster together and match external information
NFR-4	Performance	Established their safety, health and environment performance through annual objective , targets .
NFR-5	Availability	It Domestic agriculture production; A product or services that is brought into one country from another.
NFR-6	Scalability	IT is toxic and can harm humans And It affects the Environment and Ecosystem

PROJECT DESIGN:.....



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

UserType	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 providing my email address, password, and confirming my password .	I have access to my profile/dashboard.	High	Sprint-1
		USN-2	Once I have registered for the application, I will receive a confirmation email.	I can receive an through confirmation email and click the confirm button.	High	Sprint-1
		USN-3	As a user, I can sign up for the application using Gmail.	I can use Gmail to access the application.	Medium	Sprint-1
	Login	USN-4	As a user, I can access the application by entering my email address and password.	I can make use of the Application for Disease Prediction	High	Sprint-1
Customer (Web user)	Registration	USN-5	As a Web user, I can register on the System with a User ID.	I can access the app like a website.	High	Sprint-1
Customer Care Executive	Customer Support	USN-6	As a supporter, I can see how customers use the product.	I can develop Customer Guidelines and Practices.	Low	Sprint-2
Administrator	Analyst	USN-7	As an admin, I can update several datasets about plant diseases.	I can store a significant amount of data.	High	Sprint-1
Customer Purpose	Prediction	USN-8	It use artificial intelligence to identify plant diseases in captured photographs and provides a live view of prediction.	I can predict plant disease.	High	Sprint-1

USER STORIES.....

Agriculture is the main aspect of country development. Many people lead their life from agriculture field, which gives fully related to agricultural products. Plant disease, especially on leaves, is one of the major factors of reductions in both quality and quantity of the food crops. In agricultural aspects, if the plant is affected by leaf disease then it reduces the growth of the agricultural level. Finding the leaf disease is an important role of agriculture preservation. After pre-processing using a median filter, segmentation is done by Guided Active

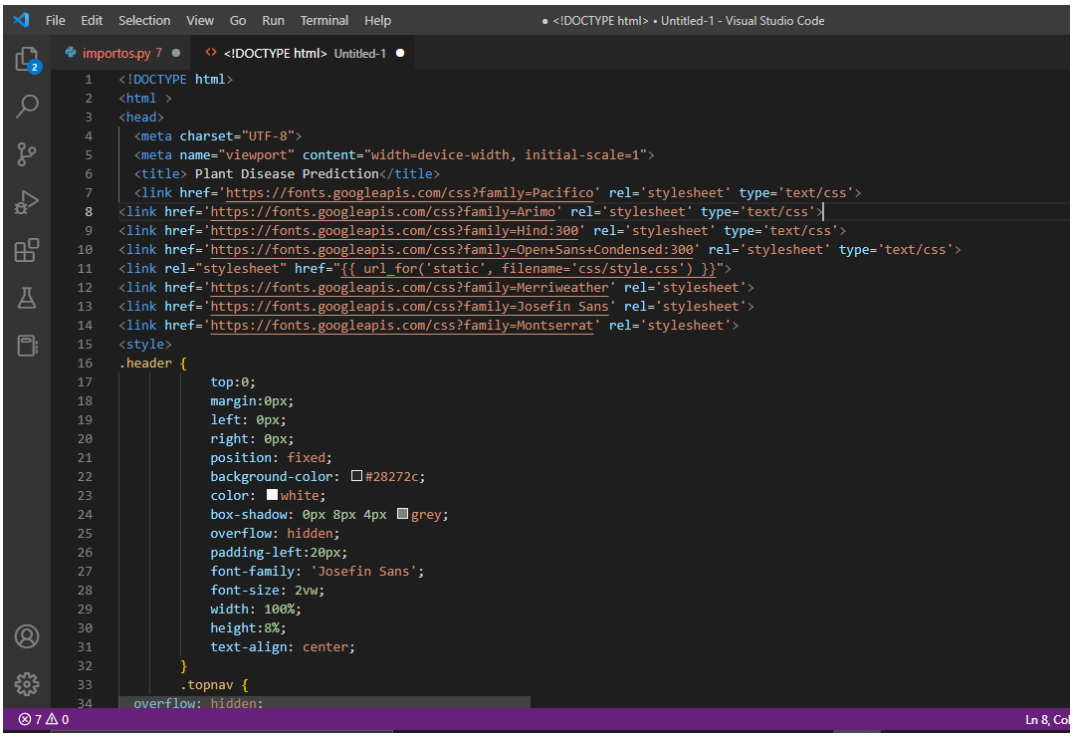
Contour method and finally, the leaf disease is identified by using Support Vector Machine.

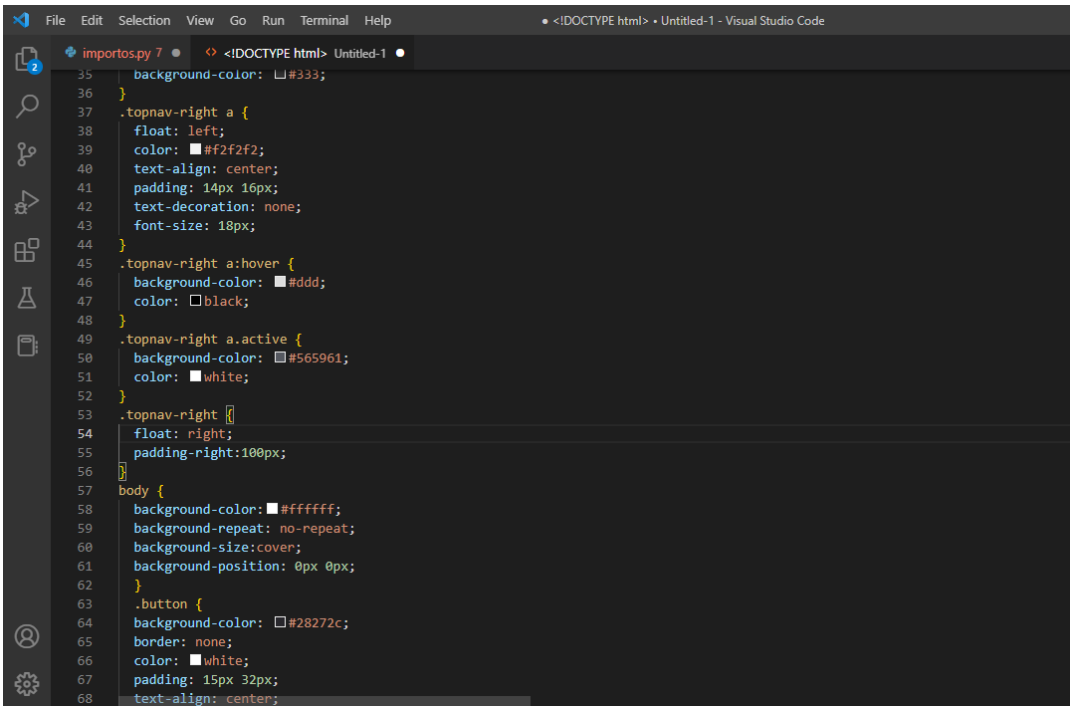
Spirit Delivery Planning: .....

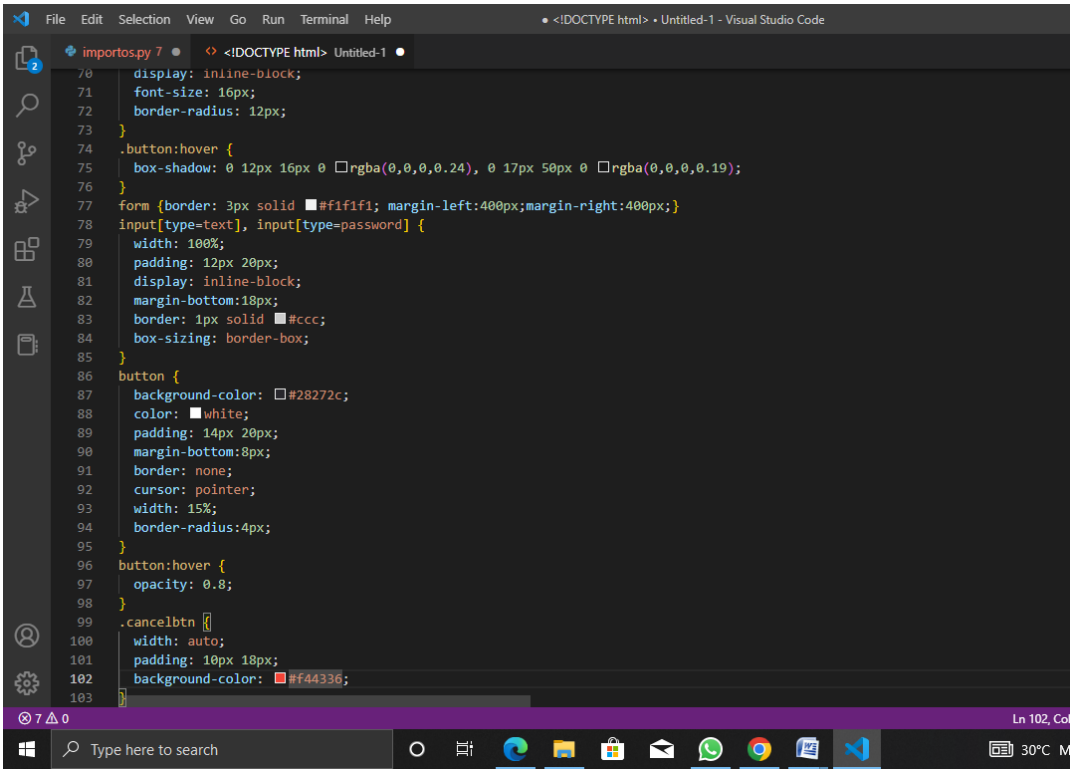
The delivery plan of project deliverables is a strategic element for every Project Manager. The goal of every project is, in fact, to produce a result that serves a specific purpose. With the word „purpose “, we can mean the most disparate goals: a software program, a chair, a building, a translation, etc.… In Project Spirit Delivery Planning is one of the processes of Completing the project and Show Casing theTime Line of the Project Planning. This Delivery plan help to understanding the process and Work Flow of the Project working by the Team Mates. Every Single Modules are assigned to the team mates to show case their work and contribution of developing the Project

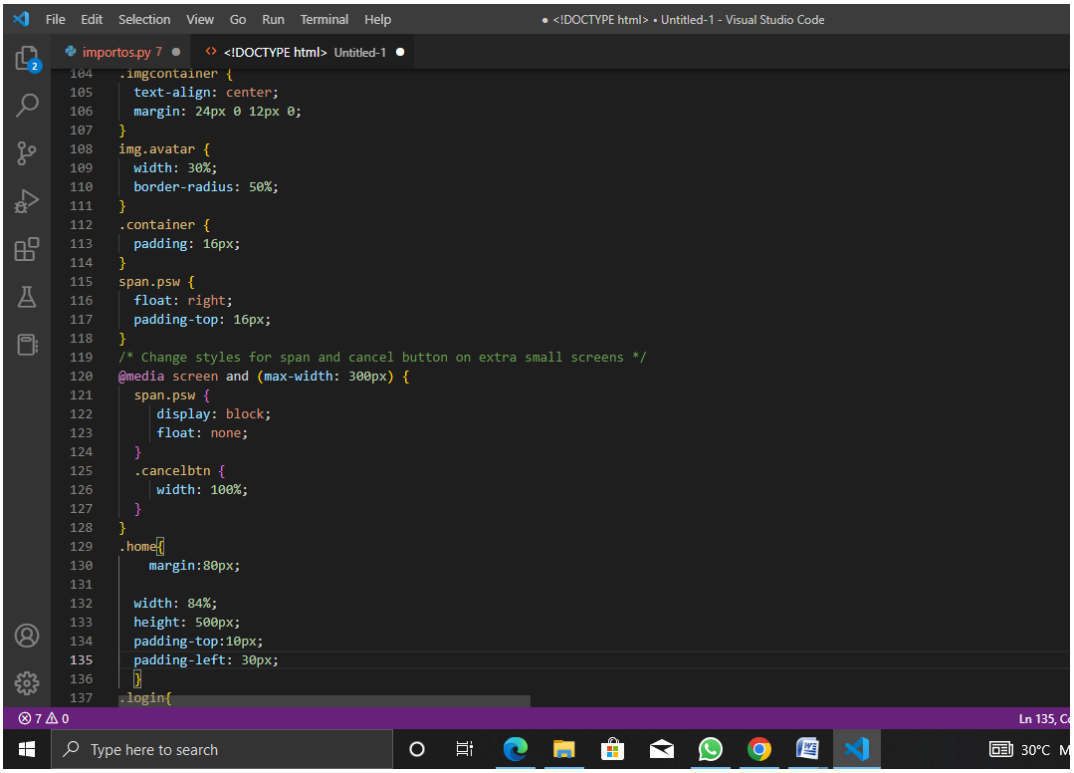
CODING & SOLUTIONING:

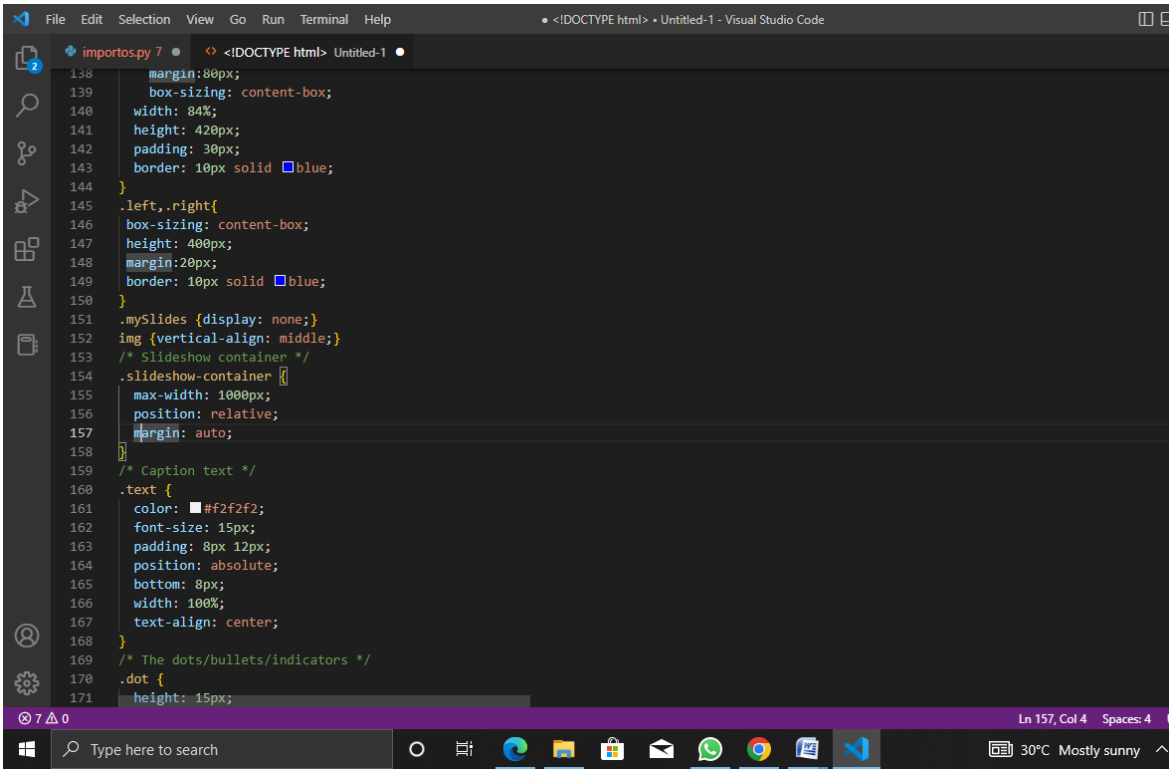
FEATURRE 1:.....

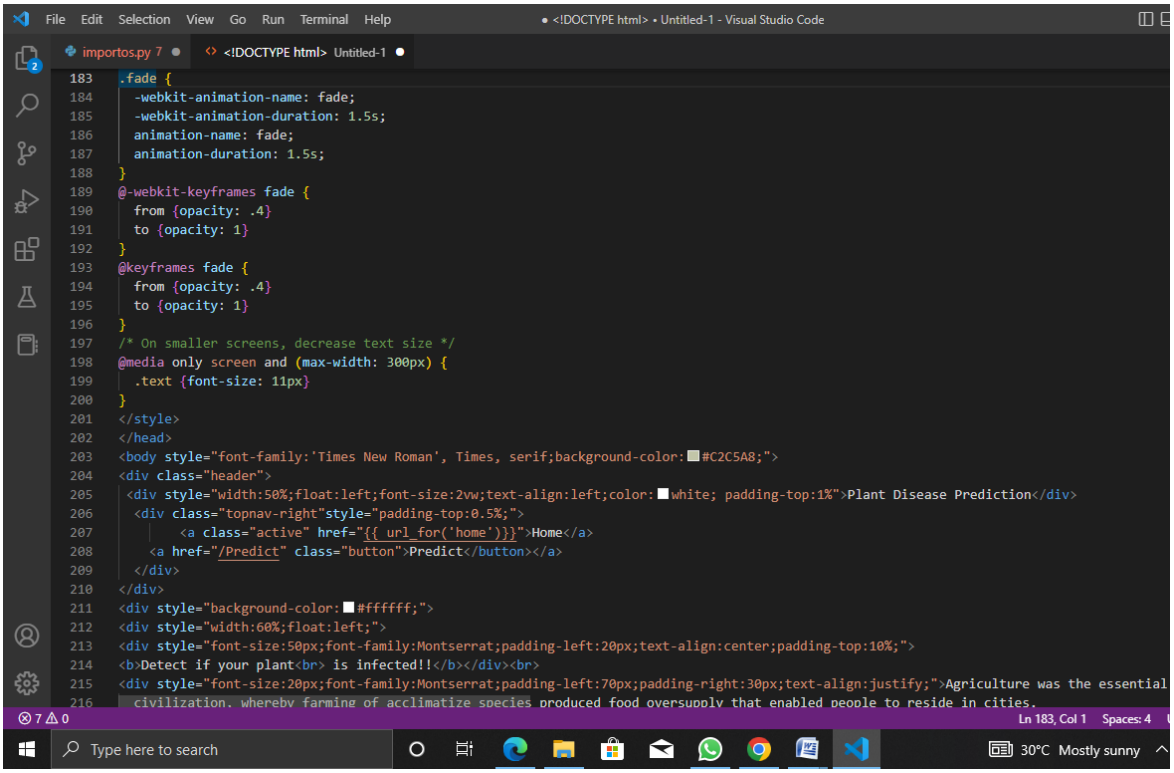





File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-1 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
display: inline-block;
font-size: 16px;
border-radius: 12px;
}
.button:hover {
box-shadow: 0 12px 16px 0 rgba(0,0,0,0.24), 0 17px 50px 0 rgba(0,0,0,0.19);
}
form {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;
}
Ln 102, Co
Type here to search
30°C

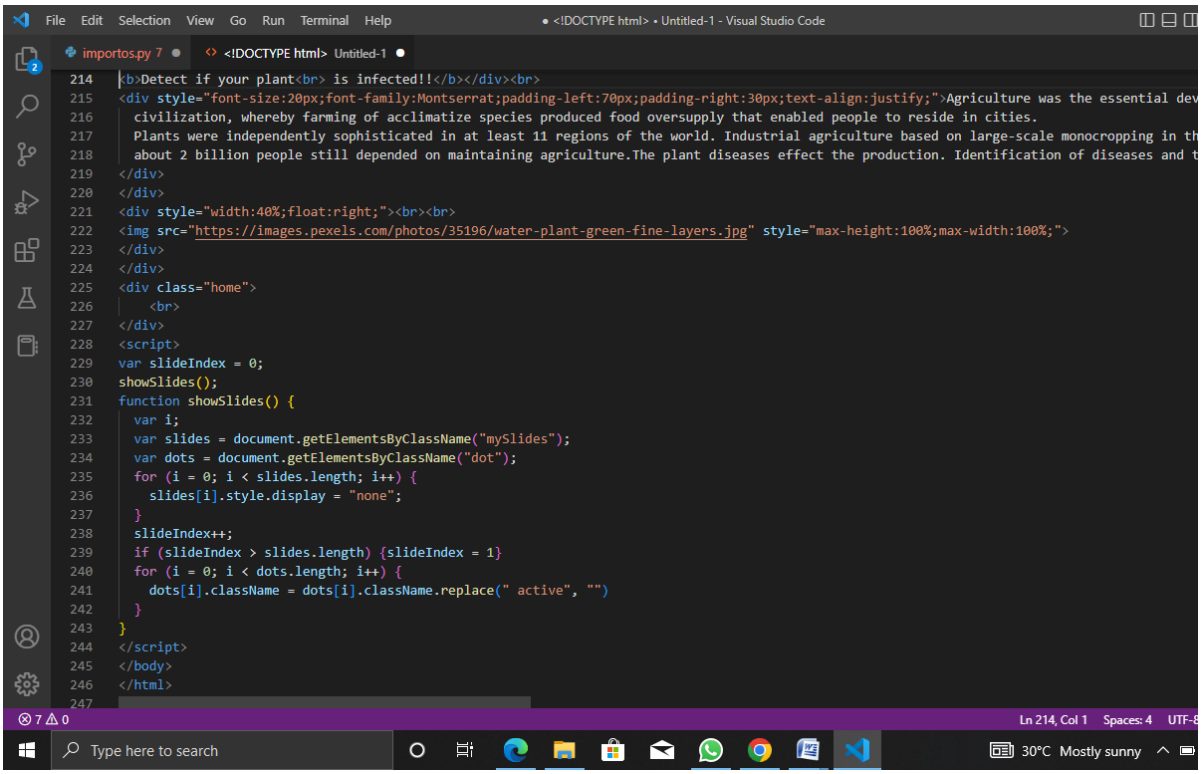

File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-1 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
.imgcontainer {
text-align: center;
margin: 24px 0 12px 0;
}
img.avatar {
width: 30%;
border-radius: 50%;
}
.container {
padding: 16px;
}
span.psw {
float: right;
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{
Ln 135, C
Type here to search
30°C


File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-1 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
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;
Ln 157, Col 4 Spaces: 4
Type here to search
30°C Mostly sunny


File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-1 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
.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;">

Plant Disease Prediction
<div class="topnav-right"style="padding-top:0.5%;">
Home
Predict</button>

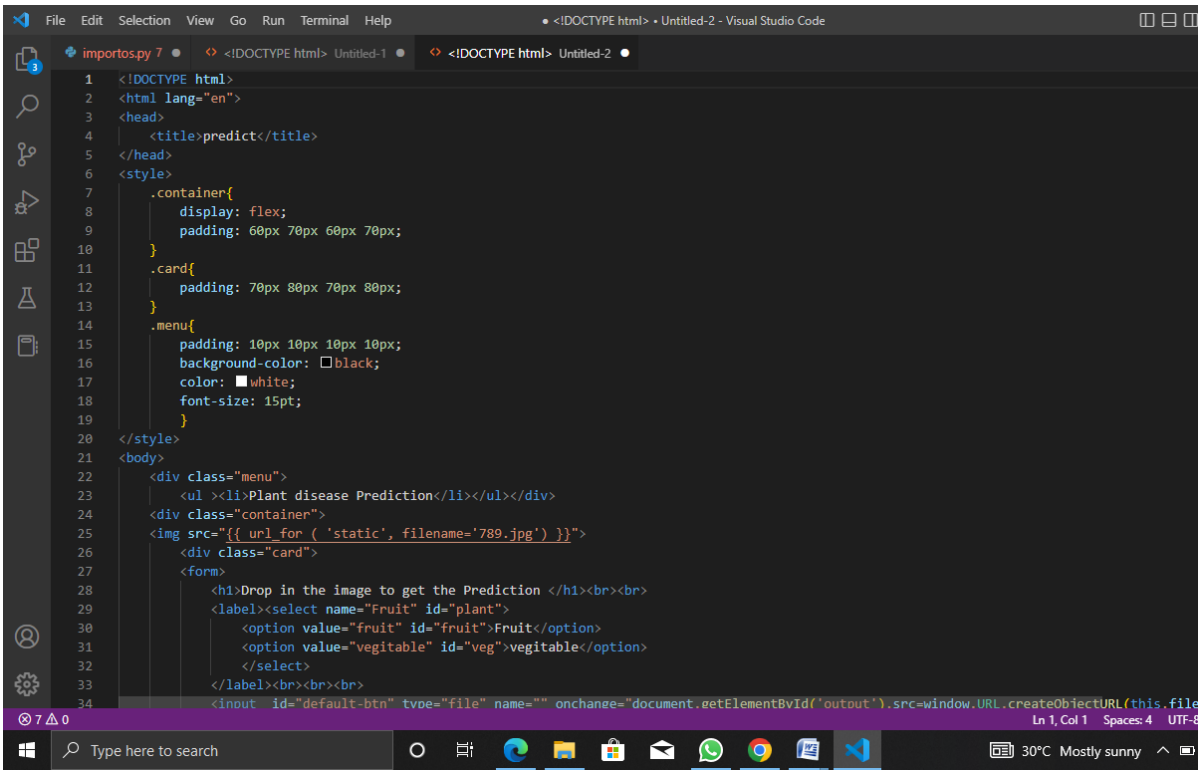
Detect if your plant
 is infected!!
Agriculture was the essential
civilization, whereby farming of acclimatize species produced food oversupply that enabled people to reside in cities.
Ln 183, Col 1 Spaces: 4
Type here to search
30°C Mostly sunny


File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-1 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
Detect if your plant
 is infected!!
Agriculture was the essential dev
civilization, whereby farming of acclimatize species produced food oversupply that enabled people to reside in cities.
Plants were independently sophisticated in at least 11 regions of the world. Industrial agriculture based on large-scale monocropping in th
about 2 billion people still depended on maintaining agriculture.The plant diseases effect the production. Identification of diseases and t

<img src="https://images.pexels.com/photos/35196/water-plant-green-fine-layers.jpg" style="max-height:100%;max-width:100%;">

<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", "")
}
}
</script>
</body>
</html>
Ln 214, Col 1 Spaces: 4 UTF-8
Type here to search
30°C Mostly sunny

FEATURE 2:.....


File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-2 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
<!DOCTYPE html> Untitled-2
<!DOCTYPE html>
<html lang="en">
<head>
<title>predict</title>
</head>
<style>
.container{
display: flex;
padding: 60px 70px 60px 70px;
}
.card{
padding: 70px 80px 70px 80px;
}
.menu{
padding: 10px 10px 10px 10px;
background-color: black;
color: white;
font-size: 15pt;
}
</style>
<body>

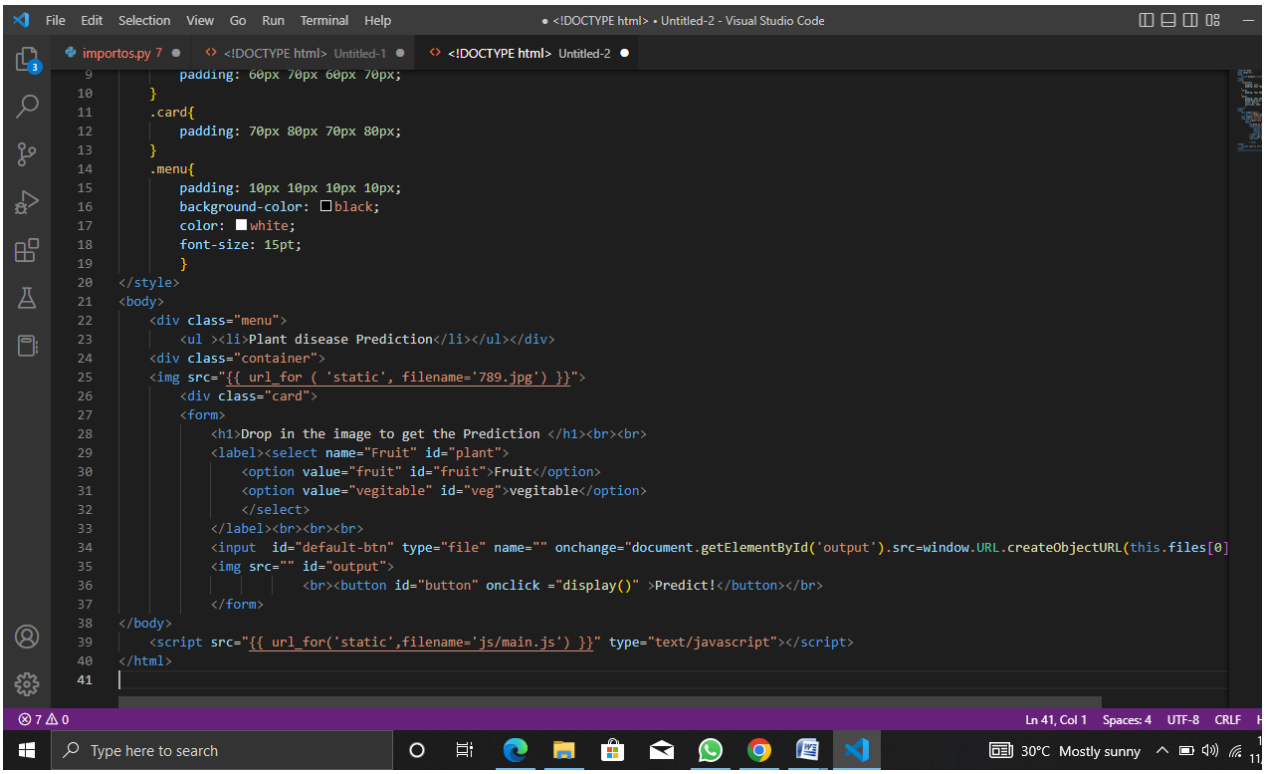
Plant disease Prediction

<img src="{{ url_for ('static', filename='789.jpg') }}">

<form>
<h1>Drop in the image to get the Prediction </h1>

<label><select name="Fruit" id="plant">
<option value="fruit" id="fruit">Fruit</option>
<option value="vegitable" id="veg">vegitable</option>
</select>
</label>

<input id="default-btn" type="file" name="" onchange="document.getElementById('output').src=window.URL.createObjectURL(this.file
Ln 1, Col 1 Spaces: 4 UTF-8
Type here to search
30°C Mostly sunny


File Edit Selection View Go Run Terminal Help
• <!DOCTYPE html> • Untitled-2 - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
<!DOCTYPE html> Untitled-2
padding: 60px 70px 60px 70px;
}
.card{
padding: 70px 80px 70px 80px;
}
.menu{
padding: 10px 10px 10px 10px;
background-color: black;
color: white;
font-size: 15pt;
}
</style>
<body>

Plant disease Prediction

<img src="{{ url_for ('static', filename='789.jpg') }}">

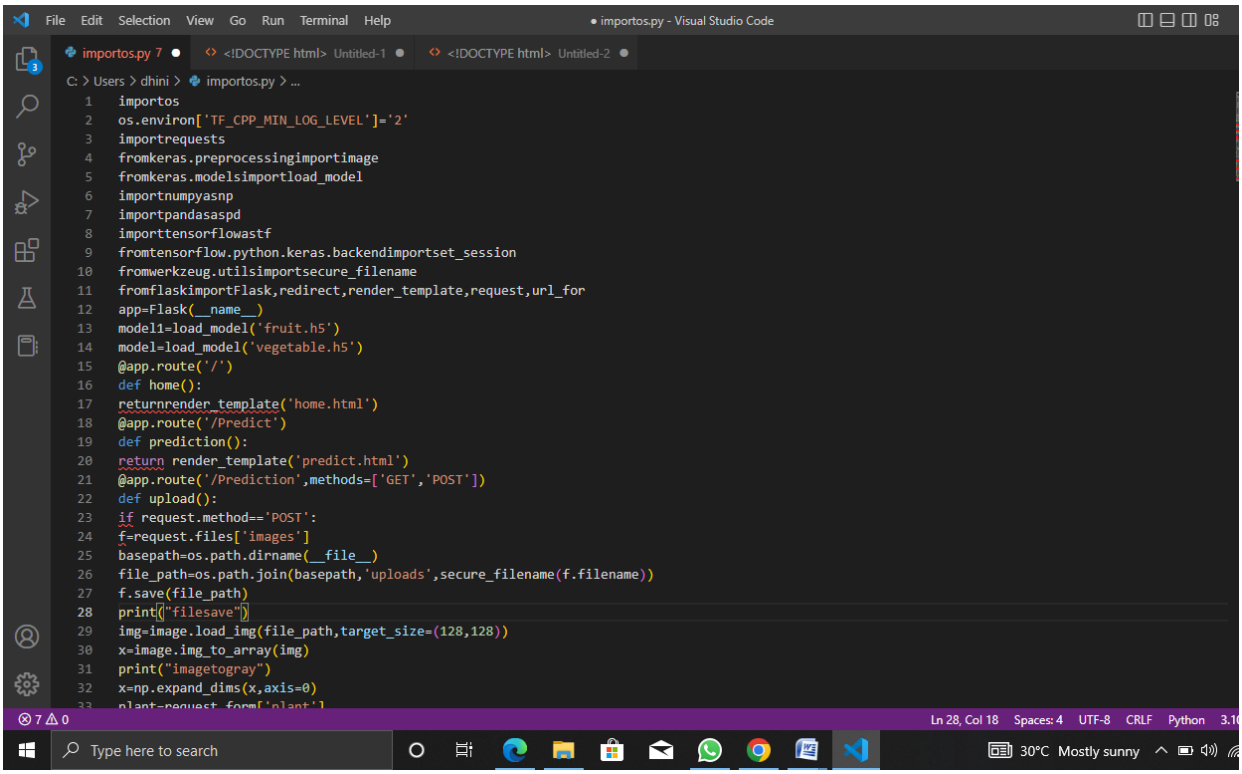
<form>
<h1>Drop in the image to get the Prediction </h1>

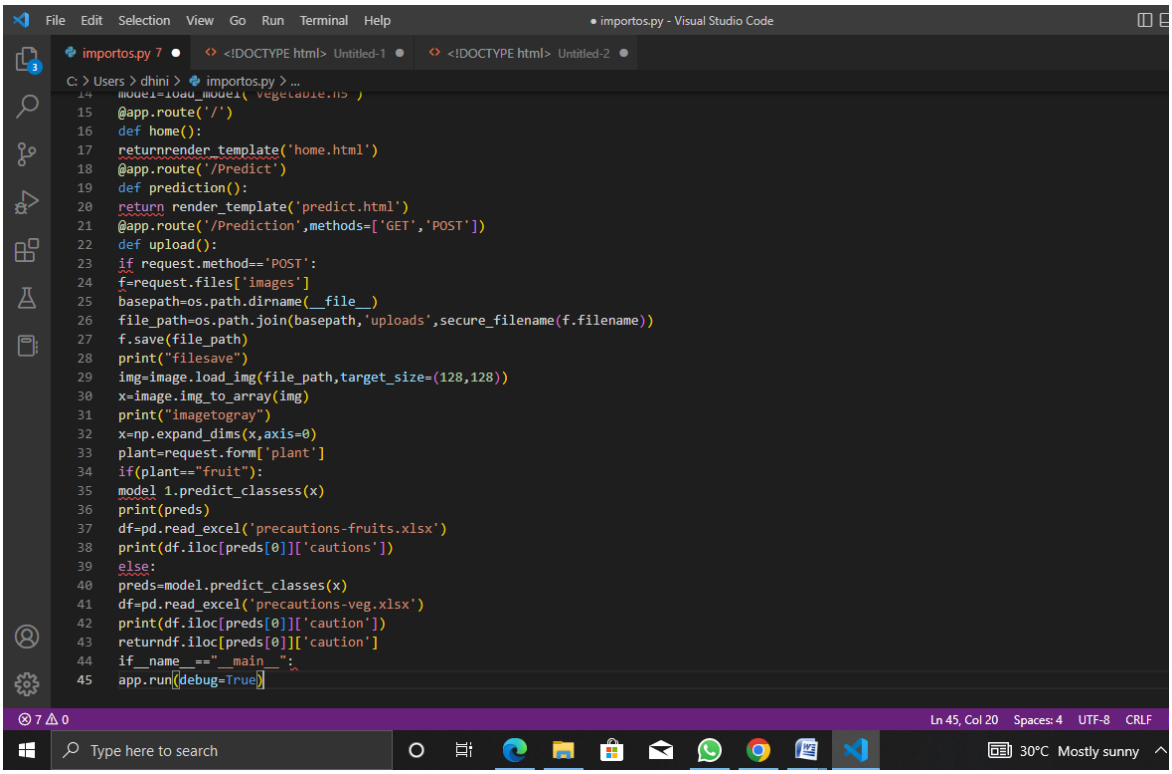
<label><select name="Fruit" id="plant">
<option value="fruit" id="fruit">Fruit</option>
<option value="vegitable" id="veg">vegitable</option>
</select>
</label>

<input id="default-btn" type="file" name="" onchange="document.getElementById('output').src=window.URL.createObjectURL(this.files[0]
<img src="" id="output">

<button id="button" onclick ="display()" >Predict!</button></br>
</form>
</body>
<script src="{{ url_for('static',filename='js/main.js') }}" type="text/javascript"></script>
</html>
Ln 41, Col 1 Spaces: 4 UTF-8 CRLF
Type here to search
30°C Mostly sunny

FEATURE 3:.....


File Edit Selection View Go Run Terminal Help
• importos.py - Visual Studio Code
importos.py 7
<!DOCTYPE html> Untitled-1
<!DOCTYPE html> Untitled-2
C: > Users > dhini > importos.py > ...
importos
os.environ['TF_CPP_MIN_LOG_LEVEL']='2'
importrequests
fromkeras.preprocessingimportimage
fromkeras.modelsimportload_model
importnumpyasnp
importpandasaspd
importtensorflowastf
fromtensorflow.python.keras.backendimportset_session
fromwerkzeug.utilsimportsecure_filename
fromflaskimportFlask,redirect,render_template,request,url_for
app=Flask(__name__)
model1=load_model('fruit.h5')
model=load_model('vegetable.h5')
@app.route('/')
def home():
returnrender_template('home.html')
@app.route('/Predict')
def prediction():
return render_template('predict.html')
@app.route('/Prediction',methods=['GET','POST'])
def upload():
if request.method=='POST':
f=request.files['images']
basepath=os.path.dirname(__file__)
file_path=os.path.join(basepath,'uploads',secure_filename(f.filename))
f.save(file_path)
print("filesave")
img=image.load_img(file_path,target_size=(128,128))
x=image.img_to_array(img)
print("imagetogray")
x=np.expand_dims(x,axis=0)
Ln 28, Col 18 Spaces: 4 UTF-8 CRLF Python
Type here to search
30°C Mostly sunny



TEST CASES:
TEST FRUIT DATA:.....

In [1]:
```
test_dir=r'C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\fruit-dataset\fruit-dataset\test'
```

In [2]:
```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [3]:
```
model = tf.keras.models.load_model(r'C:\Users\VENGAT\fruitdata.h5')
```

In [4]:
```
test_datagen_1=ImageDataGenerator(rescale=1)
test_generator_1=test_datagen_1.flow_from_directory(
    test_dir,
    target_size=(128,128),
    batch_size=20,
    class_mode='categorical'
)
```

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

In [5]:
```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [6]:
```
img=image.load_img(r"C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\fruit-dataset\fruit-dataset\train\Corn_(maize)___healthy\9faacf6a-f638-435a-89
```

In [7]:

In [7]:
```
img
```

Out[7]:

In [8]:
```
img=image.load_img(r"C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\fruit-dataset\fruit-dataset\train\Corn_(maize)___healthy\9faacf6a-f638-435a-89
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=['Apple___Black_rot', 'Apple___healthy', 'Corn_(maize)___healthy', 'Corn_(maize)___Northern_Leaf_Blight', 'Peach___Bacterial_spot', 'Peach___hea
index[y[0]]
```

```
1/1 [==============================] - 7s 7s/step
```

Out[8]:
```
'Corn_(maize)___Northern_Leaf_Blight'
```

In [9]:
```
model.evaluate(test_generator_1,steps=50)
```

```
50/50 [==============================] - 27s 495ms/step - loss: 666.1144 - accuracy: 0.6230
```

Out[9]:
```
[666.1144409179688, 0.6230000257492065]
```

In [ ]:

TEST VEGRTABLE DATA:……

In [42]:
```
test_dir=r'C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set'
```

In [43]:
```
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [44]:
```
model = tf.keras.models.load_model(r'C:\Users\VENGAT\vegetabledata.h5')
```

In [45]:
```
test_datagen_1=ImageDataGenerator(rescale=1)
test_generator_1=test_datagen_1.flow_from_directory(
    test_dir,
    target_size=(128,128),
    batch_size=20,
    class_mode='categorical'
)
```

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

In [61]:
```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [62]:
```
img=image.load_img(r"C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set\Potato___Early_blight\b7157976-61c2-4366-87c5
```

In [63]:
```
img
```

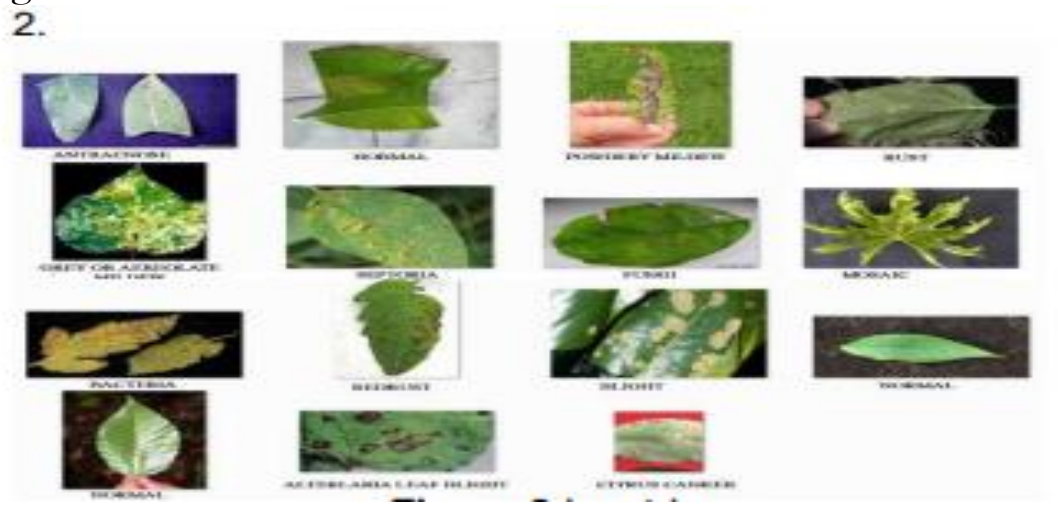
Out[63]:

```
In [ ]: img=image.load_img(r"C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set\Potato___Early_blight\b7157976-61c2-4366-87c5

In [63]: img

Out[63]: 

In [66]: img=image.load_img(r"C:\Users\VENGAT\Desktop\Data\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set\Potato___Early_blight\b7157976-61c2-4366-87c5
         x=image.img_to_array(img)
         x=np.expand_dims(x,axis=0)
         y=np.argmax(model.predict(x),axis=1)
         index=['Apple___Black_rot', 'Apple___healthy', 'Corn_(maize)___healthy', 'Corn_(maize)___Northern_Leaf_Blight', 'Peach___Bacterial_spot', 'Peach___hea

         1/1 [==============================] - 0s 266ms/step

In [67]: model.evaluate(test_generator_1,steps=50)

         50/50 [==============================] - 76s 1s/step - loss: 2357.2993 - accuracy: 0.3710

Out[67]: [2357.29931640625, 0.3709999918937683]
```

RESULT:.....

To compare the performance of the proposed SVM method with the existing CNN (Convolutional Neural Network) method. Metrics such as True Positive, False Positive, True Negative, False Negative are used. The proposed method is implemented using .NET. The code existing CNN method was written in Python was downloaded from the web [https://github.com/cs-chan/Deep-Plant]. 15 images were captured using a camera for testing purpose is given in Figure

2.



Firstly, some secondary metrics such as true positive (TP), true negative (TN), false positive (FP), and false-negative (FN) [18] are calculated as follows, True Positive: True Positive is an outcome where the model correctly predicts positive class.False Positive: False Positive is an outcome where the model incorrectly predicts positive class.True Negative: True Negative is an outcome where the model correctly predicts negative class.False Negative: False Negative is an outcome where the model incorrectly predicts negative class.The True Positive, False Positive, True Negative, and False Negative value for captured 15 images are shown in table 1. The pictorial representation of this comparison is given in

TABLE 1
COMPARISON OF CNN AND SVM IN TERMS OF TP, FP, TN, AND FN

Methods	TP	FP	TN	FN
Existing [CNN]	6	3	2	4
Proposed [SVM]	8	4	1	2

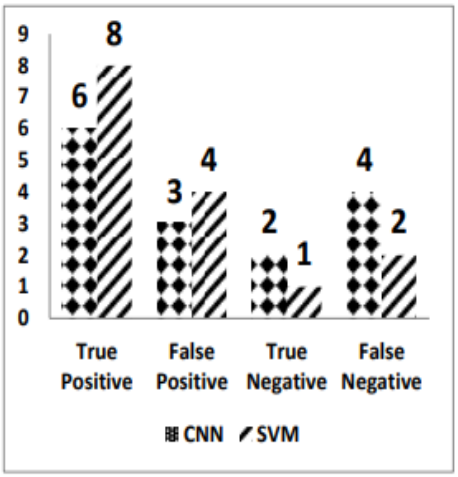


Figure.3 *Performance comparison of CNN and SVM in terms of True Positive, False Positive, True Negative and False Negative.*

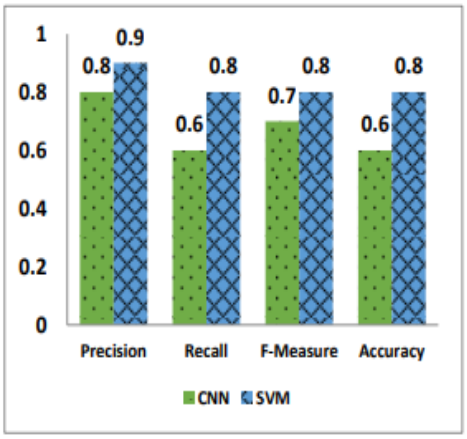


Figure.4 *Precision, Recall, F-Measure and Accuracy comparison chart for CNN and SVM*

ADVANTAGE:.....

- The proposed method uses SVM to classify tree leaves,identify the disease and suggest the fertilizer.
- The proposed method is compared with the existing CNN based leaf disease prediction.
- The proposed svm technique gives a better result when compared to existing CNN.

DISADVANTAGE:.....

- Any H/w failures may affect the system performance.
- The current paper proposesan android application for irrigation and plant leaf disease detection with cloud and IoT.
- For monitoring irrigation system they use soil moisture and temperature sensor and sensor data send to the cloud.
- The user can also detect the plant leaf disease.
- K-means clustering used for feature extraction.

CONCLUSION:.....

- The device is created primarily for farmers.
- Farmers are the backbone of our country, and India is the world's second largest food producer.
- As a result, this technology will assist farmers in determining soil fertility and recommending which crops to grow.
- It also recommends the fertilizer that should be used to boost productivity.
- It detects many diseases in crops and recommends appropriate treatments to help them recover.
- It gives farmers the vital information about farming techniques to assist them enhance crop productivity.

FUTURE SCOPE:.....

- The vast potential of Indian agriculture remains unexplored, and we still have a long way to go in this field of study, as we need to make the device more compact, lightweight, and inexpensive to farmers.
- The technology will assist farmers by providing required advice on crops, their growth, and other basic information.
- It will also offer the location of the nearest store where farmers can purchase fertilizer and other materials.
- It would also assist farmers in selling their commodities to merchants by providing accurate information on market prices and merchant details.
- The device can also help farmers calculate crop MSP.

GETHYB LINK:.....

https://github.com/IBM-EPBL/IBM-Project-46293-1660744549