FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PREDECTION

Project Report
Submitted by

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BACHELOR OF ENGINEERING
In
ELECTRONICS AND COMMUNICATION ENGINEERING

SRI ESHWAR COLLEGE OF ENGINEERING
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1 INTRODUCTION

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.

An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases. Fertilizer Recommendation system for disease Prediction is a simple ML and DL based website which recommends the best crop to grow, fertilizers to use and the diseases caught by your crops.

1.1 PROJECT OVERVIEW:

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. An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases.

1.2 PUPRPOSE:

- ➢ It allows us to predict which crops would be appropriate for a given climate.
- ➢ 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.

2 LITERATURE SURVEY:

2.1 EXISTING PROBLEM:

In our case When a pathogen that is already present or invades successfully to plant host tissues and cells results in plant disease. It is important to fix the problem because Plant diseases reduce the amount of food available to humans by ultimately interfering with crop yields. This can cause inadequate food for humans which result in starvation or death in the worst cases.

2.2 REFERENCES:

[1] S. Verma, A. Chug, and A. P. Singh, “Prediction Models for Identification and Diagnosis of Tomato Plant Diseases,” 2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Sep. 2018, Doi: 10.1109/icacci.2018.8554842.
[2] K. P. Panigrahi, H. Das, A. K. Sahoo, and S. C. Moharana, “Maize Leaf Disease Detection and Classification Using Machine Learning Algorithms,” Progress in Computing, Analytics and Networking, pp. 659–669, 2020, Doi: 10.1007/978-981-15-2414-1_66.
[3] A. Devaraj, K. Rathan, S. Jaahnavi, and K. Indira, “Identification of Plant Disease using Image Processing Technique,” 2019 International Conference on Communication and Signal Processing (ICCSP), Apr. 2019, Doi: 10.1109/iccsp.2019.8698056.
[4] S. Ramesh et al., “Plant Disease Detection Using Machine Learning,” 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C), Apr. 2018, Doi: 10.1109/icdi3c.2018.00017.
[5] S. Y. Yadhav, T. Senthilkumar, S. Jayanthy, and J. J. A. Kovilpillai, “Plant Disease Detection and Classification using CNN Model with Optimized Activation Function,” 2020 International Conference on Electronics and Sustainable Communication Systems (ICESC), Jul. 2020, Doi: 10.1109/icesc48915.2020.9155815.
[6] V. Suma, R. A. Shetty, R. F. Tated, S. Rohan, and T. S. Pujar, “CNN based Leaf Disease Identification and Remedy Recommendation System,” 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), Jun. 2019, Doi: 10.1109/iceca.2019.8821872.

2.3 PROBLEM STATEMENT DEFINITION:

This is a challenging task for a country like India, where agriculture feeds approximately 42% of the population. And the outcomes for the farmer of choosing the wrong crop 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.

3 IDEATION AND PROPOSED SOLUTION:

3.1 EMPATHY MAP:

An empathy map is a collaborative tool team can use to gain a deeper insight into their customers.

3.2 IDEATION AND PROPOSED SOLUTION:

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity.

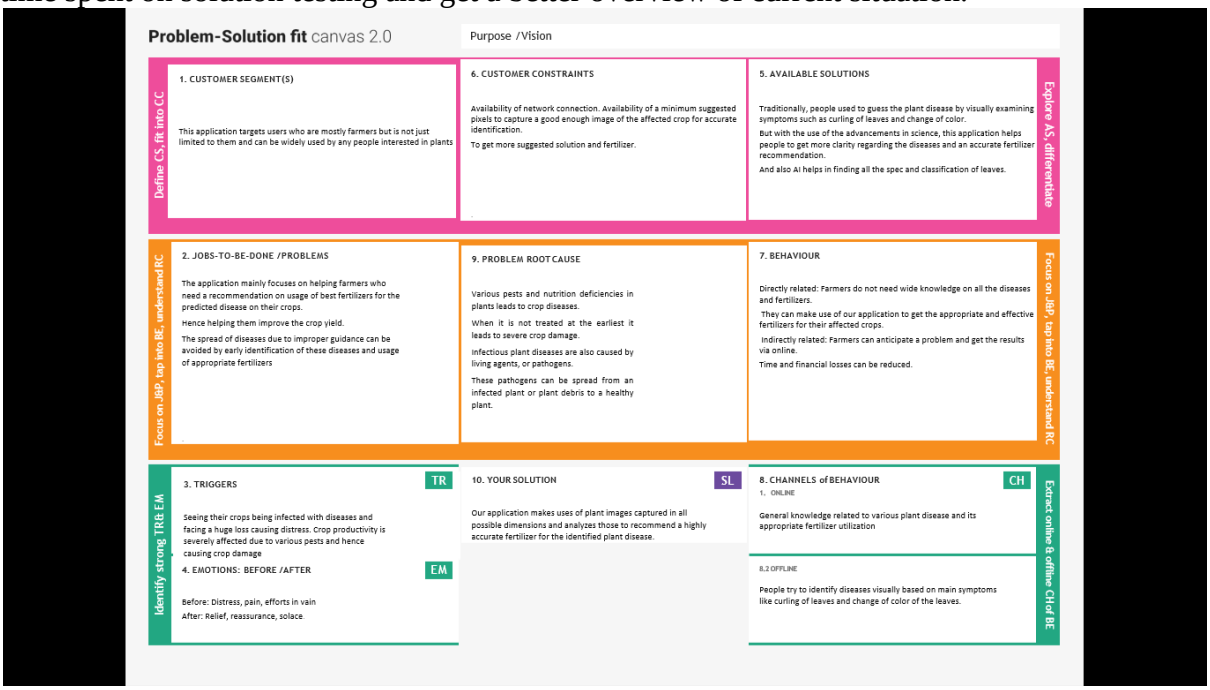
3.3 PROPOSED SOLUTION:

The solution to the problem is machine learning. This system recommends the best crop to grow on your land based on the nutritional value of the soil and along with the climate of that region. It also recommends the best fertilizer for each crop, which is a challenging task. The cultivation recommendation features a database of soil nitrogen, phosphorus and potassium for modern agriculture. The ensemble technique is used to create a recommendation model that combines multiple machine learning predictions. The models recommend the right harvest based on the value of the soil and the best fertilizer.

1.	Problem Statement (Problem to be solved)	• The main cause of production loss in agriculture products is due to the different types of diseases that affect the plants growth. • Most probably plant diseases are caused due to the abnormal physiological functionalities of plants. • These problems are to be sorted out for high quality food products.
2.	Idea / Solution description	• Image processing helps in identification of the plants specification and disease detection that helps in classifying the plants based on disease. • SVM K-Mean Clustering algorithm, Otsu's detection converting RGB to HIS later segmentation is done using boundary and spot detection algorithms. • These are the ideas to detect the plant diseases. Reducing the level of the infestation involves cultural practices, such as sanitation, removing diseased plants or plant parts, rotating crops, eliminating weeds or other plants that may be alternate hosts for the disease, and discouraging or preventing insect vectors.
3.	Novelty / Uniqueness	• Monitor the big farms of crops, at a very early stage itself it detects the symptoms of diseases. Reduce the loss of time. Reduce the future plant losses. • We used the CNN feature and a pre-trained model resulted in improved performance of prediction.
4.	Social Impact / Customer Satisfaction	• By identifying the diseases and recommending the fertilizer at the earlier stage helps in the improvement of production and the quality.
		• Which helps in human livelihood improvement and prevention of plant loss.
5.	Business Model (Revenue Model)	• Helps the farmers to make good production of food products and to reduce the production loss at an earlier stage. • With the proposed system crop yield, crop efficiency, agricultural product output will be increased. • A high gain can be seen in agricultural output and profit will be increased
6.	Scalability of the Solution	• To achieve Infectious plant diseases are caused by a pathogenic organism such as fungus, bacterium , mycoplasma, virus, viroid, nematode, or parasitic flowering plant. • Usage of deep learning and image processing techniques for the

3.4 PROBLEM SOLUTION FIT:

Problem-Solution canvas is a tool for entrepreneurs, marketers and corporate innovators, which help them, identify solutions with higher chances for a solution adoption, reduce time spent on solution testing and get a better overview of current situation.



4 REQUIREMENT ANALYSIS:

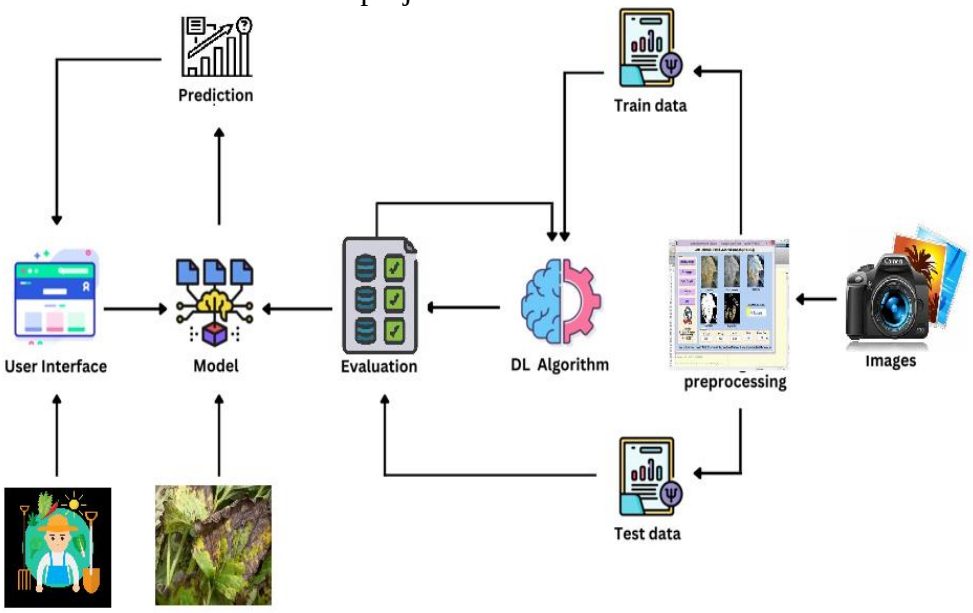
Analysis made while working on the solution The batch sizes are varied and tested. For different batch sizes, the CNN gives different accuracies. The batch size determines the number of iterations per epoch. Another important hyper parameter is the number of epochs. This determines accuracy and it has high influence on accuracy compared to other hyper parameters. The accuracy can be varied from 80% to 90% in vegetable dataset and 95% to 98% in the case of fruit dataset by increasing the number of epochs.

The size of test dataset and train dataset also has very high influence on accuracies. The accuracy can be increased by using more number of images in train dataset. The computational time for model building is increased when the size of the train dataset increased and also number of epochs increased. The batch size of train dataset and test dataset also play a vital role in computational time.

The Neural Network complexity is increased when more number of convolutional layers increased. If the number of layers increased, better accuracy result will obtain. At the same increasing the number of layers in CNN leads to more training time and also requires more time to build a model. The model .h5 size depends on the size of train datasets. But the memory requirement depends on the size of train dataset and CNN architecture complexity.

5 PROJECT DESIGN:

Project design is an early phase of the project lifecycle where ideas, processes, resources, and deliverables are planned out. A project design comes before a project plan as it’s a broad overview whereas a project plan includes more detailed information. A project design is the process of outlining all of a project's stages and creating a project plan. It includes a strategy of ideas, resources and processes to achieve project goals and keep within a budget and deadline. Project managers could add flowcharts, sketches, photo impressions and prototypes to help fully outline the project. Project managers present the project plan to senior stakeholders and investors to get final approval before beginning the project. In many cases, project managers create more than one pan for each project so stakeholders can choose which one they think would work best for the project.



5.1 USER STORIES:

A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer.

6 PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING AND ESTIMATION:

The objective of the Estimation would be to consider the User Stories for the Sprint by Priority and by the Ability of the team to deliver during the Time Box of the Sprint.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data collection and preprocessing	USN-1	Collecting plant disease dataset	2	Low	Barath Kumar R
Sprint-1		USN-2	Labelling the dataset according to class	3	Medium	Abishek K
Sprint-1		USN-3	38 types of plant diseases is labeled accordingly	2	Medium	Chandru R
Sprint-1		USN-4	Data set Will contain both healthy and diseased data	1	Low	Abishek K
Sprint-1	Preprocessing	USN-5	To prepare raw data in a format that the network can accept	2	High	Karthikeyan K
Sprint-1		USN-6	Scaling is used for making data points generalized	1	Low	Barath Kumar Abishek
Sprint-1		USN-7	Shear range image will be distorted along an axis, mostly to create or rectify the perception angle	3	High	Karthikeyan Chandru
Sprint-1		USN-8	Zoom Augmentation will randomly zoom the image and adds new pixels for the image	3	High	Chandru Barathkumar
Sprint-1		USN-9	Flipping the entire pixels of an image horizontally	3	High	Karthikeyan Abishek
Sprint-2	Training , Testing and Creating a model	USN-10	Start initiating the model	3	Medium	Abishek Chandru
Sprint-2		USN-11	Adding different layers of cnn(convolution, pooling dense , flatten)	2	Medium	Abishek
Sprint-2		USN-12	Creating/compiling with adam optimizer	1	Medium	Chandru
Sprint-2		USN-13	Keras - Categorical Cross Entropy Loss Function for multi-class classification	2	Medium	Barathkumar
Sprint-2		USN-14	creating metrics	2	Medium	Abishek

Sprint-2		USN-15	train the data with 20 epoch	3	High	Barathkumar Abishek
Sprint-2		USN-16	testing the model	5	High	Abishek Barathkumar Chandru
Sprint-2		USN-17	save the model	2	Medium	Karthikeyan
Sprint-3	Flask and Frame workdesign	USN-18	Creating backend framework with flask	8	High	Karthikeyan Barathkumar Karthikeyan
Sprint-3		USN-19	importing the model file	3	Medium	Chandru
Sprint-3		USN-20	Create route to link htmlRoutes and View Functions in Flask Framework index file	5	High	Karthikeyan Abishek
Sprint-3		USN-21	Server Startup, requests and services in a loop	4	Medium	Chandru Barathkumar
Sprint-4	Front end web application development	USN-22	creating a html template with css file	8	High	Karthikeyan Abishek Barathkumar Chandru
Sprint-4		USN-23	user can import diseased plant leaf in web page	2	Medium	Karthikeyan Abishek Barathkumar Chandru
Sprint-4		USN-24	predicting what is the type of disease occurred for the given input	2	Medium	Karthi Chandru
Sprint-4		USN-25	User can classify as healthy or diseased	2	Medium	Chandru Abishek
Sprint-4		USN-26	if plant has disease then suggest fertilizer and pesticides	3	Medium	Chandru Abishek
Sprint-4		USN-27	alert the admin about the prediction with the gmail	3	Medium	Barathkumar

6.2 SPRINT DELIVERY SCHEDULE:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	27 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	3 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

7 CODING AND SOLUTIONING:

7.1 PYTHON CODE:

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

```
global graph
graph=tf.compat.v1.get_default_graph()
model = load_model(r"C:\Users\dhars\OneDrive\Desktop\IBM project\flask\uploads\fruit.h5")
model1=load_model(r"C:\Users\dhars\OneDrive\Desktop\IBM project\flask\uploads\vegetable.h5")
@app.route('/')
def home():
return render_template('home.html')
@app.route('/prediction')
def prediction():
return render_template('predict.html')
@app.route('/predict',methods=['POST'])
def predict():
if request.method == 'POST':
  f = request.files['image']
  basepath = os.path.dirname(__file__)
file_path = os.path.join( basepath, 'Dataset Plant Disease', 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=True,use_reloader=False)
```

7.2 HTML CODE:

HOME

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link rel="icon" href="data:,">
  <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'>
<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 {
  font-family:'Times New Roman', Times, serif;
  background-image: url("../static/images/s1.jpg");
  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>
<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:40px;color:#013220;font-family:Montserrat;padding-left:20px;text-align:center;padding-top:10%;">
<b>Fertilizers Recommendation System<br> For Disease Prediction!!</b>
</div><br>
<div style="font-size:20px;color:#ffffff;font-family:Arial Black;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 labour costs.</div><br><br>
</div>
</div>
<div style="width:40%;float:right;"><br><br>
</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";
```

```
  dots[slideIndex-1].className += " active";
  setTimeout(showSlides, 2000); // Change image every 2 seconds
}
</script>
</body>
</html>
```

PREDICT

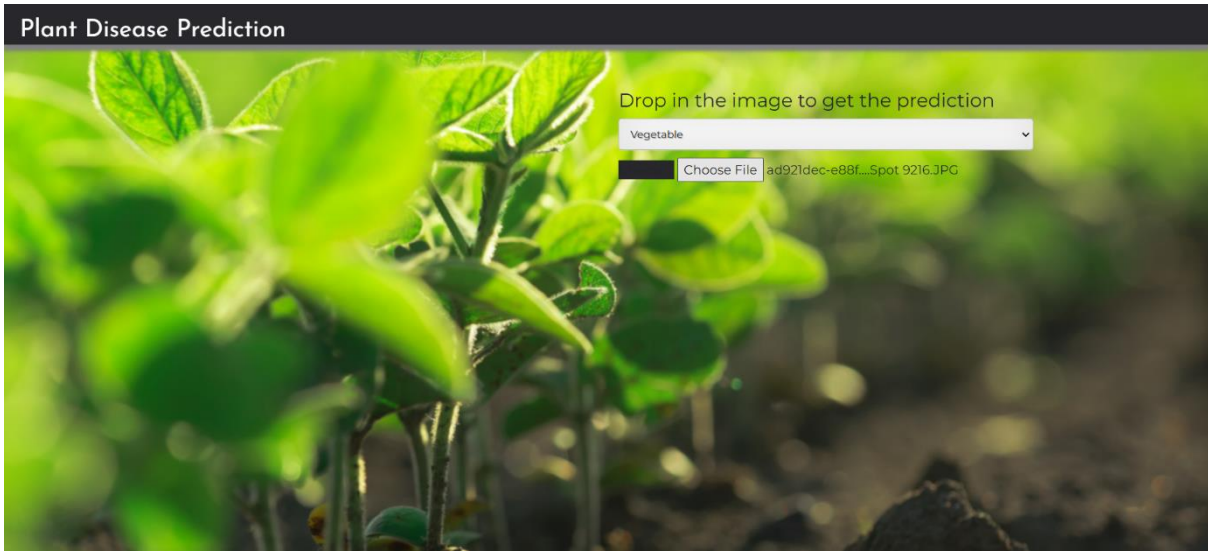
```
<!DOCTYPE html>
<html >
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title> Plant Disease Prediction</title>
  <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'
type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' 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 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-image: url("../static/images/s2.jpg");
  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>
           </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;color:white;font-family:Arial Black;">
</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>
```

8 RESULTS



9 ADVANTAGES & DISADVANTAGES

9.1 ADVANTAGES:

➢ Fertilizers provide crops with nutrients like potassium, phosphorus, and nitrogen, which allow crops to grow bigger, faster, and to produce more food. Nitrogen in particular is an essential nutrient for the growth of every organism on Earth. Nitrogen is all around us and makes up about 78% of the air you breathe.

➢ Sometimes plants need a quick fix to survive, in this type of cases fertilizers play a vital role to improve plants' health. plants need nutrients that can be absorbed quickly which is fulfilled by fertilizers. They are easily soluble and fastly absorbed by plants and as soon as possible it helps to regain and boost plant health.

➢ As the population is increasing, there is a huge demand for food, so good yield is required to fulfil the demand. Here fertilizers become helpful for the good production of crops due to their numerous benefits which promote the fast and healthy growth of plants. For large production, fertilizers become compulsory.

9.2 DISADVANTAGES:

➢ Fertilizers are man-made so they need production in factories which makes them costlier than naturally made manure. But it is important for plant nutrients so it is in demand and thus it has high value.

➢ Fertilizers are used in moderate quantities if we use excessive fertilizers, it surely damages the roots of plants and their tissues and thus plants can die. fertilizers are used according to the need of the plant. Unnecessary use of them can affect the plant's health specially if plants have good fertile soil.

➢ There are many types of fertilizers in the market, some of them are chemically made. These chemical fertilizers are harmful to humans and plants also. Skin irritation, respiratory problems commonly occur due to fertilizers. Can pass harmful chemical in our food which affects.

➢ Fertilizers can reduce the quality of soil and can harm microorganisms in the soil. Long-term use disturbs the pH of the soil and also reduces the microbial activities which are naturally good for plants.

10 CONCLUSIONS

The authors proposed a new approach for the soil-based fertilizer prediction system. The proposed system was able to analyse the soil nutrient type efficiently, kind of leaf disease present in the crop and predict the fertilizer in a proficient manner. The approach was flexible, and can be extended to the needs of the users in a better manner. The proposed method was carried out with five different crops.

11 FUTURE SCOPE

The proposed model in this project work can be extended to image recognition. The entire model can be converted to application software using python to exe software. The real time image classification, image recognition and video processing are possible with help OpenCV python library. This project work can be extended for security applications such as figure print recognition, iris recognition and face recognition. 12 APPENDIX The Project deliverables are uploaded in Git repository and in the IBM dashboard.

12 APPENDICES

The Project deliverables are uploaded in Git repository and in the IBM dashboard.

GIT LINK

https://github.com/IBM-EPBL/IBM-Project-4451-1658732788