A Project Report On

“Plant Disease Prediction Using Deep Learning.”

Submitted in partial fulfillment of the Requirements for the award of the Degree of

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SEM VI Examination

Submitted by

Surajkumar Yadav

ROLL NUMBER: 2225509

Under the esteemed guidance of:

Prof. Shreya Tiwari

Assistant Professor

DEPARTMENT OF COMPUTER SCIENCE

SEVA SADAN’s R. K. Talreja College

of Arts, Science and Commerce,

Ulhasnagar-421 003

(*Affiliated to University of Mumbai*)

A.C. 2022-2023

Seva Sadan's R.K.Talreja College of Arts, Science &Commerce
(Affiliated to University of Mumbai)
Maharashtra, Ulhasnagar - 421003

DEPARTMENT OF COMPUTER SCIENCE

CERTIFICATE

This is to certify that the project entitled, **"Plant Disease Prediction Using Deep Learning "**, is bonafied work of **Surajkumar Yadav** bearing Seat.No: **(2225509)** submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in COMPUTER SCIENCE from University of Mumbai.

Internal Guide **Coordinator**

External Examiner

Date: **College Seal**

ABSTRACT

The project "Plant Disease Prediction using Deep Learning" aims to develop a system that can accurately identify various diseases in plants using machine learning algorithms. The system will be trained on a dataset of images of plants affected by different diseases and will use deep learning techniques to extract relevant features from the images. The extracted features will then be used to train a model that can classify new images of plants based on the presence or absence of disease. The project will involve the use of deep learning frameworks such as TensorFlow, Keras, and will require the use of image processing techniques such as convolutional neural networks (CNNs) and transfer learning. Other technologies that are used to built the webapps are React JS , Streamlit, javascript. The data used had thousands of images of various plant diseases in a very organized manner.

The project involves training a deep learning model using a large dataset of images of healthy and diseased plants to learn and recognize patterns that distinguish between the two. The trained model is then used to classify new images of plants as healthy or diseased, enabling early detection and effective treatment of plant diseases.

The ultimate goal of the project is to provide a tool that can help farmers and plant pathologists quickly identify and treat plant diseases, leading to higher crop yields and better food security.

Acknowledgment

It is a genuine pleasure to express my profound gratitude and deep regards to my guide **" Prof. Shreya Tiwari"** for her exemplary guidance, monitoring and constant encouragement. I would like to express my special thanks to the computer science department from my college who gave me the golden opportunity to do this wonderful project on the topic " **Plant Disease Prediction Using Deep Learning** ", which helped me in doing a lot of Research and I came to know about so many new things.

We are also thankful to all of our teachers of the department who helped us in a number of ways by providing various resources and moral support. Last of all we are grateful to our family, who are, always with us in our every step of life.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

Plant diseases can have a significant impact on crop yield and quality, resulting in financial losses for farmers and potentially affecting global food security. Early detection and accurate diagnosis of plant diseases are crucial for effective management and control of plant diseases. The use of deep learning algorithms in plant disease prediction offers a promising solution to this problem.

The Plant Disease prediction using Deep Learning project aims to develop an accurate and reliable system for early detection and diagnosis of plant diseases using machine learning techniques. The project involves the use of deep learning algorithms to analyze large datasets of images of healthy and diseased plants to identify patterns that distinguish between the two.

The deep learning model is trained to recognize visual cues and patterns associated with different types of plant diseases. Once the model is trained, it can be used to classify new images of plants and accurately identify the presence of any diseases.

The benefits of this project are significant, as early detection of plant diseases can help farmers take preventive measures and reduce the spread of diseases, leading to increased crop yields and reduced financial losses. Moreover, the system can help farmers make informed decisions about crop management, including the use of pesticides and fertilizers, thus reducing costs and minimizing environmental damage.

In summary, the Plant Disease prediction using Deep Learning project offers a promising solution to the challenge of early detection and diagnosis of plant diseases, with significant potential benefits for farmers and the agriculture industry as a whole.

1.1 Purpose of the project.

The world is changing very rapidly with Artificial Intelligence and other technological advances that are making the human more comfortable and easier. Our application aims the same to automate the recognition process of Diseases in plants and provide treatment . The purpose of the Plant Disease prediction using Deep Learning project is to develop a reliable and accurate system for early detection and diagnosis of plant diseases using machine learning techniques. The project aims to leverage the power of deep learning algorithms to analyze large datasets of images of healthy and diseased plants and identify patterns that can distinguish between the two.

The project's primary objective is to improve crop yield and quality while reducing financial losses caused by plant diseases. By detecting and diagnosing plant diseases at an early stage, the project can help farmers take preventive measures and reduce the spread of diseases, leading to increased crop yields and reduced financial losses.

1.2 Existing System

In the present system all work is done manually by checking the condition of plants in a field which requires accurate knowledge of the checker preferably a Doctor or a Biologist. The system is very time consuming and requires a lot of human labour. A major drawback is to keep the records of diseased plants and the way to treat it and also a large amount of time gets passed from checking and treating the plants which may worsen the condition of the plants.

Traditional systems used for disease prediction in plants have several weaknesses, including:

● Reliance on Visual Symptoms: Traditional disease prediction systems often rely on visual symptoms to diagnose plant diseases, which can be unreliable and subject to interpretation. Visual symptoms can also be difficult to detect in the early stages of disease, leading to delays in treatment and a higher risk of crop loss.

● Lack of Data Integration: Traditional disease prediction systems often do not integrate data from multiple sources, such as weather data or soil conditions, which can affect disease development. This can limit their accuracy and reliability, as they may fail to account for all the factors that contribute to disease outbreaks.

● Limited Flexibility: Traditional disease prediction systems are often inflexible, as they are designed to detect specific diseases or pests. This can make it difficult to adapt to new diseases or changing environmental conditions, leading to delays in response and potentially higher crop losses.

● High Cost: Many traditional disease prediction systems are costly to implement, as they require specialized equipment or expertise. This can make them inaccessible to small-scale farmers or those in developing countries, limiting their usefulness in areas where plant diseases are a significant threat to crop yield and food security.

Overall, the weaknesses of traditional disease prediction systems highlight the need for more advanced and flexible systems that can integrate data from multiple sources and accurately predict and diagnose plant diseases. The use of technologies such as deep learning and machine learning offers promising solutions to these challenges.

1.3 Proposed system

To overcome the drawbacks of the existing system, the proposed system has been evolved. This project aims to reduce the manual work and saving time to generate accurate results of plant Diseases. The system provides with the best user interface.

Advantages of Proposed System:

- It is trouble-free to use.
- It is a relatively fast approach to Predict Diseased plants.
- Is highly reliable, approximate result most of the times.
- Best user Interface
- Availability.

※ There are 2 different systems that I am proposing:

1. **A React JS web App**:

   This app runs locally on a device with FastAPI as backend and React JS as frontend. The deep learning model is stored as .h5 file and is called by fastapi on localhost which is used on frontend for predictions. The frontend includes a basic structure of an app which has a input parameter for images

where we have to upload the plants leaves images which is sent to the backend.

2. **A Streamlit Web app hosted on cloud:**

This app is fully functional web app accessible from anywhere in the world and uses Streamlit as frontend and Google Cloud Platforms [Cloud Functions] as Backend. The following modules are there in the app:

1. **Admin Login Module:** This module is for logging into the system and accessing all the services with proper credentials, You can signup by using the signup button and if you forget your password or username there are options to retrieve it .

2. **Predict Disease Module:** This is the module where you upload you plants image to get the results, there are two options either you can upload a file from your device or you can click an image from the devices camera.

3. **Disease Information module:** This module is where you can find all the information about different Diseases that affect the plants and how to identify them and treat them.

Theory:

- **DEEP Learning:**

Deep learning is a type of machine learning that involves the use of neural networks with many layers, also called deep neural networks. These networks can learn to recognize complex patterns and relationships in data, making them well-suited for tasks such as image recognition, speech recognition, natural language processing, and more.

The main advantage of deep learning over traditional machine learning methods is its ability to automatically learn feature representations from raw data. This eliminates the need for manual feature engineering, which can be time-consuming and require expert knowledge.

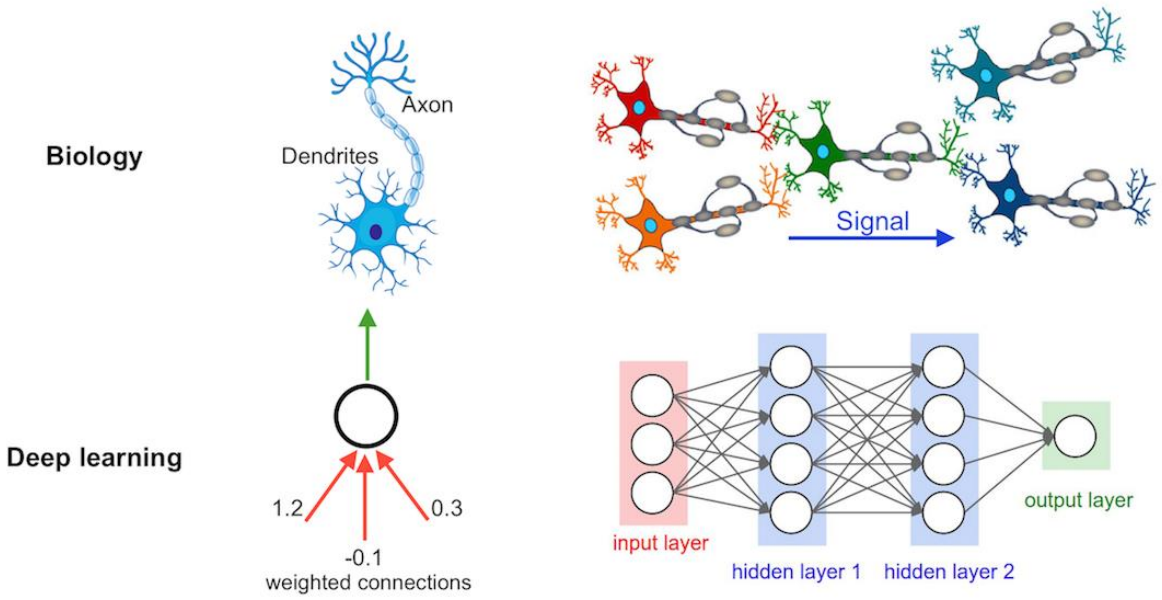
Deep learning models are typically trained using large datasets, and the learning process involves adjusting the weights and biases of the network in response to input data. This is done using an optimization algorithm such as stochastic gradient descent, which minimizes the error between the network's predicted output and the actual output.

Some popular types of deep learning models include convolutional neural networks (CNNs), which are commonly used for image and video processing; recurrent neural networks (RNNs), which are suited for sequential data such as time series or natural language processing; and generative adversarial networks (GANs), which can be used for generating new data based on existing datasets.

Despite their effectiveness, deep learning models can be computationally intensive and require significant computational resources. However, advances in hardware and software have made deep learning more accessible and easier to use for a wide range of applications.

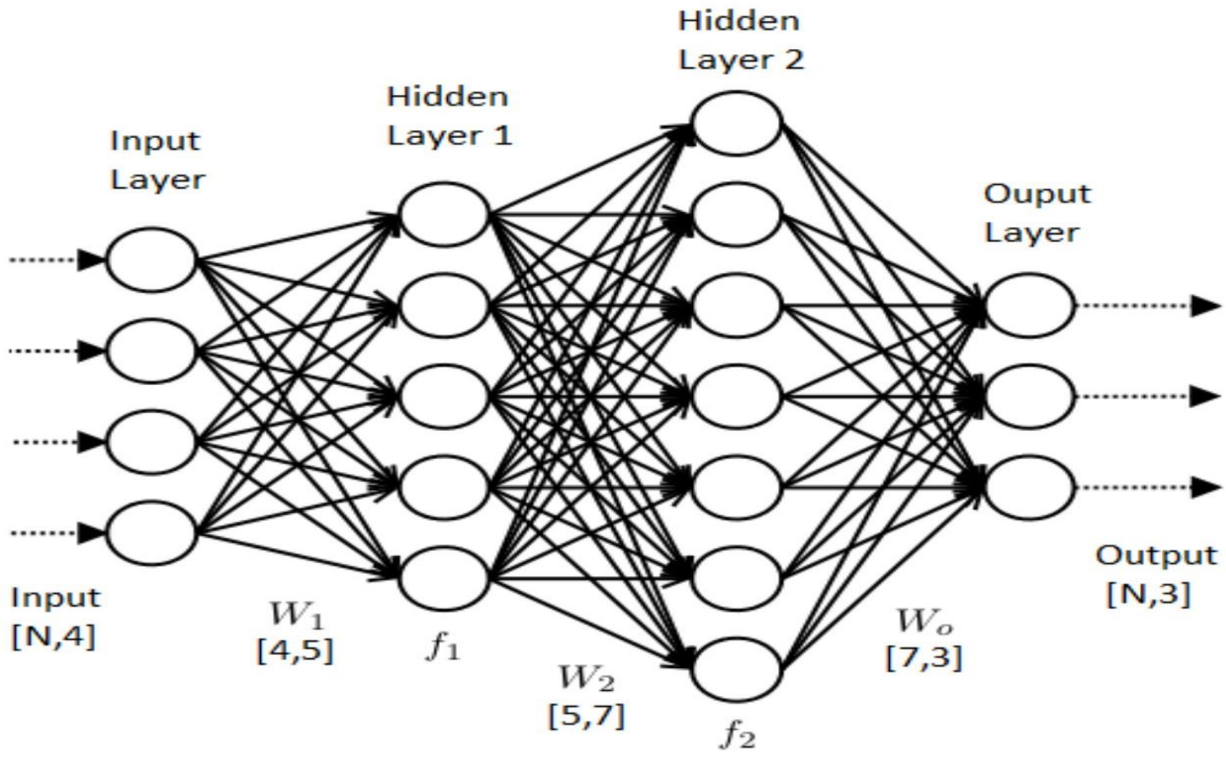
- **Convolution Neural Network:**

A neuron is a basic unit of a neural network, which is inspired by the structure and function of the human brain. A neuron receives input from other neurons or sensors, performs a computation, and produces an output that can be sent to other neurons or to an external system. The computation performed by a neuron involves a weighted sum of its inputs, followed by the application of an activation function. The weights determine the contribution of each input to the output, and they are adjusted during the learning process to optimize the performance of the network.

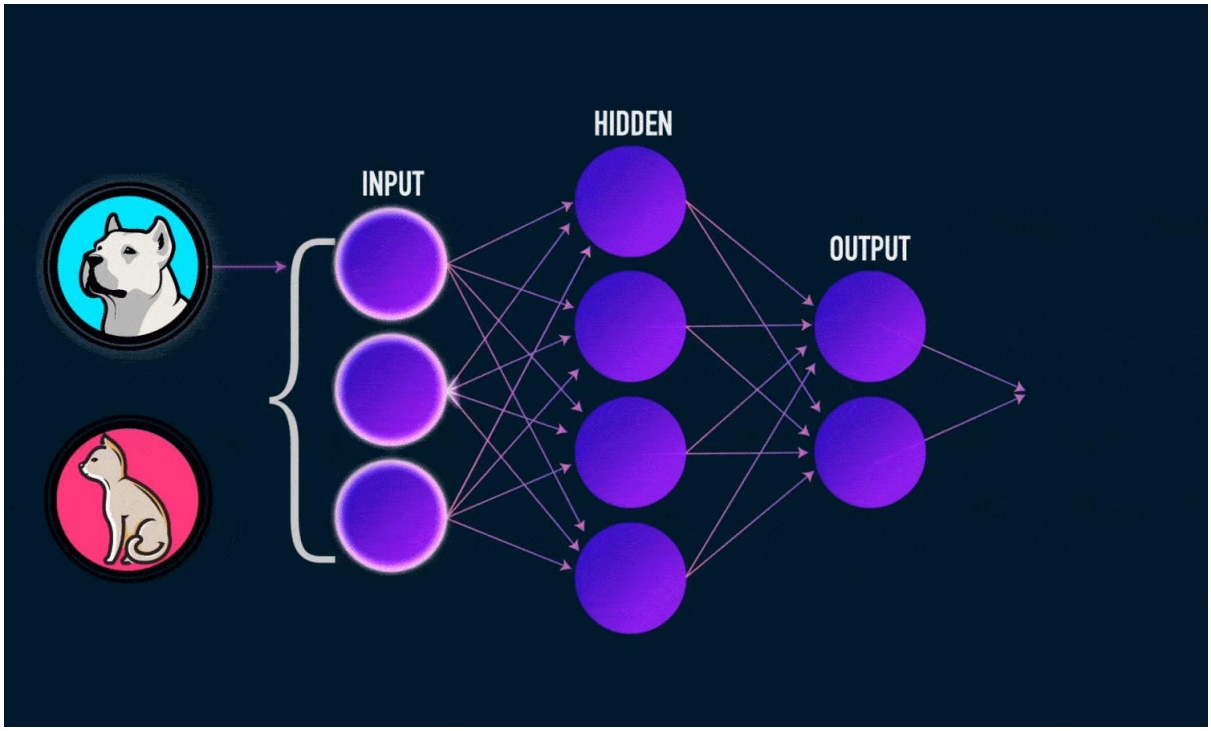


A neural network is a collection of interconnected neurons organized in layers. The input layer receives input from the external world, and the output layer produces the final output of the network. Between the input and output layers, there can be one or more hidden layers, each composed of multiple neurons. The neurons in one layer are connected to the neurons in the next layer, forming a directed graph. Neural networks can be trained using supervised or unsupervised

learning methods. In supervised learning, the network is presented with input-output pairs, and the weights are adjusted to minimize the error between the predicted and actual outputs. In unsupervised learning, the network learns to represent the input data without explicit labels.



Convolutional neural networks (CNNs) are a specialized type of neural network that is commonly used for image and video processing tasks. CNNs use convolutional layers to extract features from the input images, and pooling layers to reduce the dimensionality of the features. The output of the convolutional and pooling layers is flattened and fed into a fully connected layer that produces the final output. The convolutional layers in a CNN are designed to be translation-invariant, meaning that they can recognize patterns in different parts of the image regardless of their location. CNNs are often used in applications such as image classification, object detection, and facial recognition. They have achieved state-of-the-art performance on many benchmark datasets and are widely used in industry and academia.

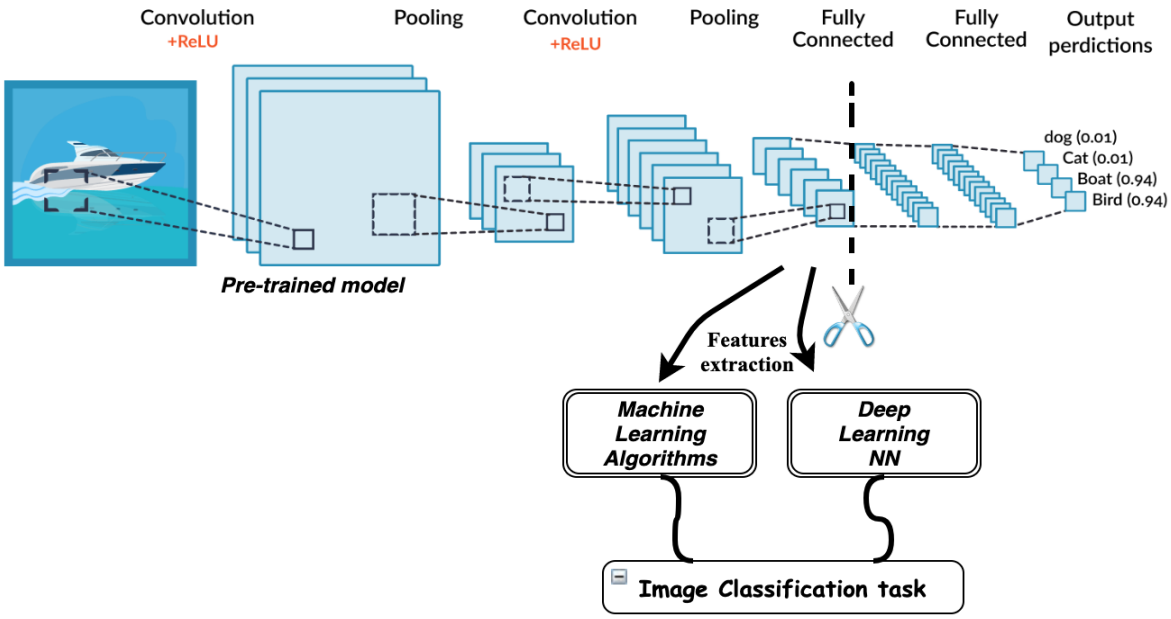


- **Transfer learning:**

Transfer learning is a technique in machine learning and deep learning where a pre-trained model is used as a starting point for a new task. Instead of starting from scratch and training a new model on a large dataset, transfer learning allows us to leverage the knowledge and feature representations learned by a pre-trained model on a related task. The idea behind transfer learning is that many real-world problems share some common underlying structure or features, and a model that has learned these features on a related task can be adapted to a new task with less data and computation.

There are two main approaches to transfer learning: fine-tuning and feature extraction. In fine-tuning, we start with a pre-trained model and train it on the new task using a small amount of new data. We typically freeze most of the layers of the pre-trained model and only fine-tune the last few layers that are specific to

the new task. This allows us to leverage the general feature representations learned by the pre-trained model while adapting to the specific characteristics of the new task. In feature extraction, we use the pre-trained model as a fixed feature extractor and train a new classifier on top of the extracted features. We typically remove the last few layers of the pre-trained model and use the output of the remaining layers as features for the new task. This approach is particularly useful when we have limited data for the new task or when the pre-trained model is too large to be fine-tuned on a new task.



Transfer learning has been shown to be effective in a wide range of applications, including computer vision, natural language processing, and speech recognition. It can significantly reduce the time and resources required to train a new model and improve the performance of the model on the new task. Pre-trained models such as VGG, ResNet, and BERT are widely used as starting points for transfer learning, and many open-source libraries provide pre-trained models and tools for fine-tuning and feature extraction.

CHAPTER 2
REQUIREMENT SPECIFICATION AND ANALYSIS PHASE

2.1 Project Background

The background for disease prediction in plants lies in the significant impact that plant diseases have on agricultural productivity, food security, and economic stability worldwide. Plant diseases can cause crop losses, reduce crop quality, increase production costs, and damage the environment. They can also pose a threat to human health, as some plant diseases can be transmitted to humans through contaminated food.

In the past, plant diseases were primarily managed through the use of chemical pesticides and fungicides. However, the overuse of these chemicals has led to resistance in plant pathogens and environmental damage, creating the need for more sustainable and effective disease management strategies.

Recent advances in computer vision, machine learning, and deep learning offer promising solutions for detecting and predicting plant diseases in a more accurate and timely manner. By analyzing large datasets of images of healthy and diseased plants, these technologies can identify patterns and features that are indicative of disease, allowing for early detection and diagnosis.

The development of disease prediction models using deep learning algorithms has the potential to revolutionize plant disease management by providing farmers with early warning systems that can help them take preventive measures and reduce the spread of diseases. This can lead to increased crop yields, reduced costs, and improved environmental sustainability.

2.2 User Requirements

To deliver the best service to the users we tried to find out the user's necessities which are below:

Administrator Aspect:

- Monitoring the whole system from the admin panel.
- Taking backup of the database.
- Creating, deleting and modifying the records.
- Add entities for the admin panel.
- Keeping the entities record like their details.

Users Aspect:

- **Getting smooth functionality and performance of the app.**
- **Getting to know the record of disease plants.**
- **Saving their time.**

2.4 Requirement Analysis

The **Plant Disease prediction using Deep Learning** is a web based application. The main purpose of the project is to provide a convenient and easy way for a farmer to identify and treat diseased plants. To develop this System. Software and Hardware Requirements are necessary. Requirements which are needed are given below briefly.

Hardware Requirements:

Processor-At least 3.0 GHZ (greater than i3 intel processors).

RAM-At least 4GB.

SSD would be great.

Your system must have camera for taking input.

Software Requirements:

Compatible operating system: Windows 8 and higher, Linux, Mac.

Front end design tool -Streamlit (python), CSS, React JS.

Back End-FastApi, Google Cloud Platforms.

Editor Tools -Notepad++, Visula Studio Code, Anaconda.

Web Browser-Google Chrome, Firefox, or any compatible updated browser.

Database tools: GCP [Cloud Storage Bucket]

2.5 Project Develop Languages

The Main language used in developing the web application is Python and its various libraries such as :

- **Tensorflow and keras** for model building and testing.
- **streamlit** for frontend.
- **Requests** for working with the model deployed on the GCP as backend.
- **Pillow** for image Manipulation.

- **Numpy** for mathematical calculations.
- **Streamlit_authenticator** for authentication purposes.
- **Streamlit_extras** for enhancing the look of frontend.
- **time** for Time related aspects.

2.6 Why Developers use python and its libraries :

Python:

Python is a high-level, interpreted, and general-purpose dynamic programming language that focuses on code readability. It generally has small programs when compared to Java and C. It was founded in 1991 by developer Guido Van Rossum. Python ranks among the most popular and fastest-growing languages in the world. Python is a powerful, flexible, and easy-to-use language. In addition, the python community is very active. It is used in many organizations as it supports multiple programming paradigms. It also performs automatic memory management.

Advantages:

1 . Presence of third-party modules

2. Extensive support libraries (NumPy for numerical calculations, Pandas for data analytics,etc.)

3. Open source and large active community base

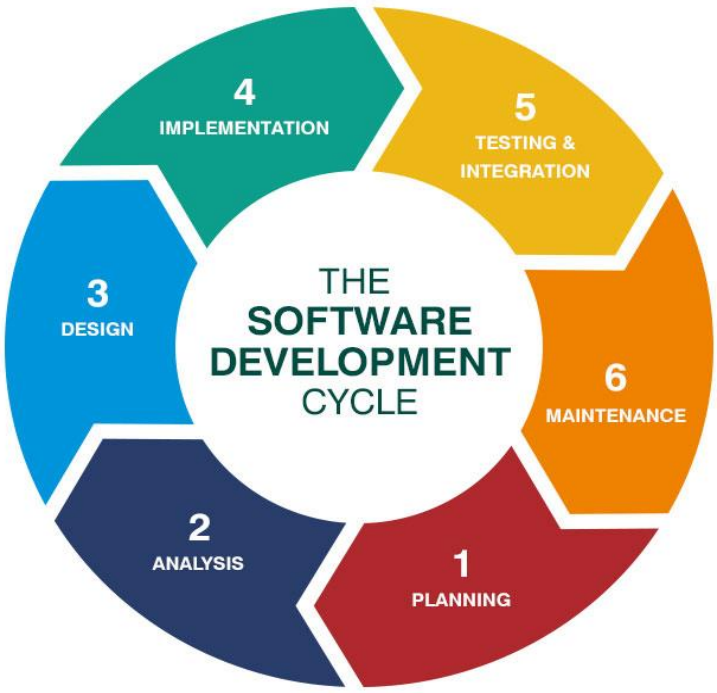
4. Versatile, Easy to read, learn and write

5. User-friendly data structures

6. High-level language

7. Dynamically typed language(No need to mention data type based on the value assigned, it takes data type).

2.7 Software Development Life Cycle



The software industry includes many different processes, for example, analysis, development, maintenance and publication of software. This industry also includes software services, such as training, documentation, and consulting. Our focus here is about software development life cycle (SDLC). So, due to that different types of projects have different requirements. Therefore, it may be required to choose the SDLC phases according to the specific needs of the project. These different requirements and needs give us various software development approaches to choose from during software implementation

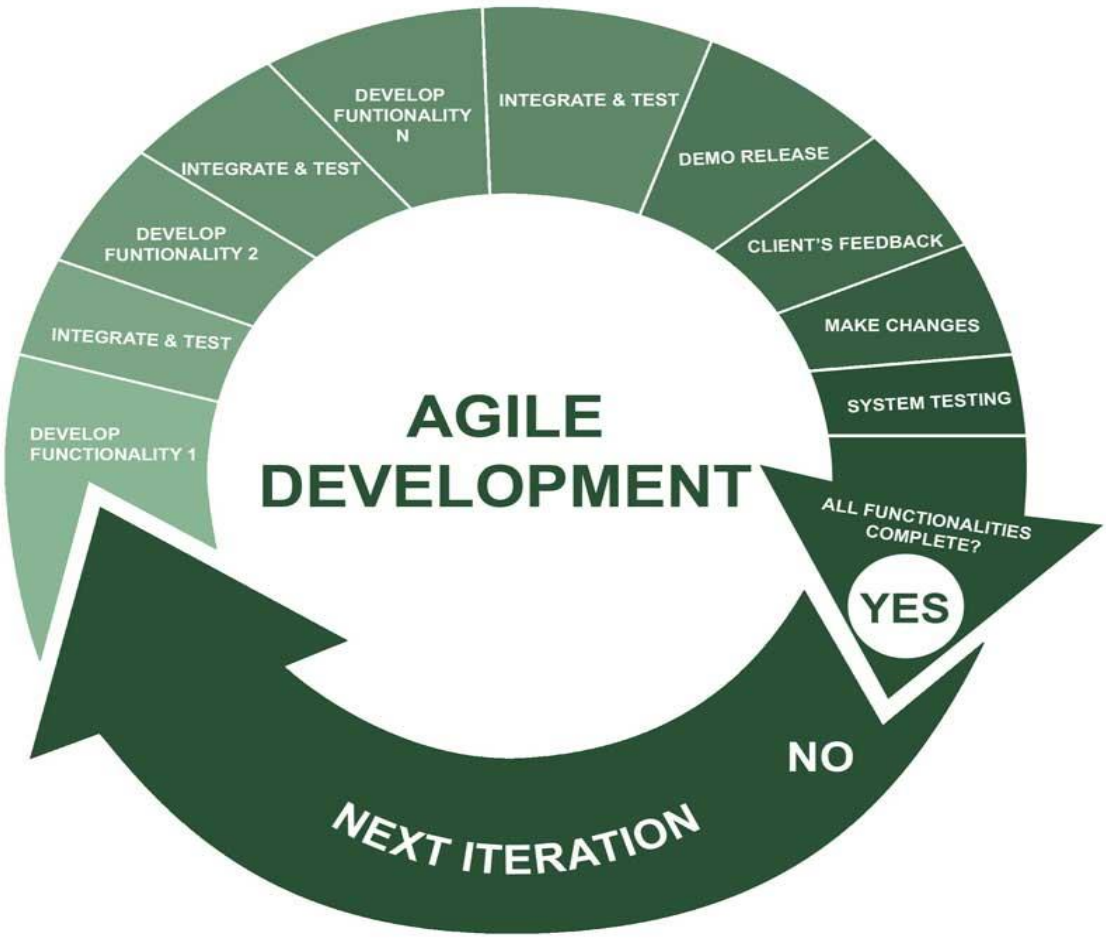
2.7.1. SDLC Models

There are various software development life cycle models defined and designed which are followed during the software development process. These models are also referred to as "Software Development Process Models". Each process model follows a Series of steps unique to its type, in order to ensure success in the

process of software development. Following are the most important and popular SDLC models followed in the industry :

1. Waterfall model
2. V-Shaped model
3. Prototyping model
4· Spiral model
5. Iterative and Incremental model
6. Agile model
7. RAD model.

2.7.2 Agile model:



When it comes to data science projects, the Agile SDLC model is often considered the best fit. Here are some reasons why:

● **Flexibility:**

Data science projects are often exploratory in nature, with a high degree of uncertainty and risk involved. The Agile model is well-suited to this type of project as it allows for flexibility and adaptability throughout the development process. Teams can adjust their plans and priorities as they learn more about the problem domain, data, and model performance.

● **Iterative Development:**

The Agile model emphasizes iterative development and continuous improvement. This is particularly beneficial for data science projects, which require a lot of experimentation and fine-tuning to achieve optimal performance. The iterative approach allows for regular testing, evaluation, and feedback, enabling teams to refine their models and algorithms over time.

●**Cross-Functional Teams:**

Data science projects typically require collaboration between different teams, including data engineers, data scientists, and subject matter experts. The Agile model supports cross-functional teams, allowing for better communication and collaboration between team members with different skill sets.

●**Customer Collaboration**:

The Agile model emphasizes customer collaboration and feedback, ensuring that the end product meets the needs of the customer. For data science projects, this means involving subject matter experts and stakeholders in the development process to ensure that the models and algorithms are aligned with their needs and goals.

● **Short Timeframes**:

Data science projects often have short timeframes and tight deadlines, which can be challenging to manage using traditional SDLC models. The Agile model

emphasizes rapid prototyping and delivery, allowing teams to deliver working models and algorithms quickly and frequently.

Overall, the Agile SDLC model is well-suited to data science projects as it provides the flexibility, iterative development, cross-functional teams, customer collaboration, and short timeframes needed to develop effective and innovative solutions.

2.7.3 PhasesAgile model:

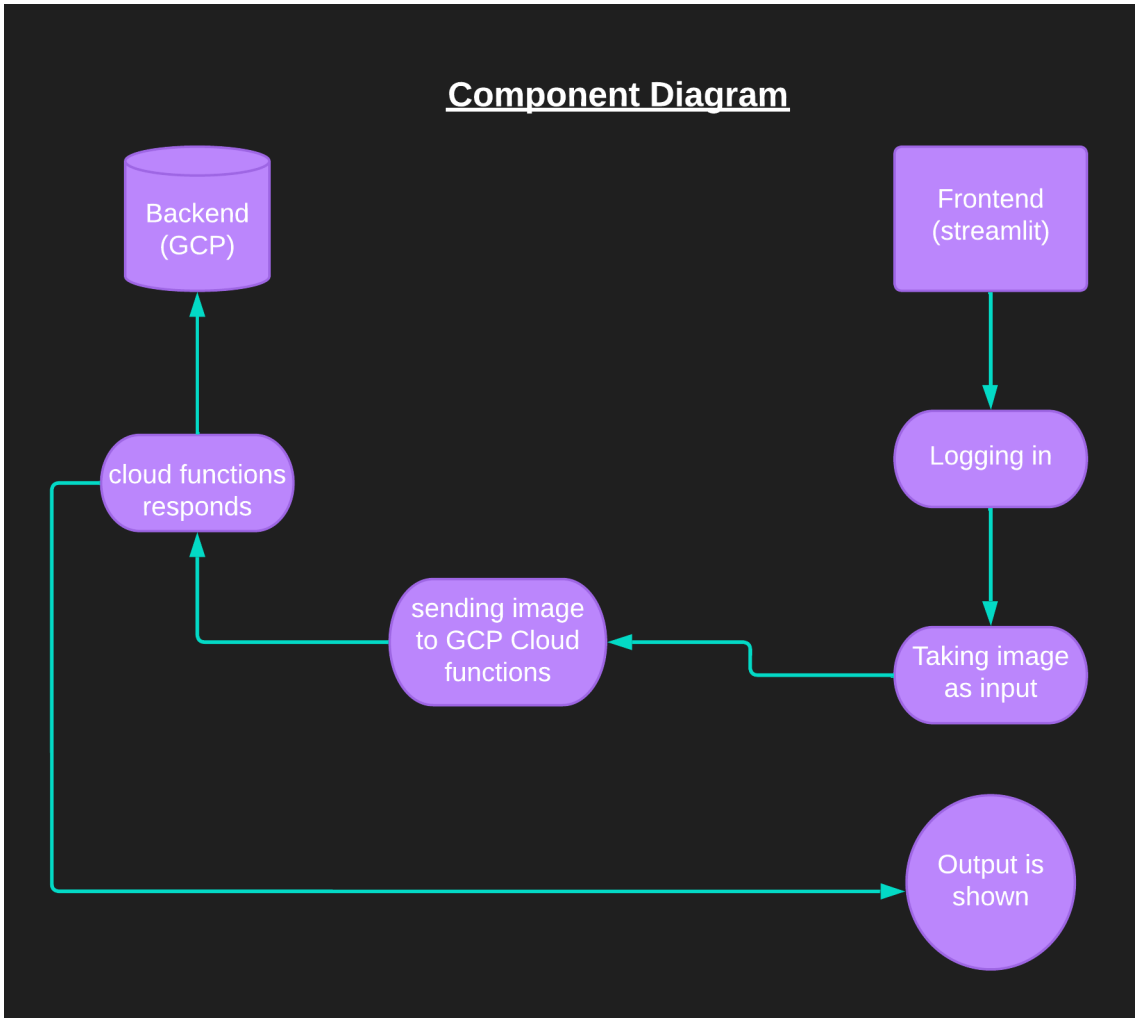
1. **Planning**: In this phase, the team defines the scope of the project, sets goals, and creates a roadmap for the development process. The team collaborates with the stakeholders to identify the requirements, prioritize them, and create a product backlog.
2. **Analysis**: In this phase, the team analyzes the requirements and creates user stories, which are short descriptions of the features and functionalities that the product should have. The team estimates the effort required for each user story and creates a sprint backlog, which is a list of user stories that will be addressed in the current sprint.
3. **Design**: In this phase, the team designs the architecture of the product, defines the technical requirements, and creates a plan for the implementation. The team collaborates with the stakeholders to ensure that the design meets their needs and expectations.
4. **Implementation**: In this phase, the team develops the product according to the plan and the sprint backlog. The team follows the Agile principles of collaboration, self-organization, and continuous improvement. The team delivers a working product at the end of each sprint, which is reviewed by the stakeholders.
5. **Testing**: In this phase, the team tests the product to ensure that it meets the quality standards and the user requirements. The team uses various testing

techniques, such as unit testing, integration testing, and acceptance testing, to identify and fix defects.

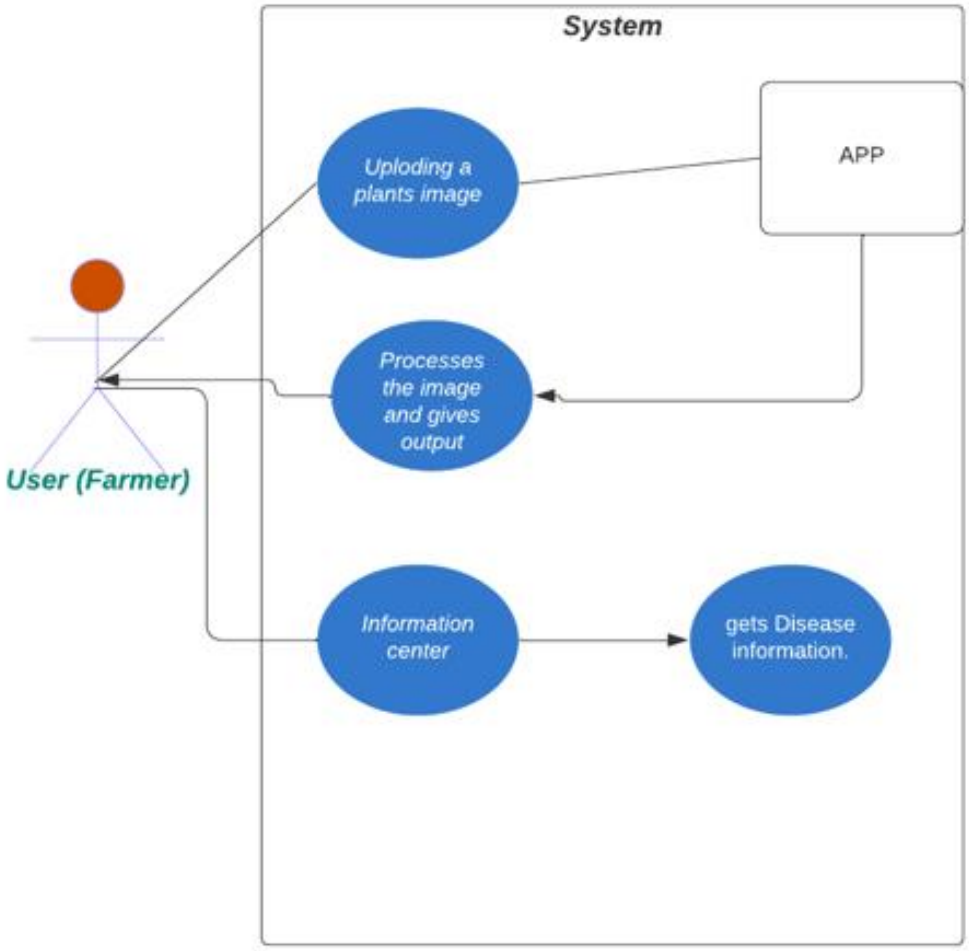
6. **Deployment**: In this phase, the team deploys the product to the production environment and makes it available to the users. The team monitors the product and collects feedback from the users to improve the product in future sprints.
7. **Review and Retrospective**: In this phase, the team reviews the sprint and the product with the stakeholders, demonstrates the progress made, and collects feedback. The team also conducts a retrospective, where they reflect on the sprint and identify opportunities for improvement. The team uses the feedback and the retrospective to plan the next sprint and improve the process.

CHAPTER 3
SYSTEM DESIGN DETAILS/System Analysis

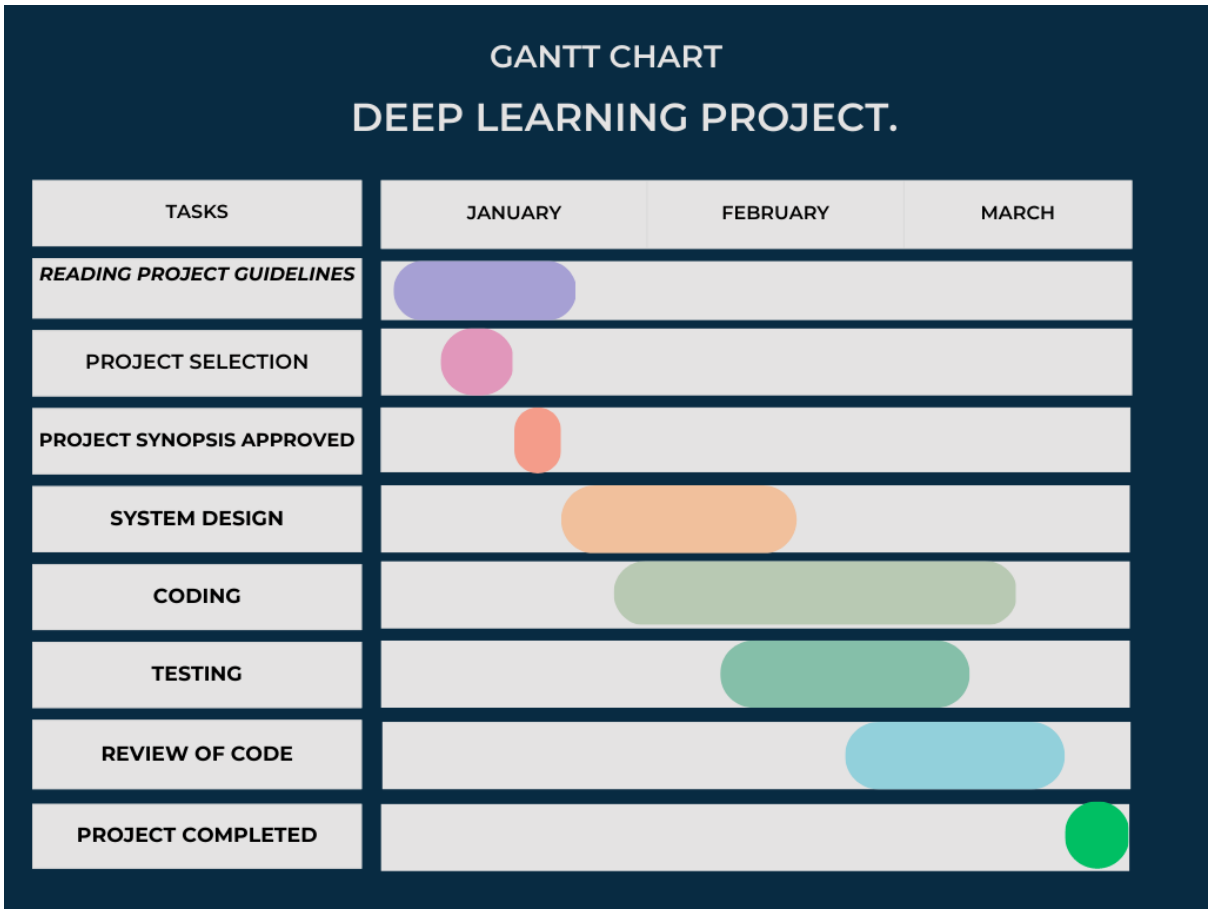
3.1 Component Diagram



3.2 Use Case Diagram



3.5 Gantt Chart



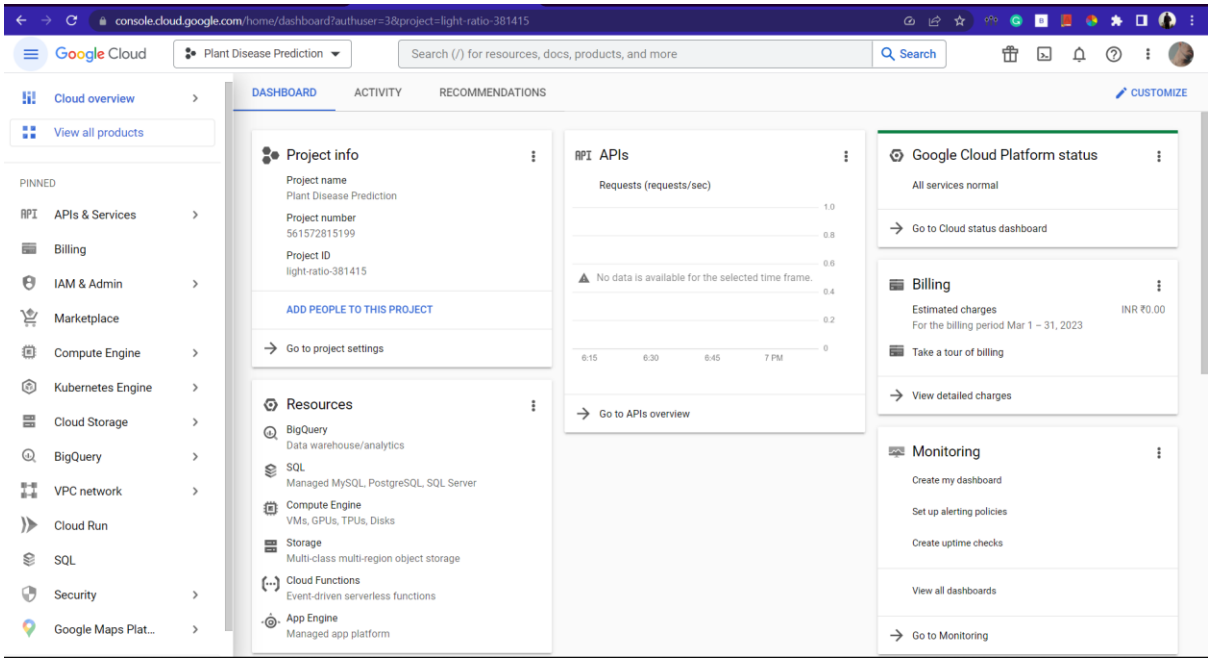
TASK	Start date	End date
Reading Project Guidelines	10/01/23	31/01/23
Project Selection	15/01/23	20/01/23
Creating Synopsis	20/01/23	22/01/23
Project Synopsis approved	25/01/23	
System Design	26/01/23	15/02/23
Requirement Analysis	16/02/23	17/02/23
Creating a Prototype	17/02/23	18/02/23
Coding	01/02/23	17/03/23

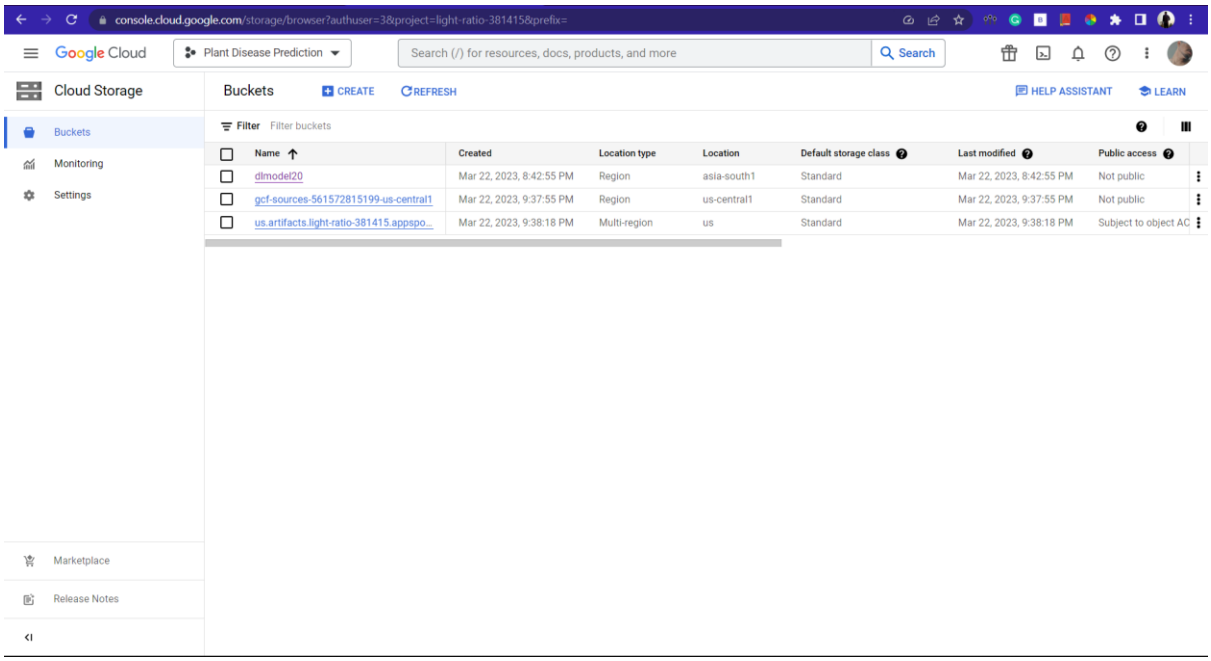
Testing	17/03/23	20/02/23
1st review of code	28/03/23	
Worked on recommended things	28/03/23	29/03/23
2nd review of code	30/03/23	
Project completed.	30/03/23	

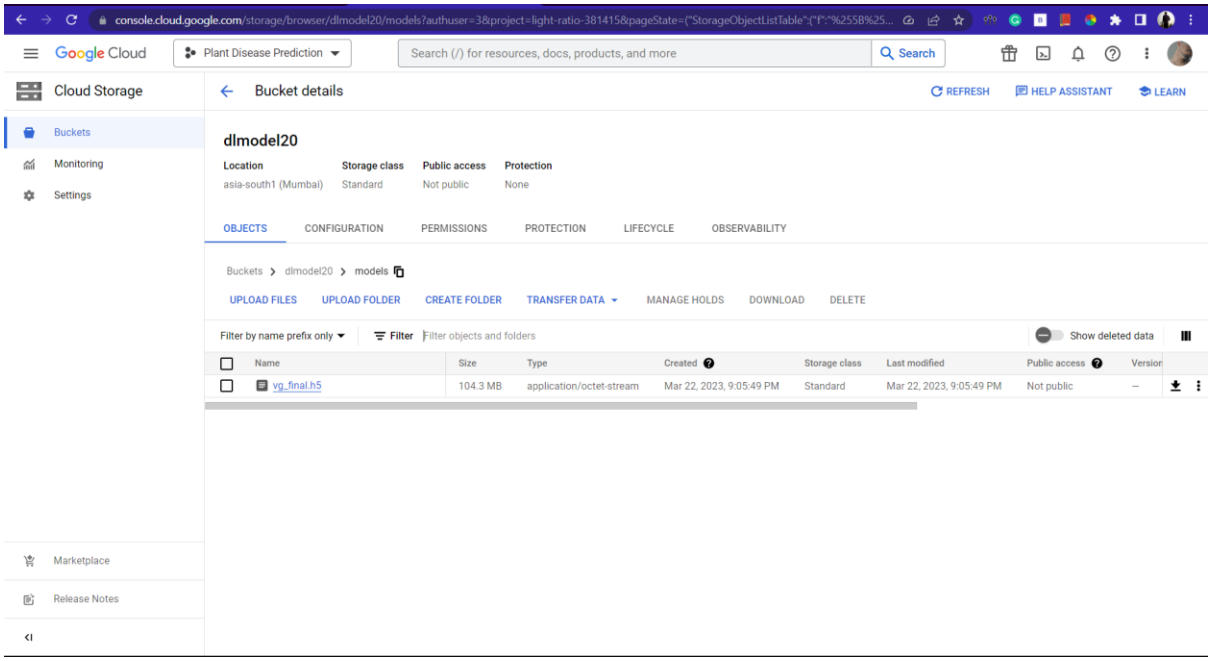
CHAPTER 4

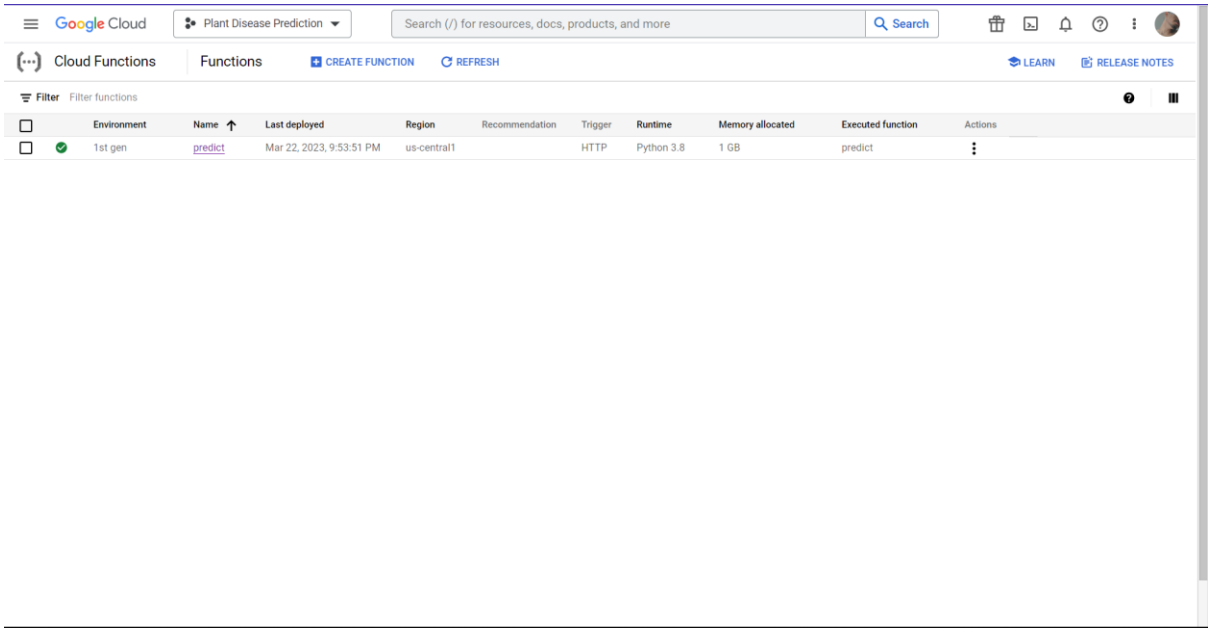
DATA DEFINITIONS AND FORM DESIGN/SNAPSHOTS

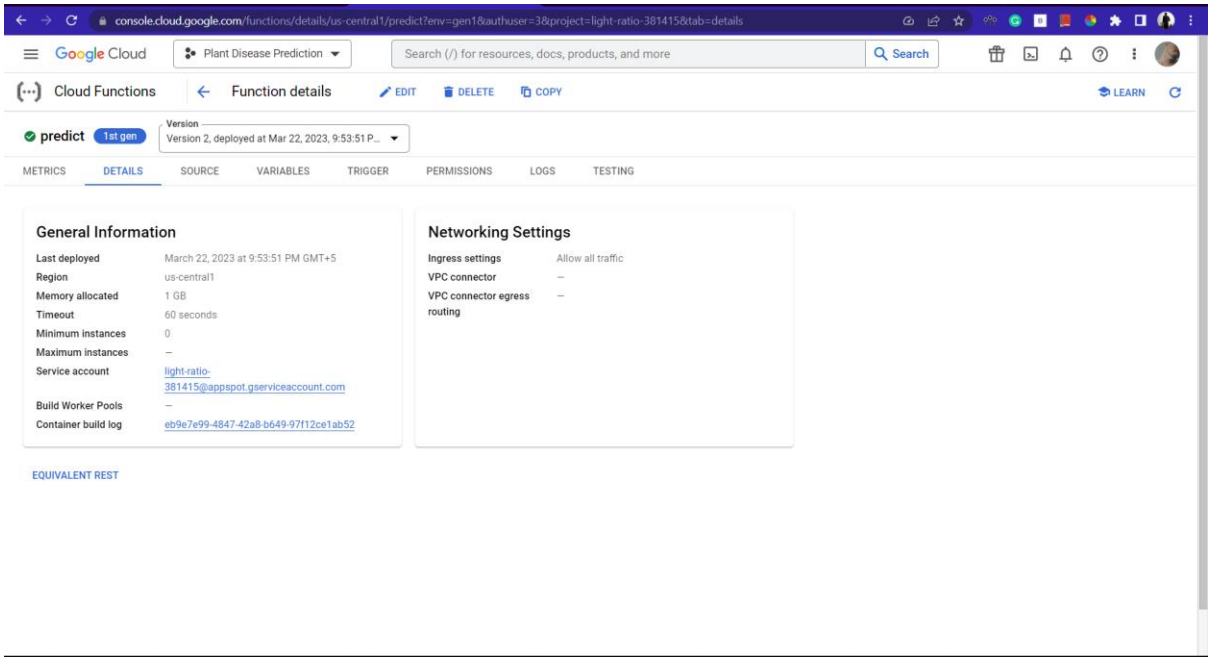
4.1 Cloud Storage:

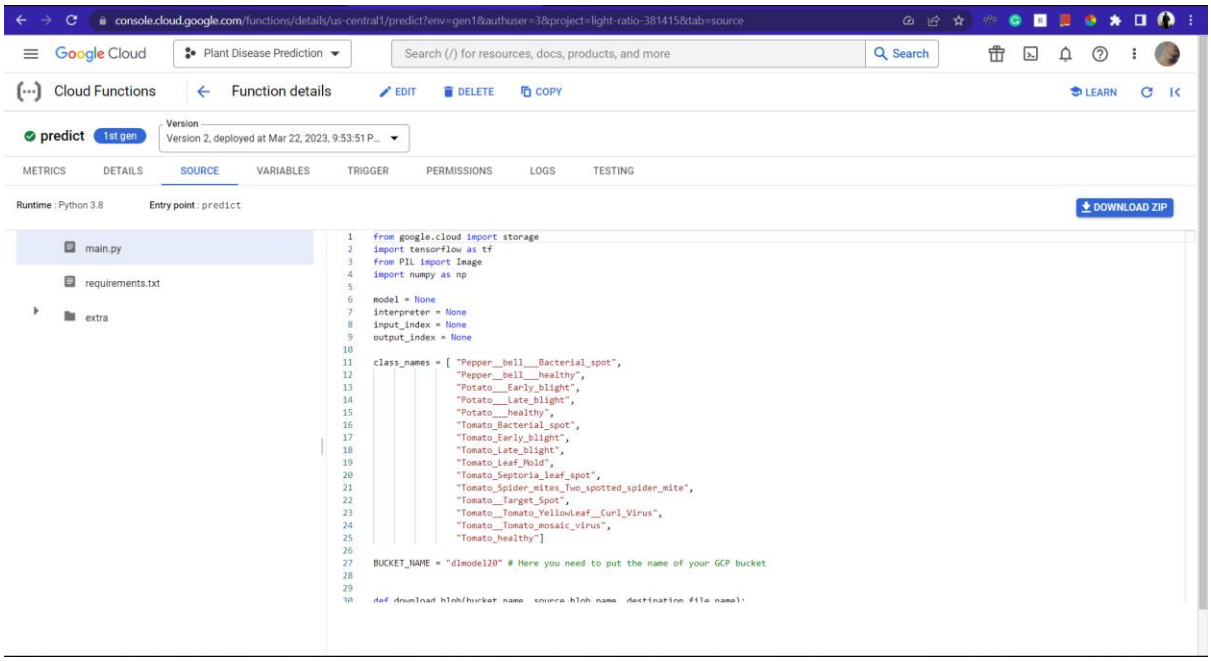





Google Cloud
Plant Disease Prediction
Search (/) for resources, docs, products, and more
Search
Cloud Storage
Bucket details
REFRESH
HELP ASSISTANT
LEARN
Buckets
Monitoring
Settings
dlmodel20
Location
asia-south1 (Mumbai)
Storage class
Standard
Public access
Not public
Protection
None
OBJECTS
CONFIGURATION
PERMISSIONS
PROTECTION
LIFECYCLE
OBSERVABILITY
Buckets > dlmodel20 > models
UPLOAD FILES
UPLOAD FOLDER
CREATE FOLDER
TRANSFER DATA
MANAGE HOLDS
DOWNLOAD
DELETE
Filter by name prefix only
Filter
Filter objects and folders
Show deleted data
Name
Size
Type
Created
Storage class
Last modified
Public access
Version
vg_final.h5
104.3 MB
application/octet-stream
Mar 22, 2023, 9:05:49 PM
Standard
Mar 22, 2023, 9:05:49 PM
Not public
Marketplace
Release Notes


Google Cloud
Plant Disease Prediction
Search (/) for resources, docs, products, and more
Search
Cloud Functions
Functions
CREATE FUNCTION
REFRESH
LEARN
RELEASE NOTES
Filter
Filter functions
Environment
Name
Last deployed
Region
Recommendation
Trigger
Runtime
Memory allocated
Executed function
Actions
1st gen
predict
Mar 22, 2023, 9:53:51 PM
us-central1
HTTP
Python 3.8
1 GB
predict

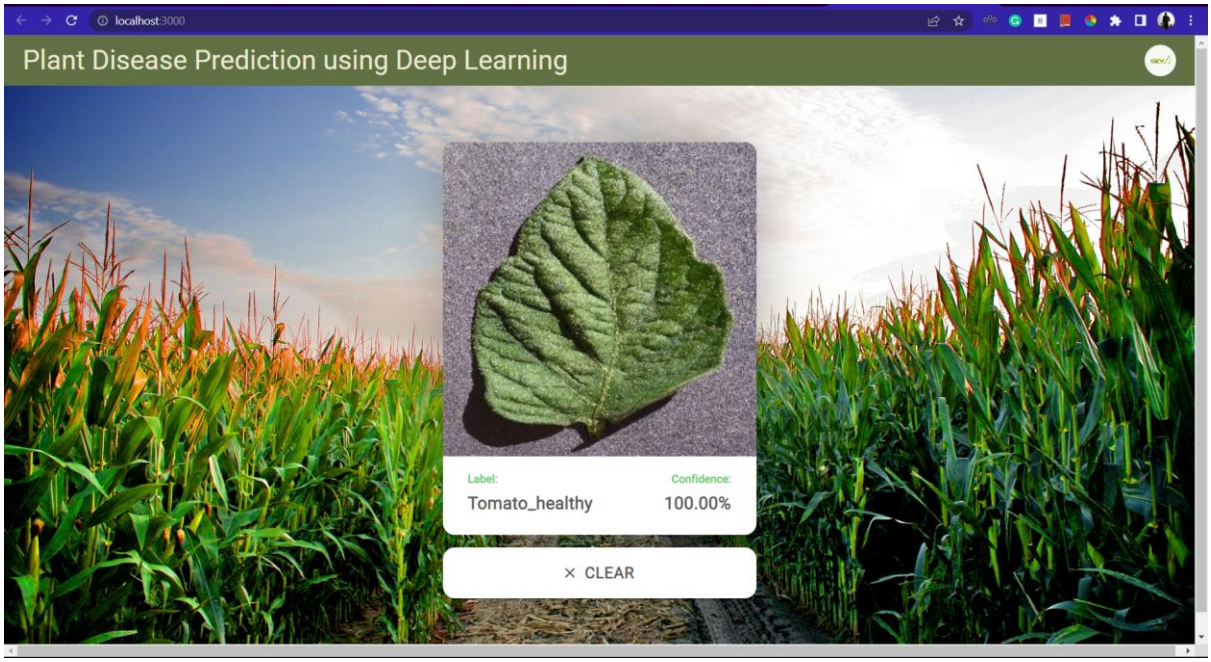

console.cloud.google.com/functions/details/us-central1/predict?env=gen1&authuser=3&project=light-ratio-381415&tab=details
Google Cloud
Plant Disease Prediction
Search (/) for resources, docs, products, and more
Search
Cloud Functions
Function details
EDIT
DELETE
COPY
LEARN
predict
1st gen
Version
Version 2, deployed at Mar 22, 2023, 9:53:51 P...
METRICS
DETAILS
SOURCE
VARIABLES
TRIGGER
PERMISSIONS
LOGS
TESTING
General Information
Last deployed
March 22, 2023 at 9:53:51 PM GMT+5
Region
us-central1
Memory allocated
1 GB
Timeout
60 seconds
Minimum instances
0
Maximum instances
–
Service account
light-ratio-381415@appspot.gserviceaccount.com
Build Worker Pools
–
Container build log
eb9e7e99-4847-42a8-b649-97f12ce1ab52
Networking Settings
Ingress settings
Allow all traffic
VPC connector
–
VPC connector egress routing
–
EQUIVALENT REST


console.cloud.google.com/functions/details/us-central1/predict?env=gen1&authuser=3&project=light-ratio-381415&tab=source
Google Cloud
Plant Disease Prediction
Search (/) for resources, docs, products, and more
Search
Cloud Functions
Function details
EDIT
DELETE
COPY
LEARN
predict
1st gen
Version
Version 2, deployed at Mar 22, 2023, 9:53:51 P...
METRICS
DETAILS
SOURCE
VARIABLES
TRIGGER
PERMISSIONS
LOGS
TESTING
Runtime : Python 3.8
Entry point : predict
DOWNLOAD ZIP
main.py
requirements.txt
extra
from google.cloud import storage
import tensorflow as tf
from PIL import Image
import numpy as np
model = None
interpreter = None
input_index = None
output_index = None
class_names = ["Pepper__bell___Bacterial_spot",
"Pepper__bell___healthy",
"Potato___Early_blight",
"Potato___Late_blight",
"Potato___healthy",
"Tomato_Bacterial_spot",
"Tomato_Early_blight",
"Tomato_Late_blight",
"Tomato_Leaf_Mold",
"Tomato_Septoria_leaf_spot",
"Tomato_Spider_mites_Two_spotted_spider_mite",
"Tomato__Target_Spot",
"Tomato__Tomato_YellowLeaf__Curl_Virus",
"Tomato__Tomato_mosaic_virus",
"Tomato_healthy"]
BUCKET_NAME = "dlmodel20" # Here you need to put the name of your GCP bucket
def download_blob(bucket_name, source_blob_name, destination_file_name):

4.2 Form Design /Snapshots

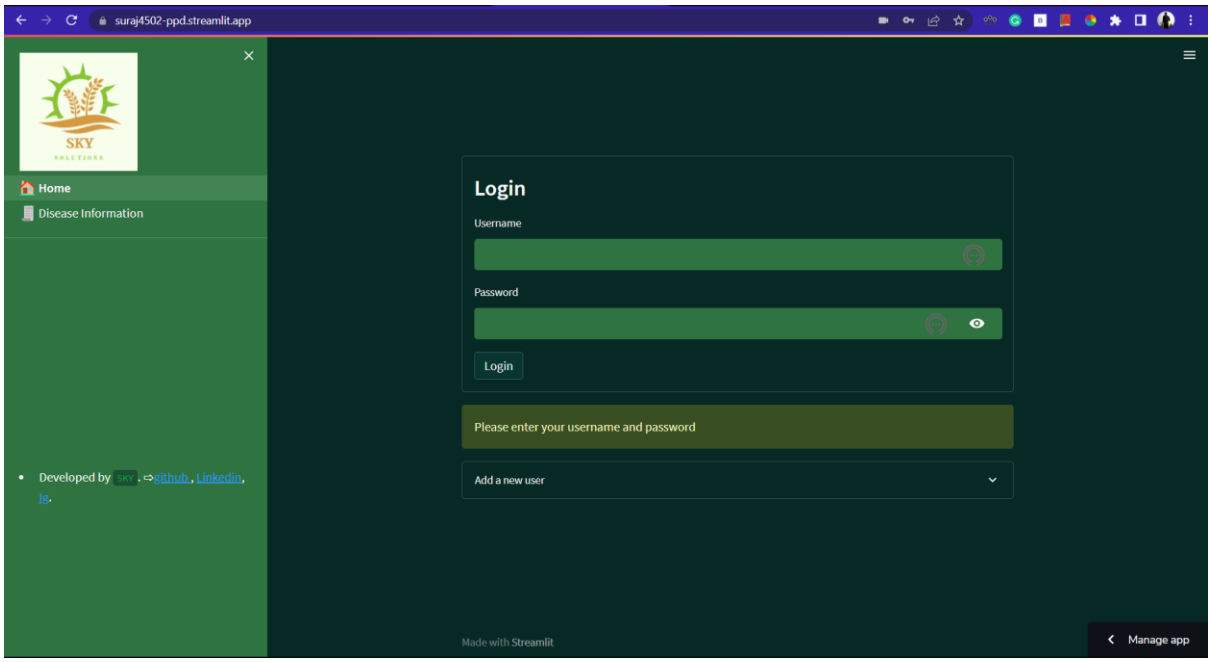
This section describes form those are used into the system.

4.2.1 React JS APP:

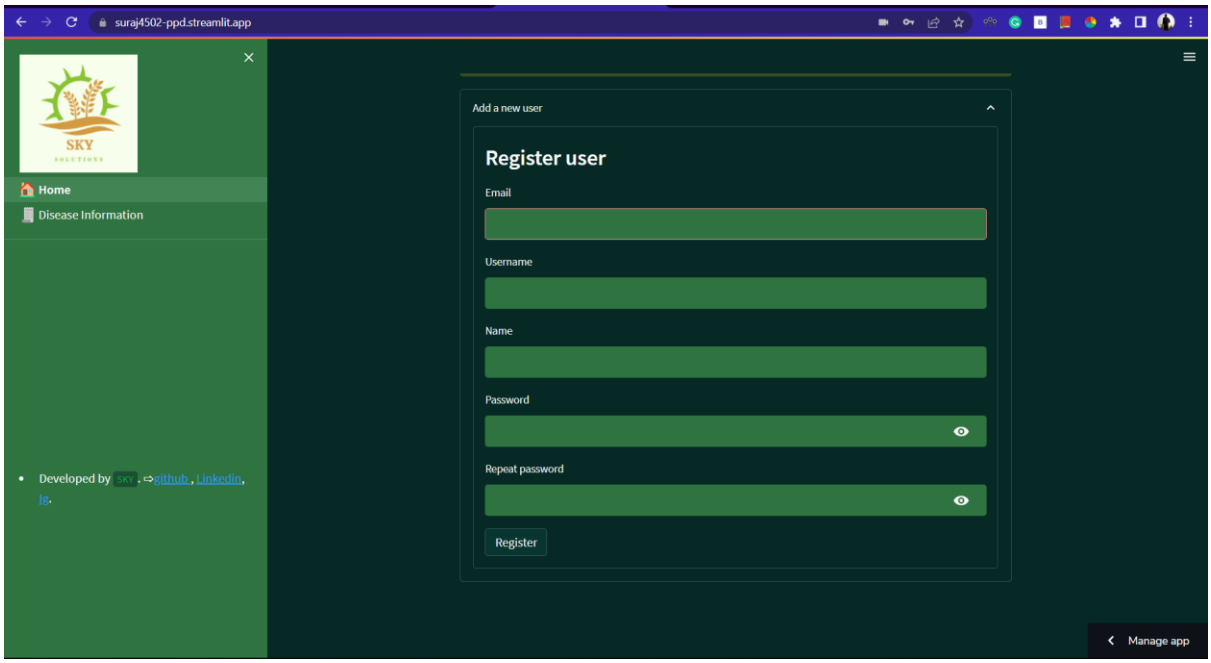


4.2.2 Streamlit APP:

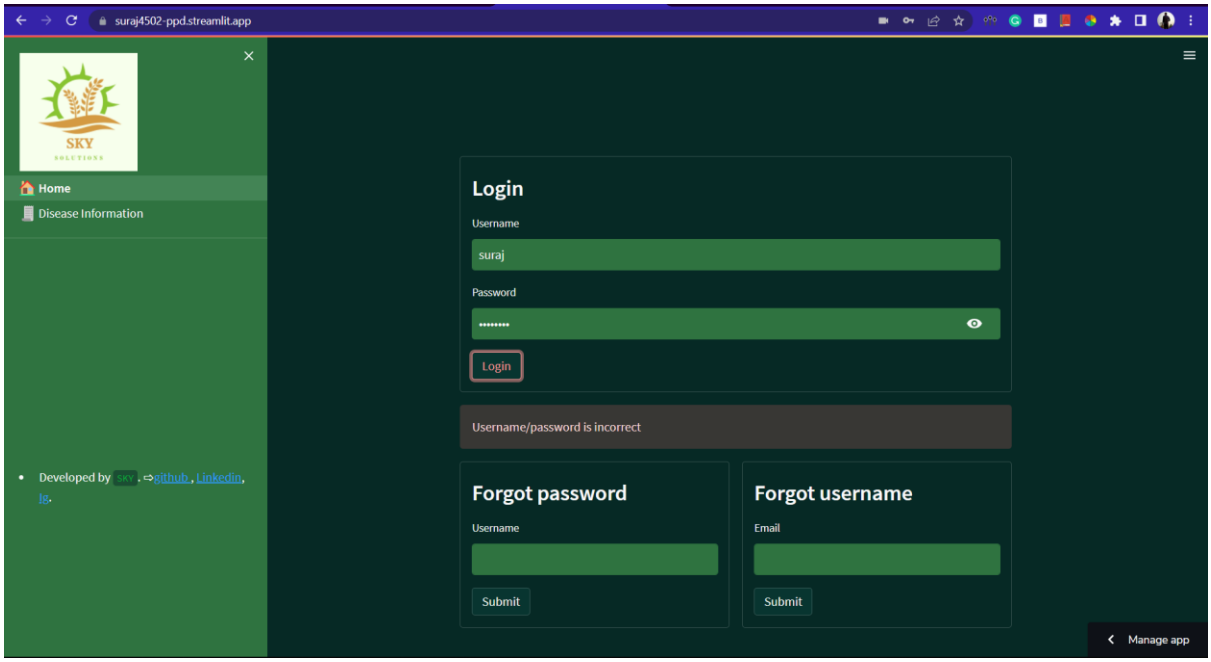
- **Login page:**



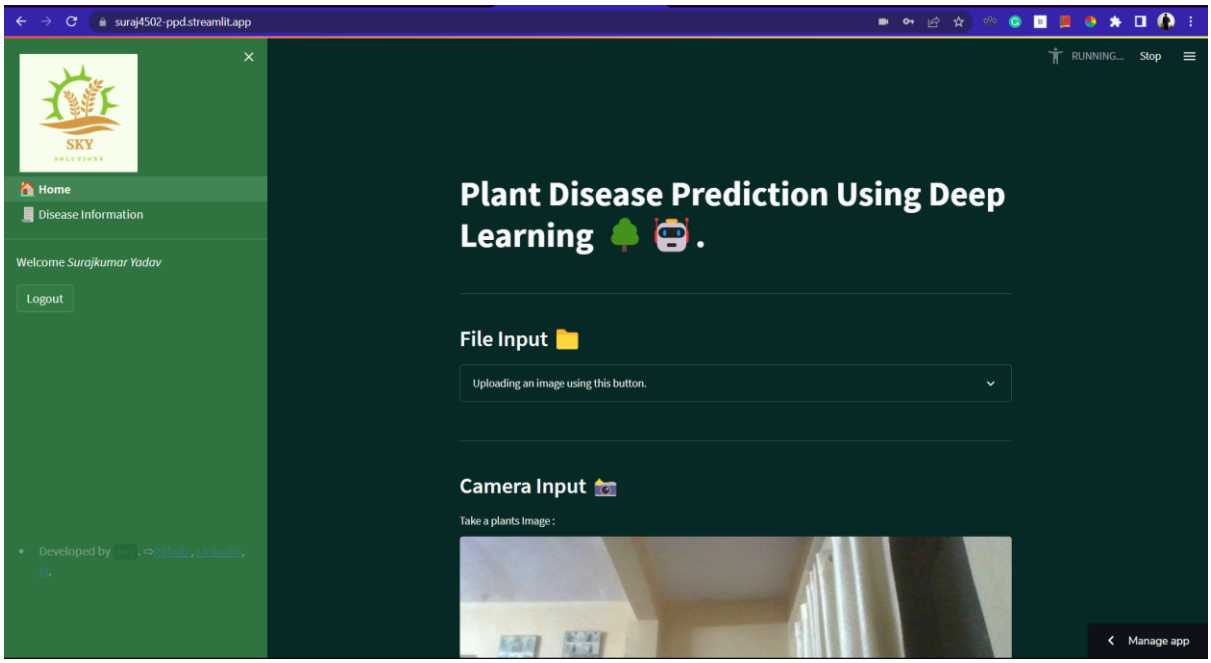
- **Signing up:**



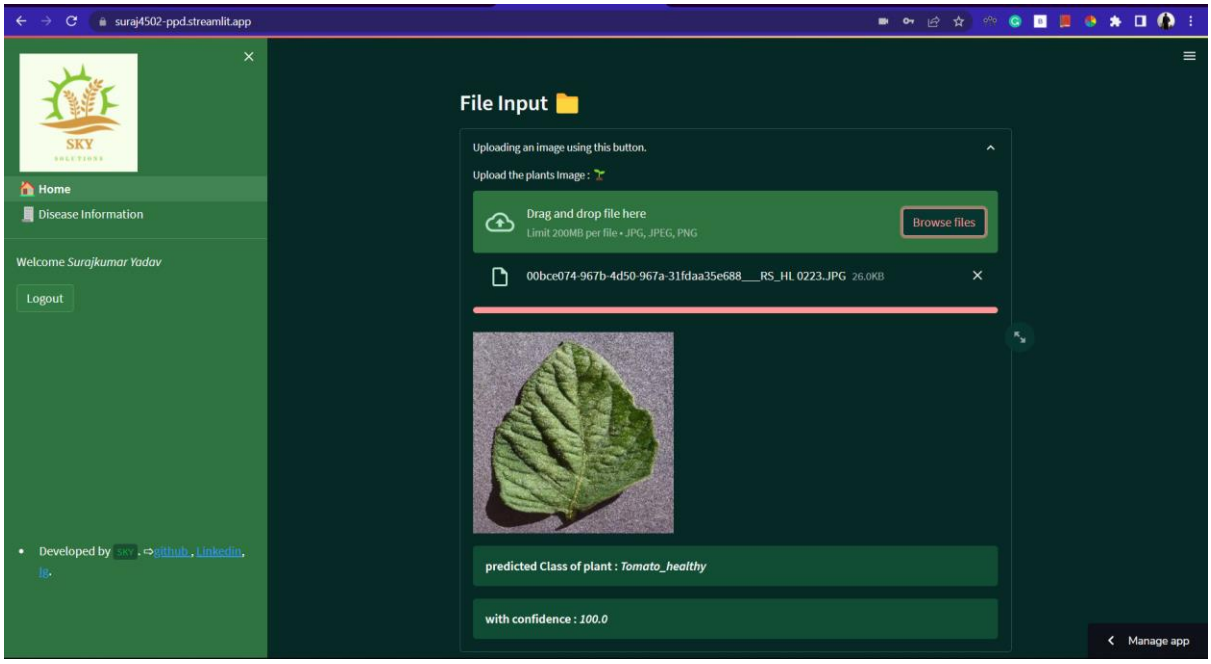
- **Retrieving Credentials:**



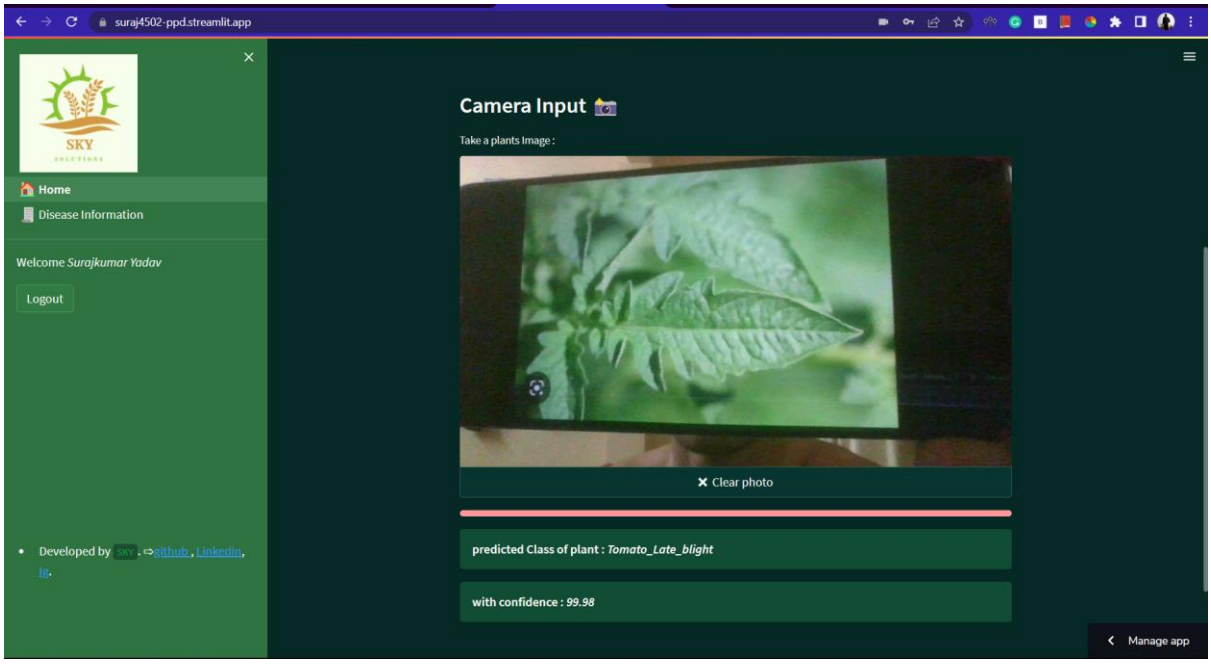
- **Main Section:**



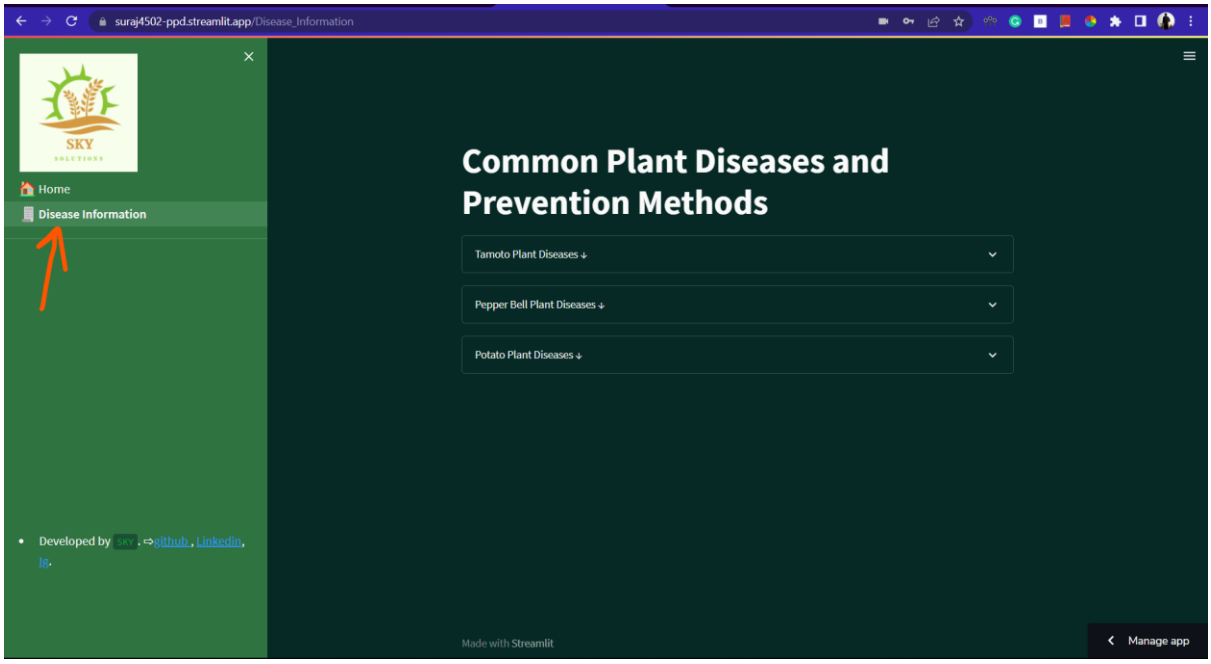
- **Uploading an image to get results:**

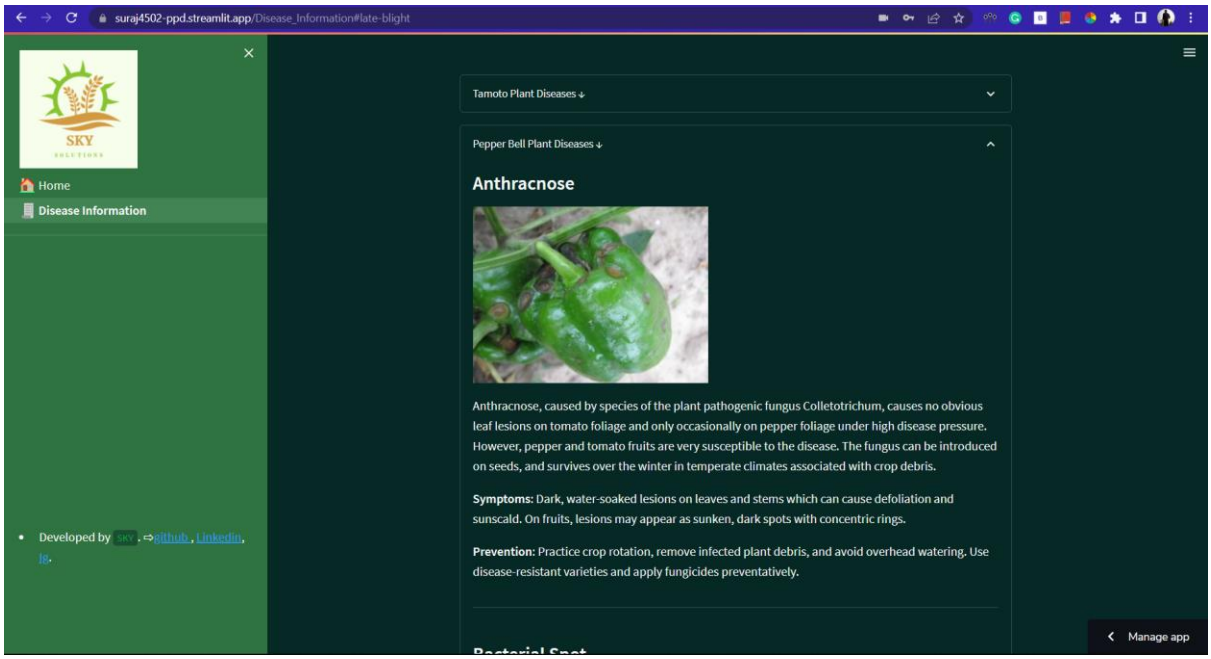


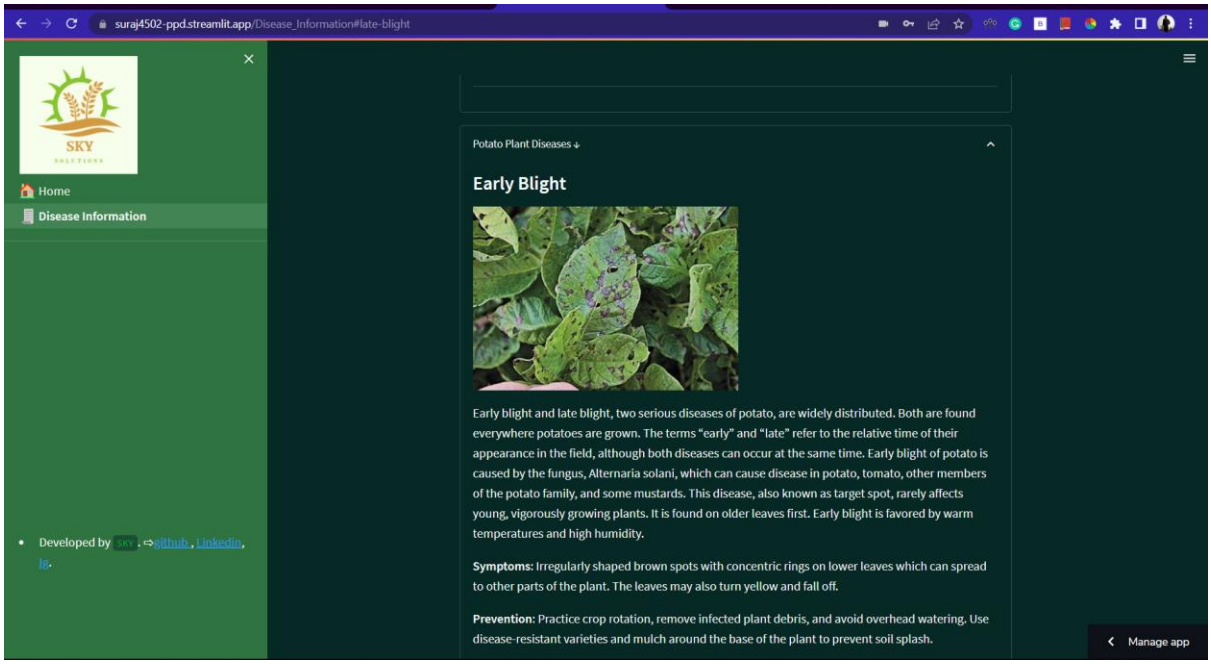
- **Taking an image from camera to get results:**



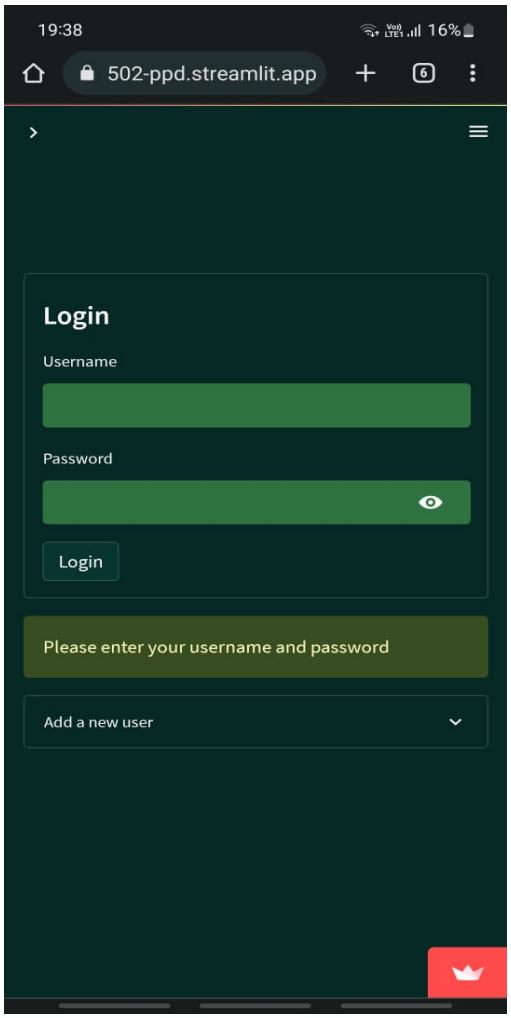
- **Disease Information Page:**

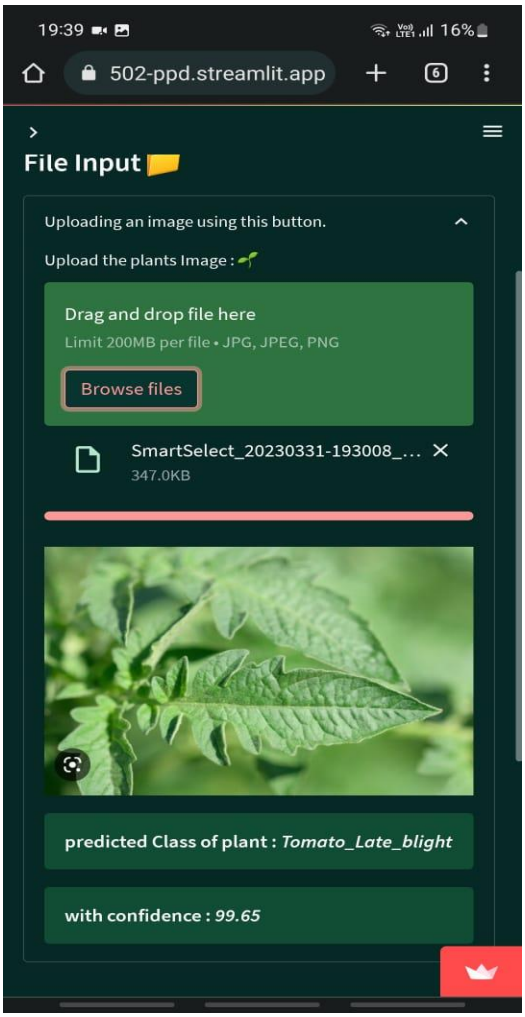


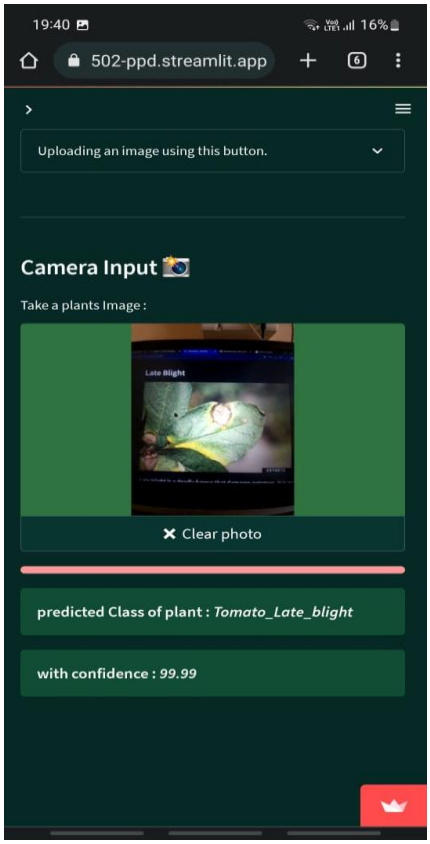


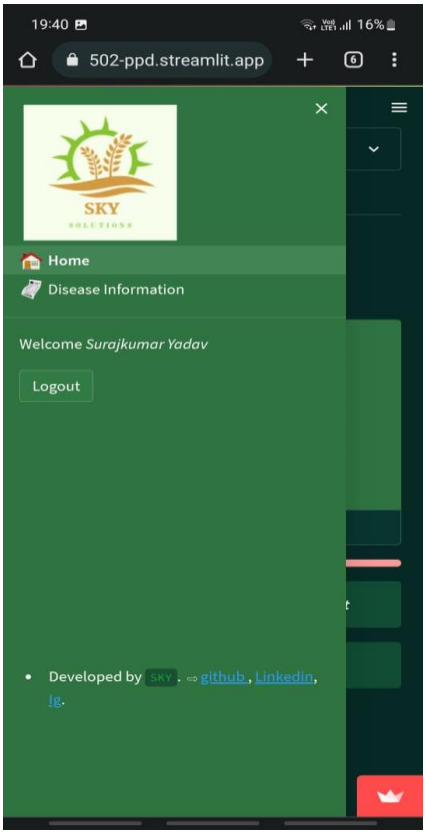

suraj4502-ppd.streamlit.app/Disease_Information#late-blight
SKY
Home
Disease Information
Potato Plant Diseases
Early Blight
Early blight and late blight, two serious diseases of potato, are widely distributed. Both are found everywhere potatoes are grown. The terms "early" and "late" refer to the relative time of their appearance in the field, although both diseases can occur at the same time. Early blight of potato is caused by the fungus, Alternaria solani, which can cause disease in potato, tomato, other members of the potato family, and some mustards. This disease, also known as target spot, rarely affects young, vigorously growing plants. It is found on older leaves first. Early blight is favored by warm temperatures and high humidity.
Symptoms: Irregularly shaped brown spots with concentric rings on lower leaves which can spread to other parts of the plant. The leaves may also turn yellow and fall off.
Prevention: Practice crop rotation, remove infected plant debris, and avoid overhead watering. Use disease-resistant varieties and mulch around the base of the plant to prevent soil splash.
Developed by
Manage app

- **Mobile View:**


19:38
16%
502-ppd.streamlit.app
Login
Username
Password
Login
Please enter your username and password
Add a new user


19:39
16%
502-ppd.streamlit.app
File Input
Uploading an image using this button.
Upload the plants Image :
Drag and drop file here
Limit 200MB per file • JPG, JPEG, PNG
Browse files
SmartSelect_20230331-193008_...
347.0KB
predicted Class of plant : Tomato_Late_blight
with confidence : 99.65

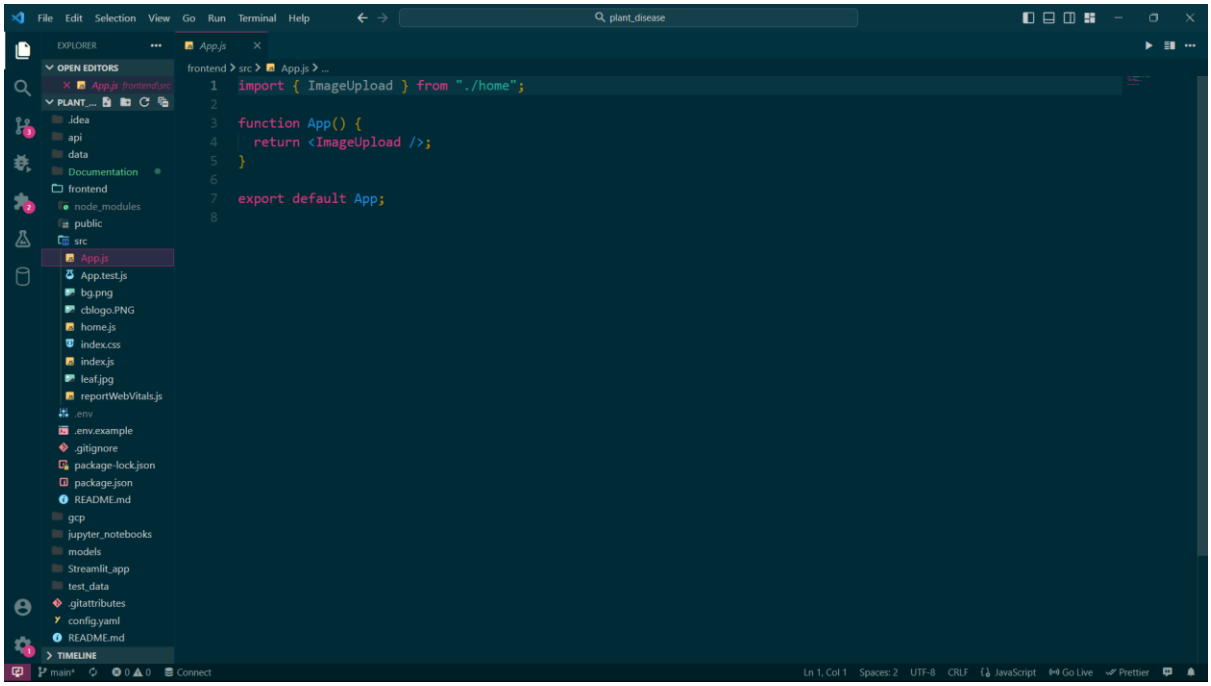

19:40
502-ppd.streamlit.app
Uploading an image using this button.
Camera Input
Take a plants Image :
Late Blight
Clear photo
predicted Class of plant : Tomato_Late_blight
with confidence : 99.99

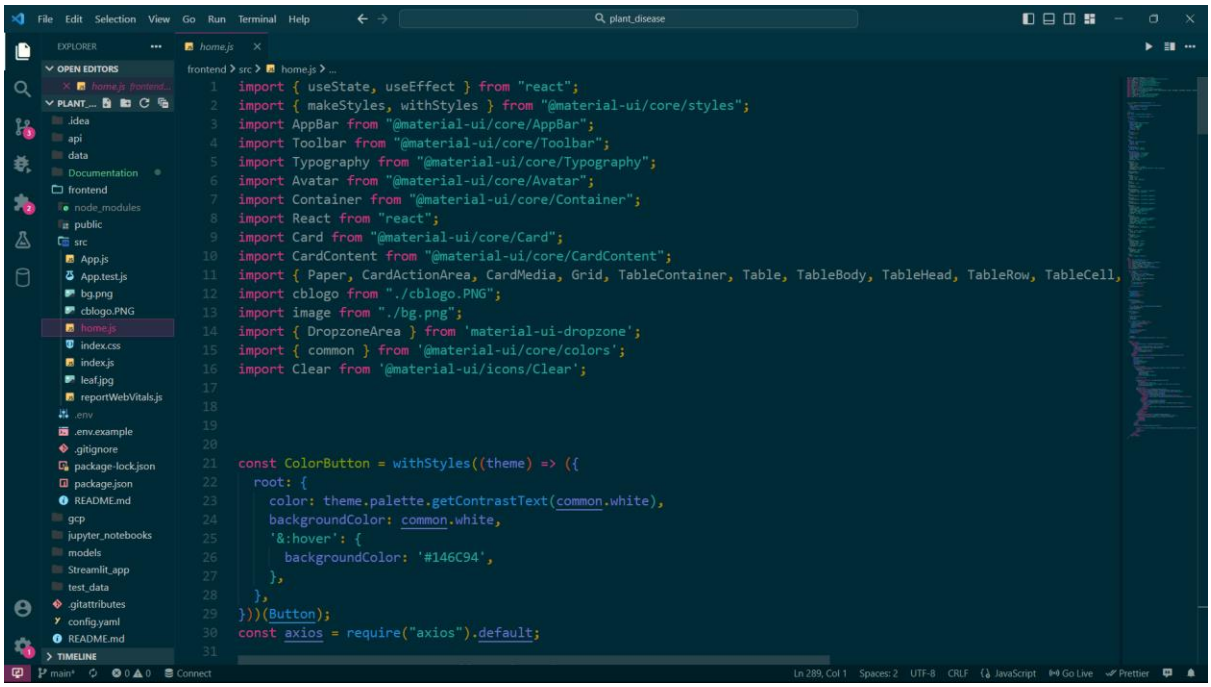

19:40
502-ppd.streamlit.app
SKY
SOLUTIONS
Home
Disease Information
Welcome Surajkumar Yadav
Logout
Developed by SKY . github , Linkedin, Ig.

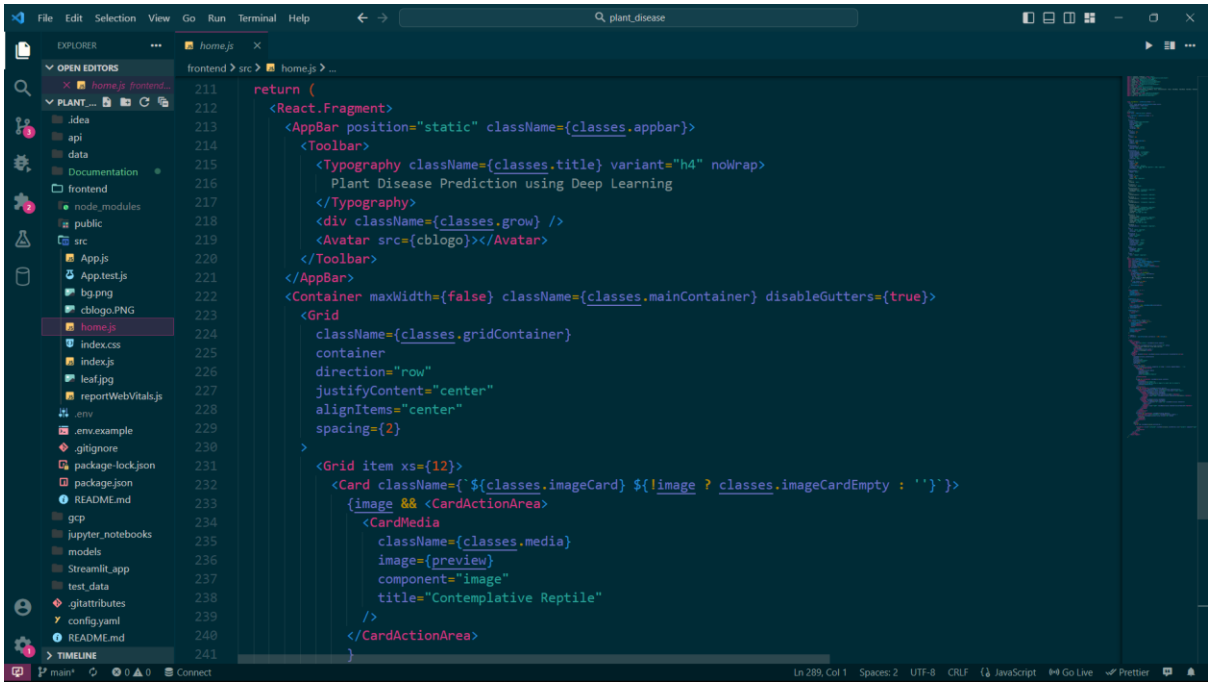

19:41
502-ppd.streamlit.app
Common Plant Diseases and Prevention Methods
Tamoto Plant Diseases ↓
Pepper Bell Plant Diseases ↓
Potato Plant Diseases ↓
Early Blight
Early blight and late blight, two serious diseases of potato, are widely distributed. Both are found everywhere potatoes are grown. The terms “early” and “late” refer to the relative time of their

CHAPTER 5
SYSTEM CODE & FUTURE SCOPE

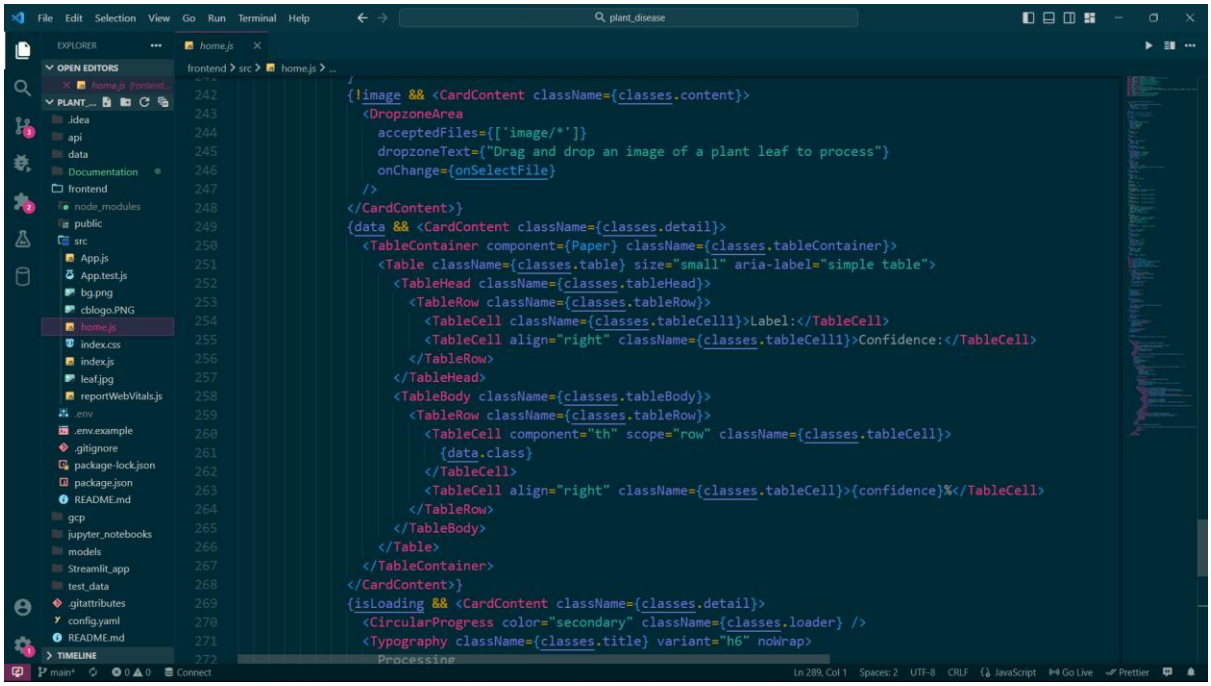
5.1 React JS app:



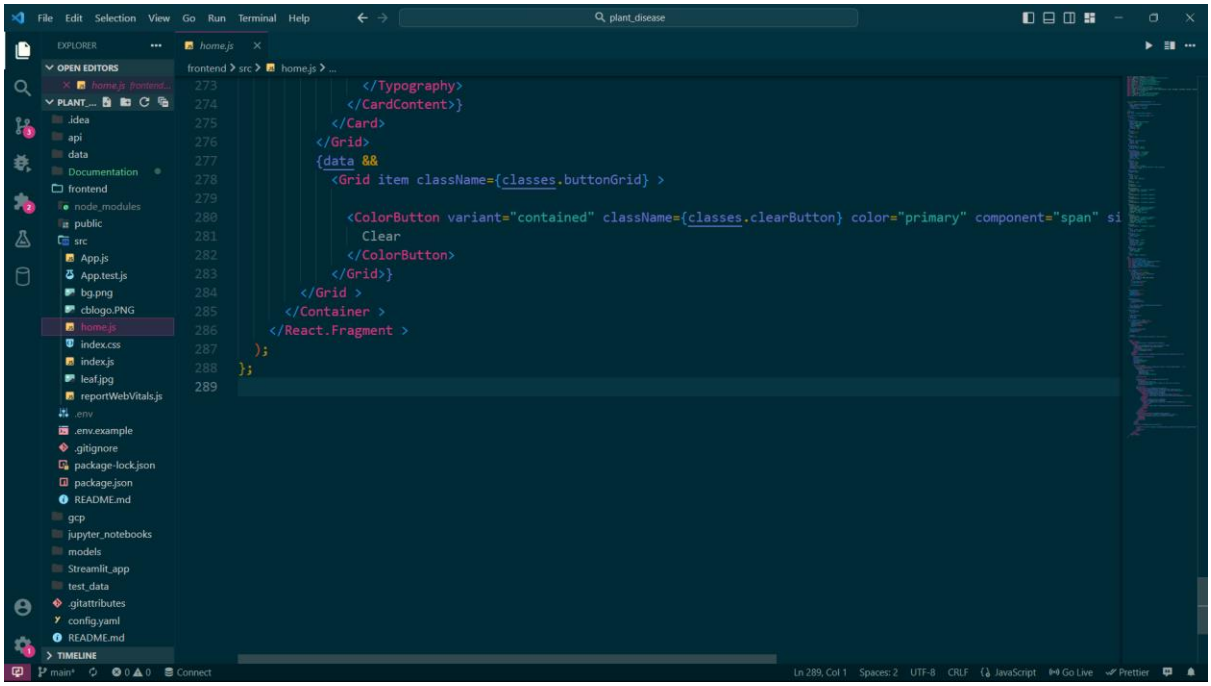


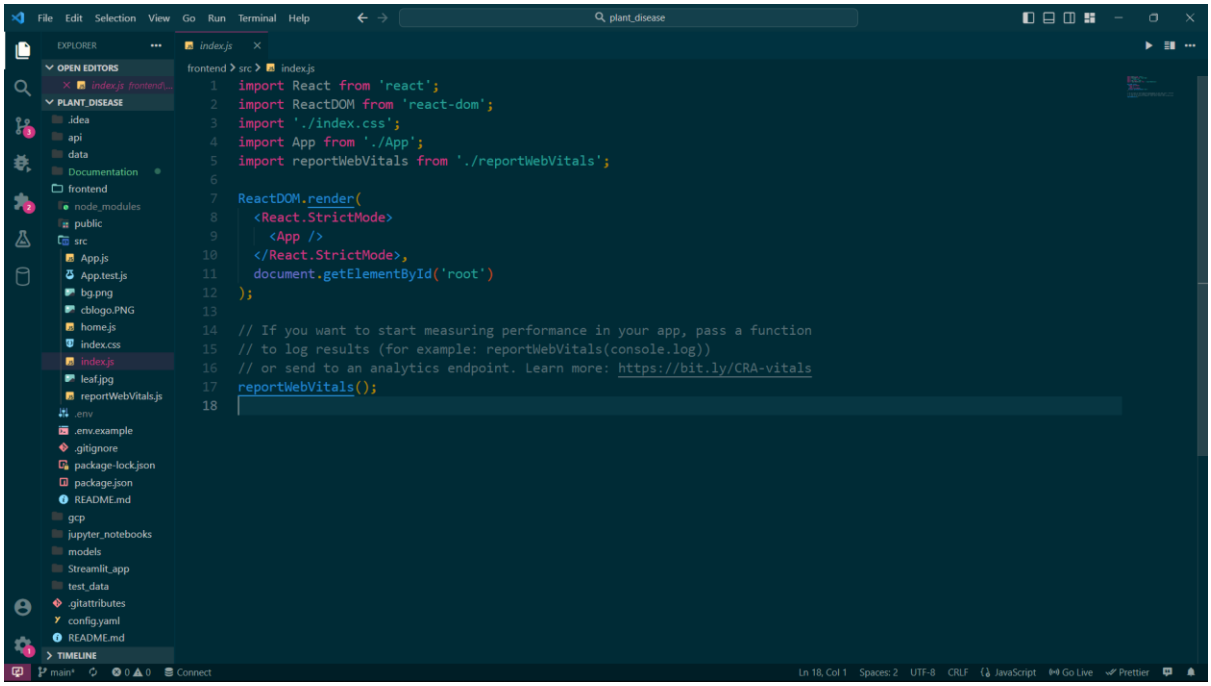


```
return (
  <React.Fragment>
    <AppBar position="static" className={classes.appbar}>
      <Toolbar>
        <Typography className={classes.title} variant="h4" noWrap>
          Plant Disease Prediction using Deep Learning
        </Typography>
        <div className={classes.grow} />
        <Avatar src={cblogo}></Avatar>
      </Toolbar>
    </AppBar>
    <Container maxWidth={false} className={classes.mainContainer} disableGutters={true}>
      <Grid
        className={classes.gridContainer}
        container
        direction="row"
        justifyContent="center"
        alignItems="center"
        spacing={2}
      >
        <Grid item xs={12}>
          <Card className={`${classes.imageCard} ${!image ? classes.imageCardEmpty : ''}`}>
            {image && <CardActionArea>
              <CardMedia
                className={classes.media}
                image={preview}
                component="image"
                title="Contemplative Reptile"
              />
            </CardActionArea>
            }
```

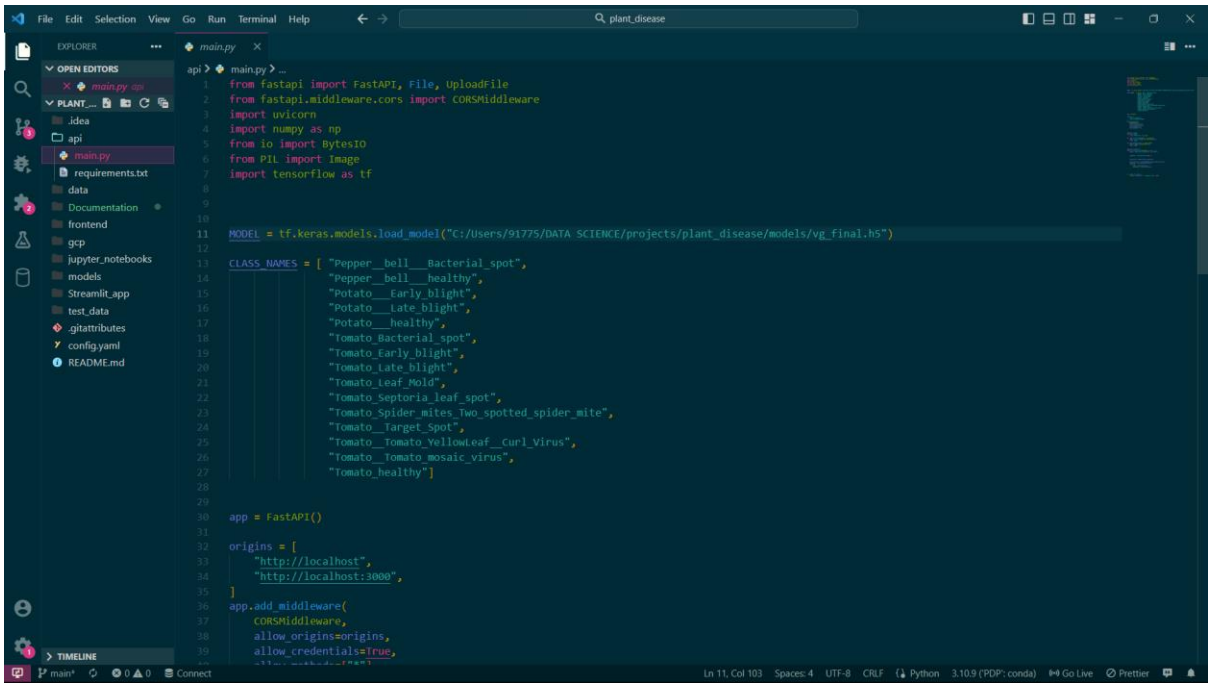


```
            {!image && <CardContent className={classes.content}>
              <DropzoneArea
                acceptedFiles={['image/*']}
                dropzoneText={"Drag and drop an image of a plant leaf to process"}
                onChange={onSelectFile}
              />
            </CardContent>}
            {data && <CardContent className={classes.detail}>
              <TableContainer component={Paper} className={classes.tableContainer}>
                <Table className={classes.table} size="small" aria-label="simple table">
                  <TableHead className={classes.tableHead}>
                    <TableRow className={classes.tableRow}>
                      <TableCell className={classes.tableCell1}>Label:</TableCell>
                      <TableCell align="right" className={classes.tableCell1}>Confidence:</TableCell>
                    </TableRow>
                  </TableHead>
                  <TableBody className={classes.tableBody}>
                    <TableRow className={classes.tableRow}>
                      <TableCell component="th" scope="row" className={classes.tableCell}>
                        {data.class}
                      </TableCell>
                      <TableCell align="right" className={classes.tableCell}>{confidence}%</TableCell>
                    </TableRow>
                  </TableBody>
                </Table>
              </TableContainer>
            </CardContent>}
            {isLoading && <CardContent className={classes.detail}>
              <CircularProgress color="secondary" className={classes.loader} />
              <Typography className={classes.title} variant="h6" noWrap>
                Processing
```

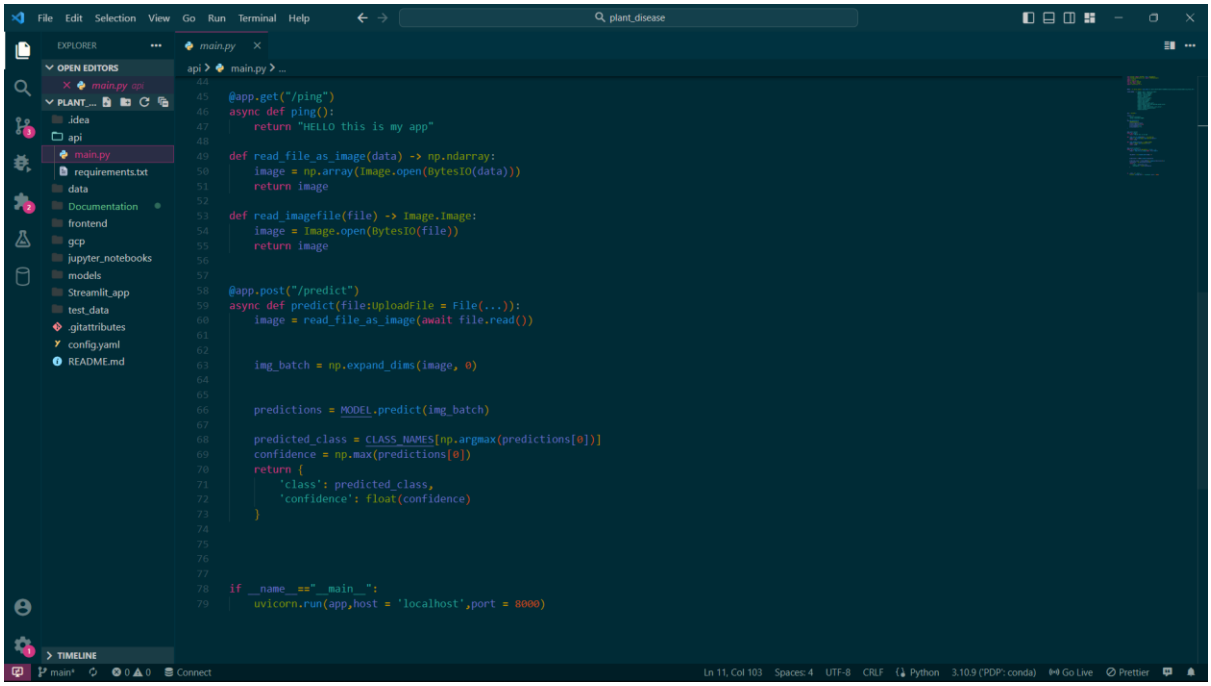

File Edit Selection View Go Run Terminal Help
plant_disease
home.js
frontend > src > home.js > ...
</Typography>
</CardContent>}
</Card>
</Grid>
{data &&
<Grid item className={classes.buttonGrid} >
<ColorButton variant="contained" className={classes.clearButton} color="primary" component="span" si
Clear
</ColorButton>
</Grid>}
</Grid >
</Container >
</React.Fragment >
);
};


File Edit Selection View Go Run Terminal Help
plant_disease
index.js
frontend > src > index.js
import React from 'react';
import ReactDOM from 'react-dom';
import './index.css';
import App from './App';
import reportWebVitals from './reportWebVitals';
ReactDOM.render(
<React.StrictMode>
<App />
</React.StrictMode>,
document.getElementById('root')
);
// If you want to start measuring performance in your app, pass a function
// to log results (for example: reportWebVitals(console.log))
// or send to an analytics endpoint. Learn more: https://bit.ly/CRA-vitals
reportWebVitals();

5.2 Backend code (Fast API):

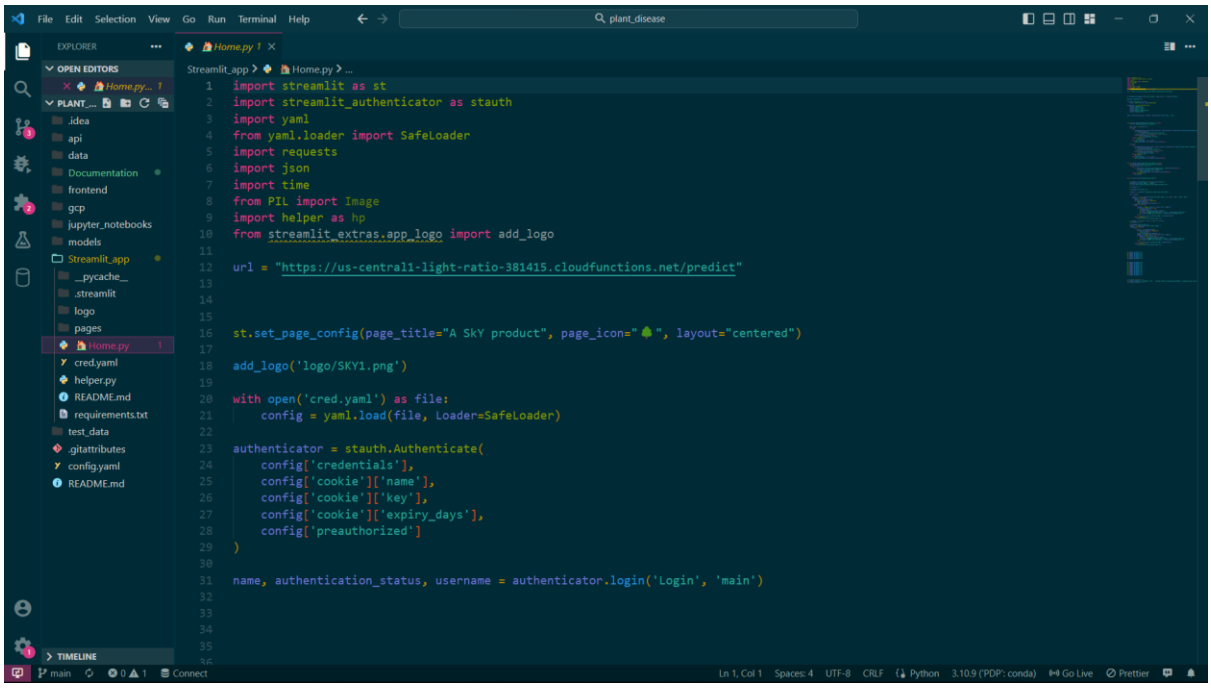


```python
from fastapi import FastAPI, File, UploadFile
from fastapi.middleware.cors import CORSMiddleware
import uvicorn
import numpy as np
from io import BytesIO
from PIL import Image
import tensorflow as tf


MODEL = tf.keras.models.load_model("C:/Users/91775/DATA SCIENCE/projects/plant_disease/models/vg_final.h5")

CLASS_NAMES = [ "Pepper__bell___Bacterial_spot",
                "Pepper__bell___healthy",
                "Potato___Early_blight",
                "Potato___Late_blight",
                "Potato___healthy",
                "Tomato_Bacterial_spot",
                "Tomato_Early_blight",
                "Tomato_Late_blight",
                "Tomato_Leaf_Mold",
                "Tomato_Septoria_leaf_spot",
                "Tomato_Spider_mites_Two_spotted_spider_mite",
                "Tomato__Target_Spot",
                "Tomato__Tomato_YellowLeaf__Curl_Virus",
                "Tomato__Tomato_mosaic_virus",
                "Tomato_healthy"]


app = FastAPI()

origins = [
    "http://localhost",
    "http://localhost:3000",
]
app.add_middleware(
    CORSMiddleware,
    allow_origins=origins,
    allow_credentials=True,
```

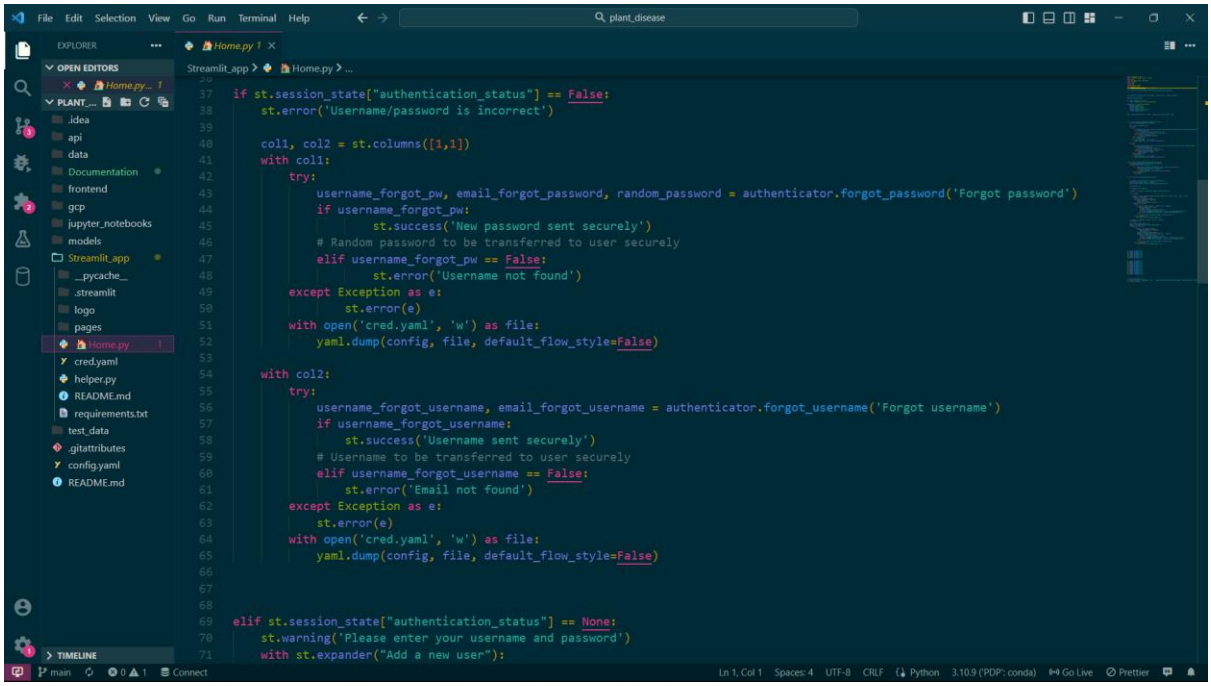


```python
@app.get("/ping")
async def ping():
    return "HELLO this is my app"

def read_file_as_image(data) -> np.ndarray:
    image = np.array(Image.open(BytesIO(data)))
    return image

def read_imagefile(file) -> Image.Image:
    image = Image.open(BytesIO(file))
    return image


@app.post("/predict")
async def predict(file:UploadFile = File(...)):
    image = read_file_as_image(await file.read())


    img_batch = np.expand_dims(image, 0)


    predictions = MODEL.predict(img_batch)

    predicted_class = CLASS_NAMES[np.argmax(predictions[0])]
    confidence = np.max(predictions[0])
    return {
        'class': predicted_class,
        'confidence': float(confidence)
    }



if __name__=="__main__":
    uvicorn.run(app,host = 'localhost',port = 8000)
```

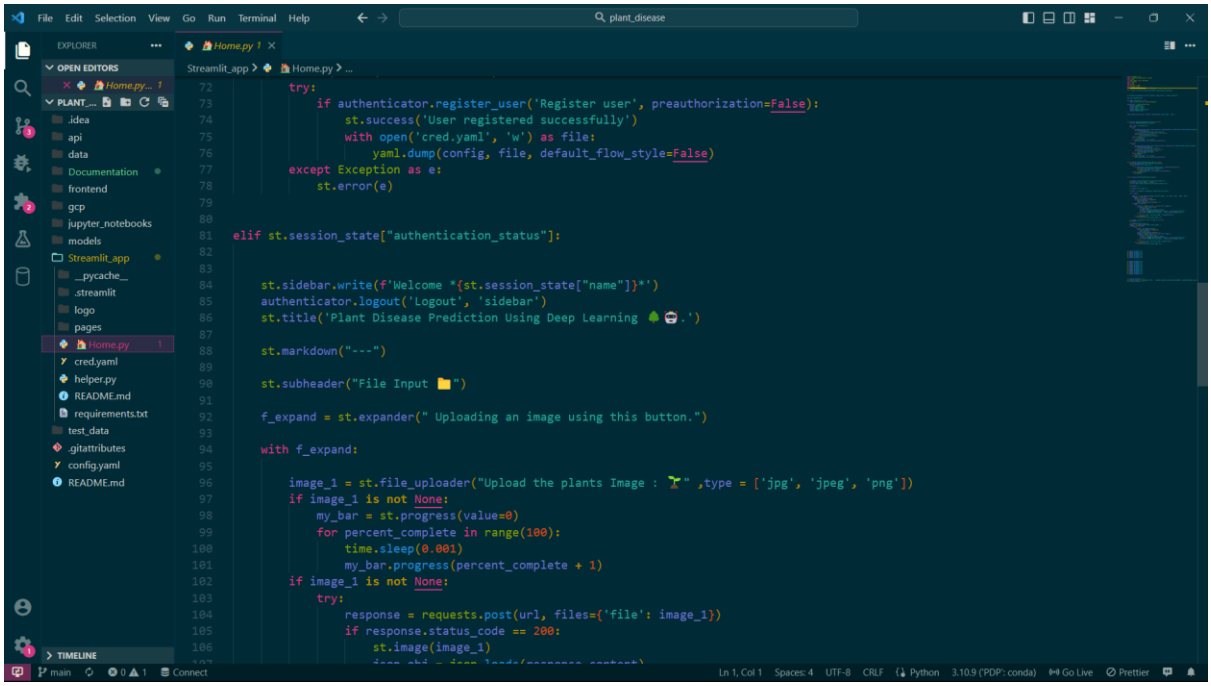
5.3 Streamlit App :



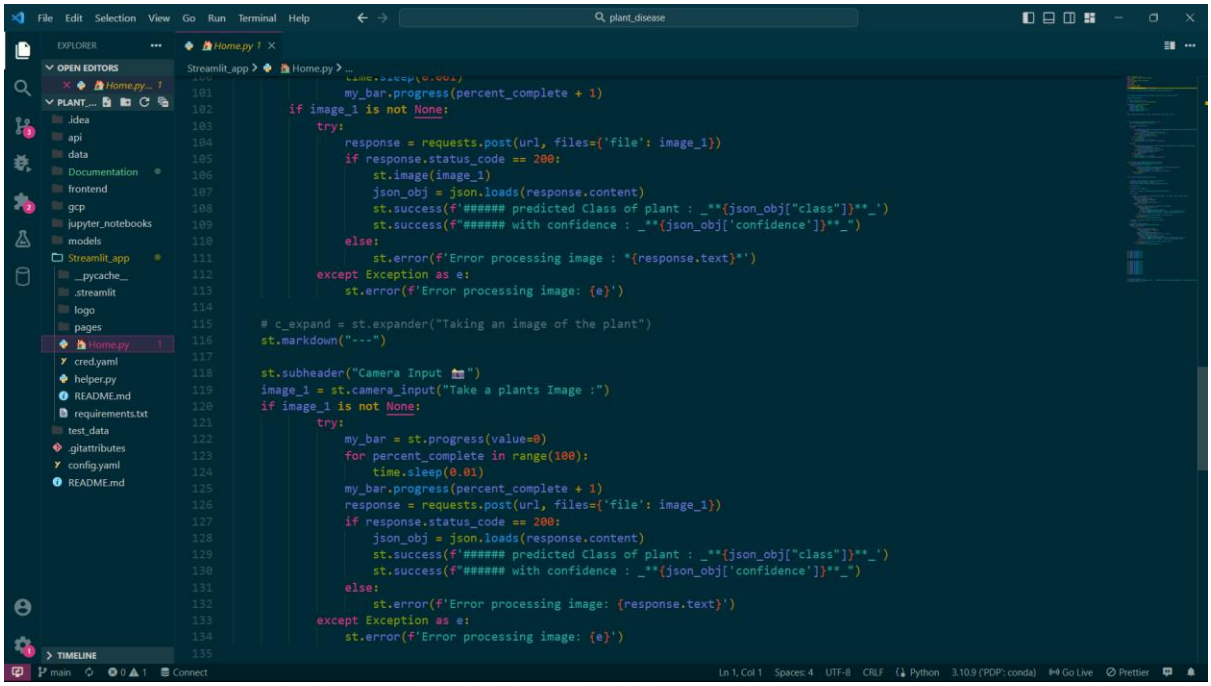
```python
import streamlit as st
import streamlit_authenticator as stauth
import yaml
from yaml.loader import SafeLoader
import requests
import json
import time
from PIL import Image
import helper as hp
from streamlit_extras.app_logo import add_logo

url = "https://us-central1-light-ratio-381415.cloudfunctions.net/predict"



st.set_page_config(page_title="A SkY product", page_icon="🌲", layout="centered")

add_logo('logo/SKY1.png')

with open('cred.yaml') as file:
    config = yaml.load(file, Loader=SafeLoader)

authenticator = stauth.Authenticate(
    config['credentials'],
    config['cookie']['name'],
    config['cookie']['key'],
    config['cookie']['expiry_days'],
    config['preauthorized']
)

name, authentication_status, username = authenticator.login('Login', 'main')
```



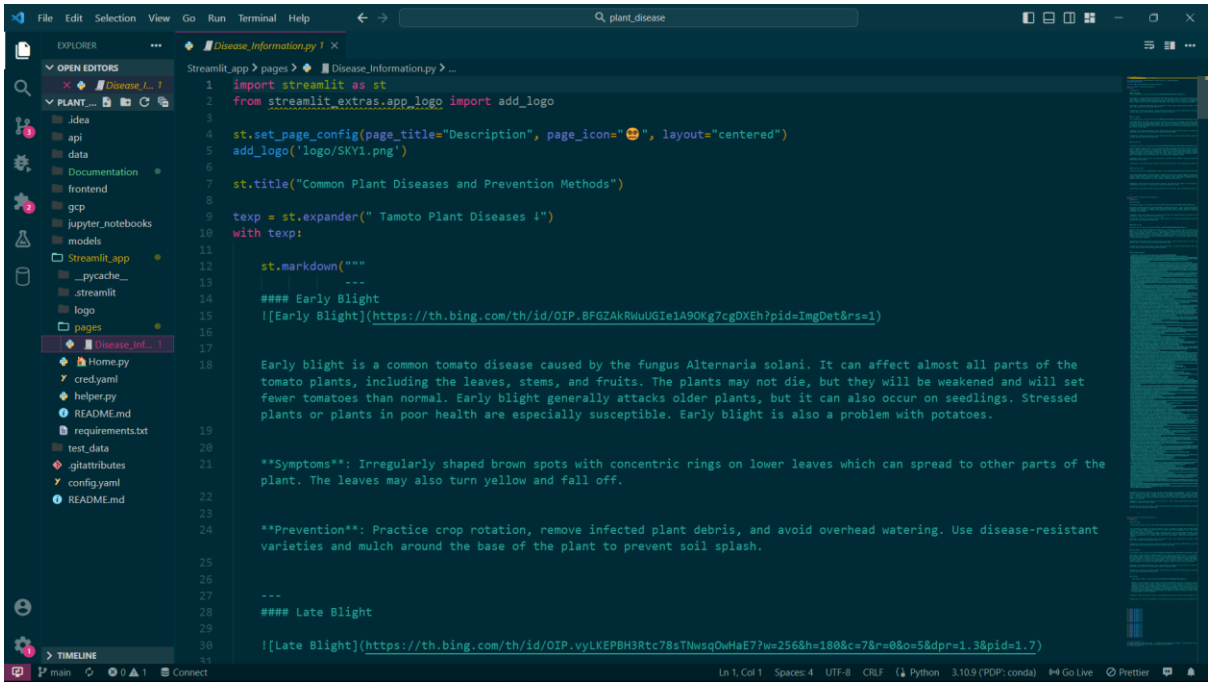
```python
if st.session_state["authentication_status"] == False:
    st.error('Username/password is incorrect')

    col1, col2 = st.columns([1,1])
    with col1:
        try:
            username_forgot_pw, email_forgot_password, random_password = authenticator.forgot_password('Forgot password')
            if username_forgot_pw:
                    st.success('New password sent securely')
            # Random password to be transferred to user securely
            elif username_forgot_pw == False:
                    st.error('Username not found')
        except Exception as e:
                st.error(e)
        with open('cred.yaml', 'w') as file:
            yaml.dump(config, file, default_flow_style=False)

    with col2:
        try:
            username_forgot_username, email_forgot_username = authenticator.forgot_username('Forgot username')
            if username_forgot_username:
                st.success('Username sent securely')
            # Username to be transferred to user securely
            elif username_forgot_username == False:
                st.error('Email not found')
        except Exception as e:
            st.error(e)
        with open('cred.yaml', 'w') as file:
            yaml.dump(config, file, default_flow_style=False)



elif st.session_state["authentication_status"] == None:
    st.warning('Please enter your username and password')
    with st.expander("Add a new user"):
```



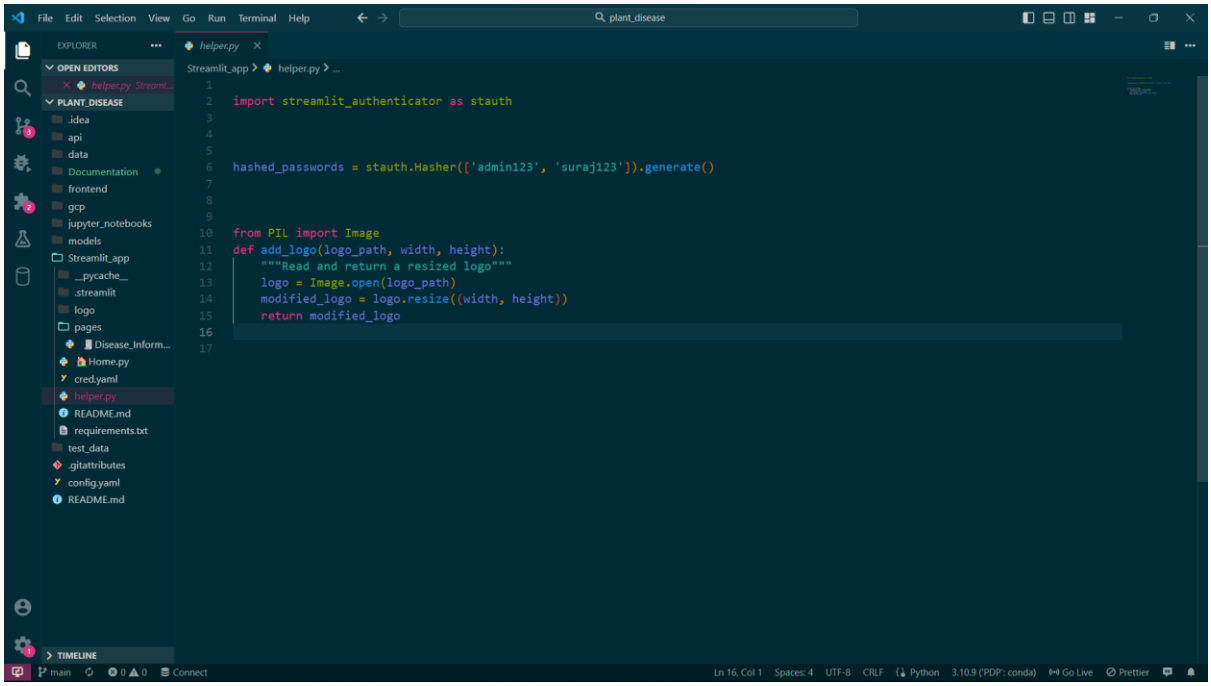
```
        try:
            if authenticator.register_user('Register user', preauthorization=False):
                st.success('User registered successfully')
                with open('cred.yaml', 'w') as file:
                    yaml.dump(config, file, default_flow_style=False)
        except Exception as e:
            st.error(e)


elif st.session_state["authentication_status"]:


    st.sidebar.write(f'Welcome *{st.session_state["name"]}*')
    authenticator.logout('Logout', 'sidebar')
    st.title('Plant Disease Prediction Using Deep Learning 🌳👨‍🌾.')

    st.markdown("---")

    st.subheader("File Input 📂")

    f_expand = st.expander(" Uploading an image using this button.")

    with f_expand:

        image_1 = st.file_uploader("Upload the plants Image : 🍸" ,type = ['jpg', 'jpeg', 'png'])
        if image_1 is not None:
            my_bar = st.progress(value=0)
            for percent_complete in range(100):
                time.sleep(0.001)
                my_bar.progress(percent_complete + 1)
        if image_1 is not None:
            try:
                response = requests.post(url, files={'file': image_1})
                if response.status_code == 200:
                    st.image(image_1)
```



```
                my_bar.progress(percent_complete + 1)
        if image_1 is not None:
            try:
                response = requests.post(url, files={'file': image_1})
                if response.status_code == 200:
                    st.image(image_1)
                    json_obj = json.loads(response.content)
                    st.success(f'###### predicted Class of plant : _**{json_obj["class"]}**_')
                    st.success(f"###### with confidence : _**{json_obj['confidence']}**_")
                else:
                    st.error(f'Error processing image : *{response.text}*')
            except Exception as e:
                st.error(f'Error processing image: {e}')

    # c_expand = st.expander("Taking an image of the plant")
    st.markdown("---")

    st.subheader("Camera Input 📸")
    image_1 = st.camera_input("Take a plants Image :")
    if image_1 is not None:
            try:
                my_bar = st.progress(value=0)
                for percent_complete in range(100):
                    time.sleep(0.01)
                my_bar.progress(percent_complete + 1)
                response = requests.post(url, files={'file': image_1})
                if response.status_code == 200:
                    json_obj = json.loads(response.content)
                    st.success(f'###### predicted Class of plant : _**{json_obj["class"]}**_')
                    st.success(f"###### with confidence : _**{json_obj['confidence']}**_")
                else:
                    st.error(f'Error processing image: {response.text}')
            except Exception as e:
                st.error(f'Error processing image: {e}')
```



```python
import streamlit as st
from streamlit_extras.app_logo import add_logo

st.set_page_config(page_title="Description", page_icon="🤩", layout="centered")
add_logo('logo/SKY1.png')

st.title("Common Plant Diseases and Prevention Methods")

texp = st.expander(" Tamoto Plant Diseases ↓")
with texp:

    st.markdown("""
                ---
    #### Early Blight
    ![Early Blight](https://th.bing.com/th/id/OIP.BFGZAkRWuUGIe1A9OKg7cgDXEh?pid=ImgDet&rs=1)


    Early blight is a common tomato disease caused by the fungus Alternaria solani. It can affect almost all parts of the
    tomato plants, including the leaves, stems, and fruits. The plants may not die, but they will be weakened and will set
    fewer tomatoes than normal. Early blight generally attacks older plants, but it can also occur on seedlings. Stressed
    plants or plants in poor health are especially susceptible. Early blight is also a problem with potatoes.


    **Symptoms**: Irregularly shaped brown spots with concentric rings on lower leaves which can spread to other parts of the
    plant. The leaves may also turn yellow and fall off.


    **Prevention**: Practice crop rotation, remove infected plant debris, and avoid overhead watering. Use disease-resistant
    varieties and mulch around the base of the plant to prevent soil splash.


    ---
    #### Late Blight

    ![Late Blight](https://th.bing.com/th/id/OIP.vyLKEPBH3Rtc78sTNwsqOwHaE7?w=256&h=180&c=7&r=0&o=5&dpr=1.3&pid=1.7)
```



```python
import streamlit_authenticator as stauth


hashed_passwords = stauth.Hasher(['admin123', 'suraj123']).generate()


from PIL import Image
def add_logo(logo_path, width, height):
    """Read and return a resized logo"""
    logo = Image.open(logo_path)
    modified_logo = logo.resize((width, height))
    return modified_logo

```

5.8 Limitations.

While the Plant Disease Prediction using Deep learning project has the potential to be highly beneficial, there are some limitations and challenges that need to be considered. Here are some limitations of this project:

- **Limited dataset:** Deep learning models require large amounts of data to be trained effectively. However, in the case of plant disease prediction, it can be challenging to obtain a sufficient amount of data for all plant species and disease types. This can limit the accuracy and generalization of the model.
- **Difficulty in labeling data:** Obtaining a large dataset is not the only challenge. The data needs to be properly labeled to train the deep learning model. The process of labeling data can be time-consuming and expensive, and errors in labeling can impact the accuracy of the model.
- **Variability in plant appearance:** Different plant species can exhibit varying appearances for the same disease type, and the appearance of a plant can be influenced by environmental factors. This can make it challenging to accurately identify the disease and train the model.
- **Model overfitting:** Deep learning models are prone to overfitting, where the model learns to recognize specific features in the training dataset that are not present in the test dataset. This can result in poor generalization performance of the model.
- **Model explainability:** Deep learning models are often referred to as "black boxes" because it can be difficult to understand how they arrive at their predictions. This can be problematic when trying to diagnose a disease and understand the underlying causes.
- **Deployment challenges:** Deploying deep learning models in the real world can be challenging due to computational requirements and compatibility with hardware and software infrastructure.

In conclusion, while the Plant Disease Prediction using Deep learning project has great potential, it is important to consider the limitations and challenges associated with the project to ensure that the results are accurate, reliable, and practical.

5.9 Future Scope.

The Plant Disease Prediction using Deep learning project has significant future scope as it can have a major impact on agriculture, food security, and environmental sustainability. Here are some potential future directions for this project:

- **Expansion of plant species and disease types:** Currently, this project may be limited to certain plant species and disease types due to the availability of data. However, as more data becomes available, the project can be expanded to cover a wider range of plant species and diseases, which will enhance its practicality and usefulness.
- **Integration with precision agriculture:** The use of deep learning for plant disease prediction can be integrated with precision agriculture techniques to optimize crop yields and minimize the use of fertilizers and pesticides. This can lead to more sustainable and efficient agricultural practices.
- **Real-time monitoring:** The project can be integrated with real-time monitoring systems that can continuously analyze plant health data and provide early warnings of disease outbreaks. This can enable timely interventions to prevent the spread of diseases and reduce crop losses.
- **Collaboration with plant scientists:** Collaboration with plant scientists can help to identify new features and data sources that can enhance the accuracy and robustness of the deep learning models. This can lead to the development of more advanced and reliable prediction models.

In conclusion, the Plant Disease Prediction using Deep learning project has significant future scope in agriculture and environmental sustainability. With continued research and development, this project has the potential to revolutionize the way we detect, diagnose, and manage plant diseases.

References.

- Articles:

https://www.analyticsvidhya.com/blog/2021/10/understanding-transfer-learning-for-deep-learning/
https://www.researchgate.net/publication/360397084_Plant_Disease_Detection_Using_Cnn

- Youtubers:

  Misra Turp
  CodingIsFun
  Avra
  krishnaik
  Fanilo Andrianasolo

- Other Refernces :

https://docs.streamlit.io/library/api-reference
https://docs.python.org/3/
https://towardsdatascience.com/how-to-add-a-user-authentication-service-in-streamlit-a8b93bf02031