FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PRECTION

TEAM ID: PNT2022TMID13660

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CONTENT

CHAPTER 1

INTRODUCTION

Machine learning is particularly effective in identifying and detecting plant illnesses by providing symptoms. Early stages of illnesses. For the purpose of diagnosing plant diseases, plant pathologists can examine digital photographs utilising digital image processing. Simply said, the use of computer vision and image processing techniques benefits farmers across all areas of agriculture. In most cases, aberrant physiological functioning of plants is what causes plant diseases. Therefore, the difference between the plants' regular physiological capabilities and abnormal physiological functionalities leads to the generation of the specific symptoms.

The pathogens that typically infect plant leaves are found on the stems of the plants. Different image processing techniques can forecast these various leaf signs and diseases. These many approaches make use of various core techniques like segmentation, feature extraction, and classification, among others. Most often, segmentation is used to distinguish between healthy and diseased tissues of leaves in order to forecast and diagnose leaf diseases.

1.1 Project Overview

From ancient period, agriculture is considered as the main and the foremost culture practiced in India. Ancient people cultivate the crops in their own land and so they have been accommodated to their needs. Since the invention of new innovative technologies and techniques in the agriculture field is slowly degrading. Due to these, abundant invention people are been concentrated on cultivating artificial products that is hybrid products where there leads to an unhealthy life.

The early identification of disease symptoms is made possible by the detection and recognition of plant diseases using machine learning. Plant pathologists are able to examine to diagnose plant diseases, digital photos are processed digitally. Simply said, the use of computer vision and image processing techniques benefits farmers across all areas of agriculture. In most cases, aberrant physiological functions of plants are what cause plant diseases.

Two datasets—the fruit dataset and the vegetable dataset—are gathered for this research. Convolutional Neural Networks, a deep learning neural network, is used to train and test the datasets that have been collected (CNN). The fruit dataset is first trained, and then CNN is tested. Python is the programme used to train and test datasets.

All of the Python code is initially created in the Jupyter notebook that comes with Anaconda Python, and it is then tested in the IBM cloud. Finally, with the aid of the Python package Flask, a web-based framework is created. Along with their related files in the static folder, two html files are created and placed in the templates folder. Spyder-Anaconda Python was used to write and test the Python software "app.py" that interfaces with these two websites.

1.2 Purpose

Crop Failure, Inadequate Knowledge, Crop Damage Caused by Ignorance or Carelessness, Lack of Professional Assistance, and Accessibility to Agro-Tech Solutions are the main issues that our nation's farmers are currently dealing with. The following tools will be provided by CROFED to assist farmers in resolving these issues: Crop Recommendation System, Fertilizer Suggestion System, and Crop Disease Detection System. We'll create an Internet of Things (IoT) gadget that assesses soil quality and can identify crop illnesses by scanning crop leaves. Testing the soil is important since it enables the measurement of soil fertility and, consequently, the forecast of crops.

CHAPTER 2

LITERATURE SURVEY

[1] TITLE: Agriculture Based Recommendation System with Image Processing. (2022)

Authors: K.Saranya , Deena Dhayalan , R.Prasanth ,M. Sathish ,

The major problem that a farmer faces is the disease and pest that affect the plant. which are aware only in later stages. This system which recommends the most suitable crop by considering parameters like weather and soil based on live location. The First and foremost limitation in Image classification is gathering the proper quality data as the Image background may contain elements that may present in multiple samples.

Agriculture is the backbone of India as it plays a major role in Employment and Economy. One of the main reasons for loss in Agriculture is poor selection of crops that are to be grown. Most of the farmers are also not aware of requirements of soil like Nutrients, Minerals, Moisture content and others. This causes mental and financial stress to farmers. Other, Major problem that a farmer faces is the disease and pest that affects the plant, which are aware only in later stages.

Disadvantage

The First and foremost limitation in Image classification is gathering the proper quality data as the Image background may contain elements that may present in multiple samples.

[2] TITLE: Improved Plant Disease Detection Technique Using CNN (2022)

Authors: Oviya kumari, HJ Bharath , Jaisal Srivastava, JY manvith, Anusha Preetham,

This paper deals with the optimized real time detection of diseases that affect the plant and the area affected using Convolutional Neural Networks (CNN) algorithms so that appropriate fertilizers can be used to prevent further damage to plants from pathogenic viruses. The activation function is the core of the CNN model as it incorporates the non - linearity to have an authentic artificial intelligence system for classification. ReLu is one among the best activation functions, but has a disadvantage that the derivative of the function is zero for negative values and leads to neuronal necrosis. New mathematical activation function is developed and compared with existing activation functions to improve the accuracy and performance of the system on a Tensor Flow framework.

If the plant is unhealthy then the cause of the disease is also identified via taking two inputs such as plant leaves and soil sample from where the diseased plant is present. Images were taken in various weather conditions, at different angles, and daylight hours with an inconsistent background mimicking practical situations. The result will further be accompanied by recommending the required fertilizer or pesticide to tackle the problem and reducing loss in production.

Disadvantage

Images were taken in various weather conditions, at different angles, and daylight hours with an inconsistent background mimicking practical situations.

[3] TITLE: Soil Based Fertilizer Recommendation System for Crop Disease Prediction System (2021)

Authors: Dr.P. Pandi Selvi , P.Poornim a

The soil type fertilizer recommendation diseases in plants and leaves. All these features need to be considered. It is one of the major factors that reduce the yield in both quality and quantity of the food crops. Finding the leaf disease is an important role to preserve agriculture does not work for diverse varieties of crops cultivated

The primary driver of a nation's economic development is agriculture. For most Indians, agriculture is their livelihood and their heart. However, in recent days the field was deteriorating as a result of different natural disasters. Numerous problems in this area must be resolved in order to solve the problem. The kind of soil, suggested fertiliser, and plant illnesses and goes. All of these aspects must be taken into account. Our suggested system was set up to analyse the soil type, identify diseases in the leaves, and then advise the farmers on the fertiliser that would be most helpful to them. One of the main reasons reducing the output of the plant, both in terms of quality and quantity, is plant disease, particularly on the leaves.

Disadvantage

Does not work for diverse varieties of crops cultivated.

[4] TITLE: CNN based leaf disease identification and remedy recommendation system (2019)

Authors: V.Suma ,R.Amog Shetty, SunkuRohan

One industry that significantly affects human existence and economic condition is agriculture. Agriculture-related items are lost as a result of poor management. As a result of their ignorance about disease farmers produce less. Even though photos and videos of crops offer a better perspective and agro scientists are better equipped to address problems with healthy crops, farmers are not yet aware of these solutions. It is important to remember that there is a greater danger of poor and unhealthy nourishment being provided if the crop's yield is unhealthy. As a result of technological advancements, instruments that can recognise and diagnose plant illnesses now exist.

The devices are smart enough to recognize and detect plant diseases. Recognizing illness can prompt faster treatment in order to lessen the negative impacts on harvest. It is focus upon plant disease detection using image processing approach. This work utilizes an open dataset of 5000 pictures of unhealthy and solid plants. Time management is an issue in this method.

Disadvantage

Time management is an issue in this method.

[5] TITLE: Soil toxicity prediction and recommendation system using data mining in Precision agriculture (2018)

Authors: Mayuri Pawar, Geetha Chillarge

The system can help farmers by making them aware about soil conditions. Farmers can maximize crops yield by knowing proportion of nutrients present in the soil. Thus the system recommends the farmer about the crop, fertility of soil, level of toxicity and water supply. This system cannot be utilized effectively by the soil testing laboratories. Because soil toxicity affects soil nutrients, crops' health is also impacted. The suggested approach forecasts the degree of soil toxicity and alerts farmers to it. Rainfall is a common source of dependence for farmers, which contributes to slow growth and lower agricultural yields.

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Disadvantage

This system can not be utilized effectively by the soil testing laboratories.

2.1 Existing Problem

Detecting plant diseases and pests is a key area of research in the science of machine vision. It is a system that gathers photos of plants using machine vision equipment and determines whether any pests or illnesses are present . Plant diseases and pests detection tools based on machine vision are currently being used in agriculture and have partially replaced the old-fashioned naked eye identification methods. In order to create the imaging scheme and select the suitable light source and shooting angle, this type of technology typically makes use of the various characteristics of plant diseases and pests. This is beneficial in obtaining photos with uniform illumination.

2.2 References

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2. James. N. Mugo, Nancy N. Karanja, Charles K. Gachene, Klaus Dittert, Shadrack O. Nyawade,and Elmar Schulte-Geldermann -Assessment of soil fertility and potato crop nutrient status in central and eastern highlands of Kenya, (8th May, 2020)

3. S. Yegneshwar Yadhav, T. Senthilkumar, S. Jayanthy, J. Judeson Antony Kovilpillai Plant Disease Detection and Classification using CNN Model with Optimized Activation Function (2020 - 4 th July)

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8. Sladojevic, Srdjan, Marko Arsenovic, AndrasAnderla, DubravkoCulibrk, and DarkoStefanovic. "Deep neural networks based recognition of plant diseases by leaf image classification." Computational intelligence and neuroscience (2016).

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10. Sue Han, CheeSeng Chan, Paul Wilkin, and Paolo Remagnino, "Deep-plant: Plant identification with convolutional neural networks", In Image Processing (ICIP), 2015 IEEE International Conference on, pp. 452-456, IEEE, 2015.

2.3 Problem Statement Definition

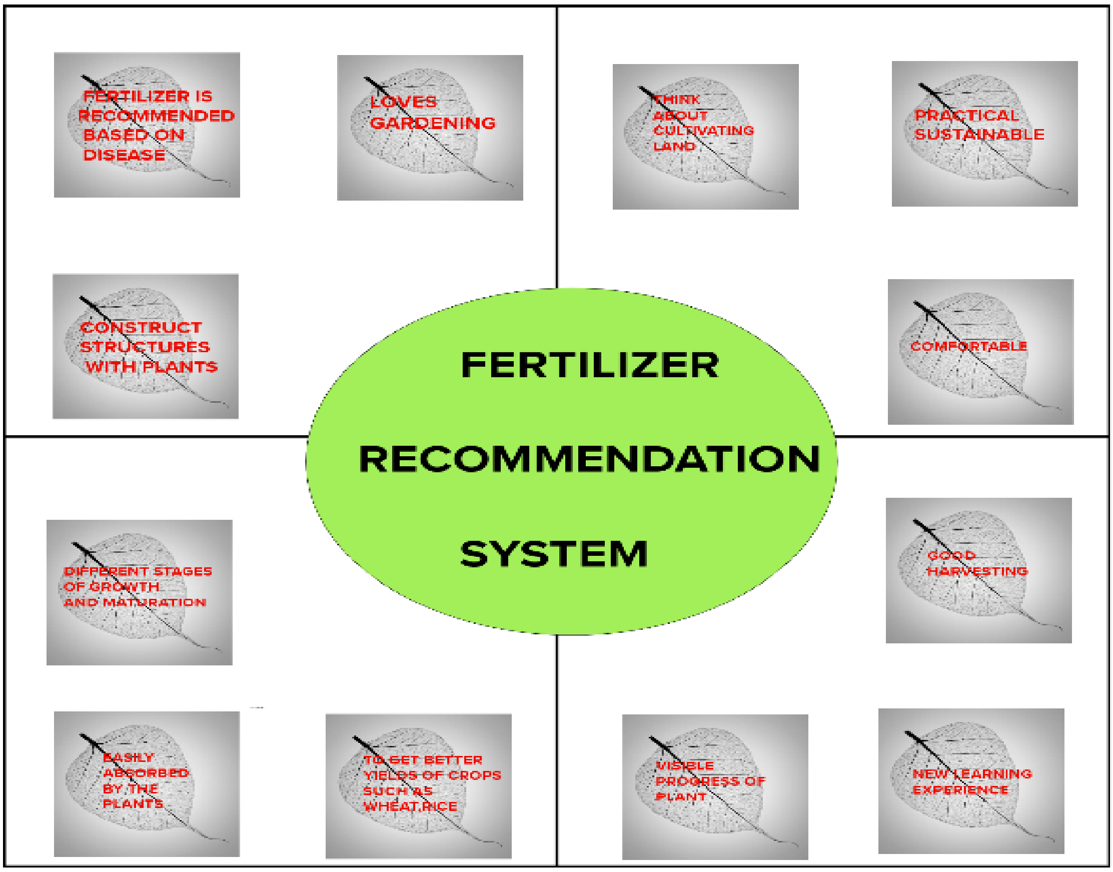
Based on plant disease, the fertiliser recommendation system makes fertiliser recommendations. supplying fertiliser to the crop in a way that minimises nutrient losses to the plants while still achieving yield and quality goals fertilisers have been introduced to treat many plant diseases, and fertiliser recommendations have been improved with sound advice. The nutrients that crops remove from the soil and replace with fertilisers. Crop yields and agricultural output would be much lower without the addition of fertilisers. Therefore, fertilisers are crucial today for increased output. Customers are happy when the right fertiliser is suggested along with helpful instructions. The mechanism for recommending fertilisers is expedited. Digital signals are used to link farmers and retailers. In a few years, the system might generate more money than it invested. We can achieve drought-tolerant agriculture with this system. In the agricultural sector, recommender systems are used to give clients effective recommendations for choosing the right fertiliser for their crops, thereby increasing crop yield and minimising environmental impact.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

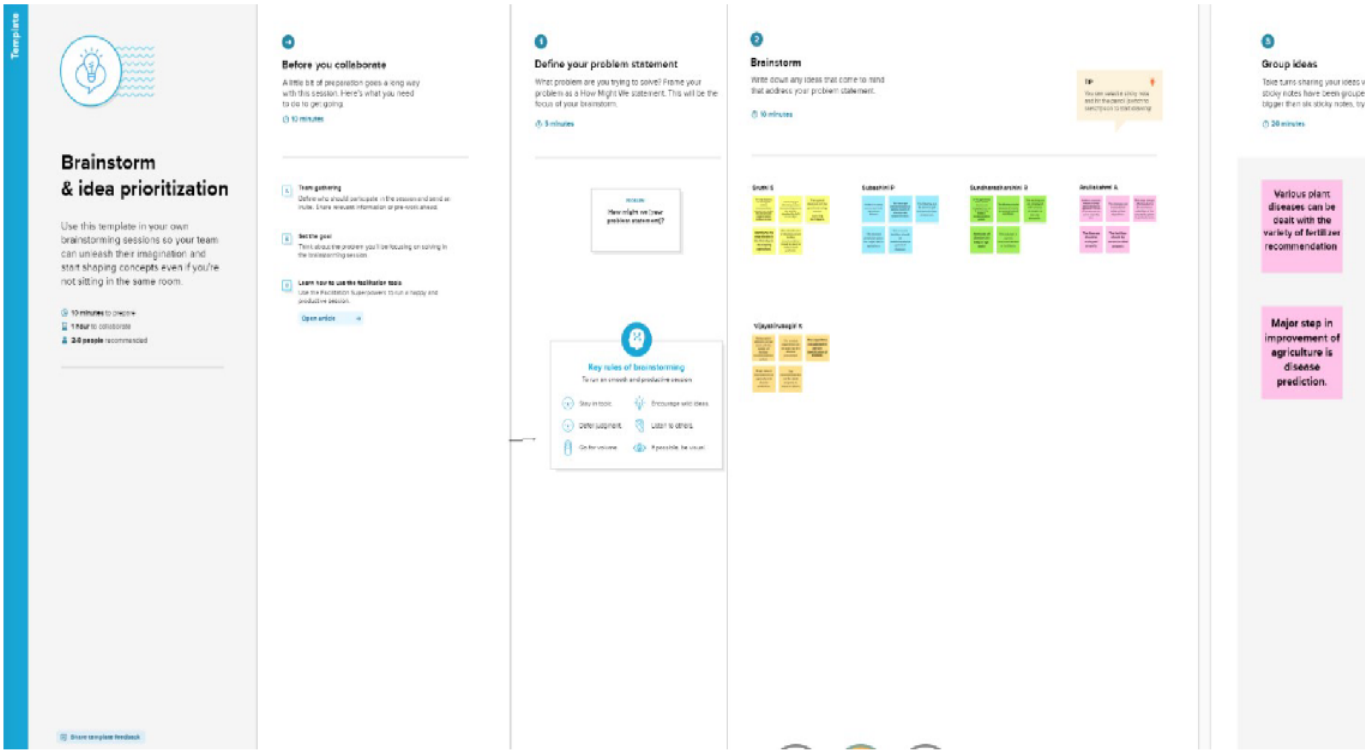
3.1 Empathy map canvas

Empathy maps are created with the fertilizer recommendation system. This procedure is especially for the plants which experiences diseases. The diseases can be predicted from the leaves of the plant. The pre-processing step is where the work begins. The acquired data underwent pre-processing in this step. The majority of the data from the data set was gathered. The diseases of the both fruit and vegetable plants can be predicted with the leaves. These ideas are explained in the empathy map.


FERTILIZER IS RECOMMENDED BASED ON DISEASE
LOVES GARDENING
THINK ABOUT CULTIVATING LAND
PRACTICAL SUSTAINABLE
CONSTRUCT STRUCTURES WITH PLANTS
COMFORTABLE
FERTILIZER RECOMMENDATION SYSTEM
DIFFERENT STAGES OF GROWTH AND MATURATION
GOOD HARVESTING
EASILY ABSORBED BY THE PLANTS
TO GET BETTER YIELDS OF CROPS SUCH AS WHEAT,RICE
VISIBLE PROGRESS OF PLANT
NEW LEARNING EXPERIENCE

3.2 Ideation & Brainstorming

Ideation and brainstorming, a specific technique for generating new ideas, are typically closely related. The key difference between ideation and brainstorming is that ideation is often viewed as being more of a solo activity while brainstorming is almost always done in groups. People regularly come together for a brainstorming session to come up with either new, all-encompassing ideas or answers to particular issues or situations. The line between ideation and brainstorming has become more hazy since the development of brainstorming software programmes like Brightidea and Idea wake. These software tools are designed to motivate staff members to come up with innovative solutions to improve operations and, ultimately, bottom-line profitability.



Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A. Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B. Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C. Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM
How might we [your problem statement]?

Key rules of brainstorming
To run an smooth and productive session

Stay in topic.
Encourage wild ideas.
Defer judgment.
Listen to others.
Go for volume.
If possible, be visual.

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP
You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

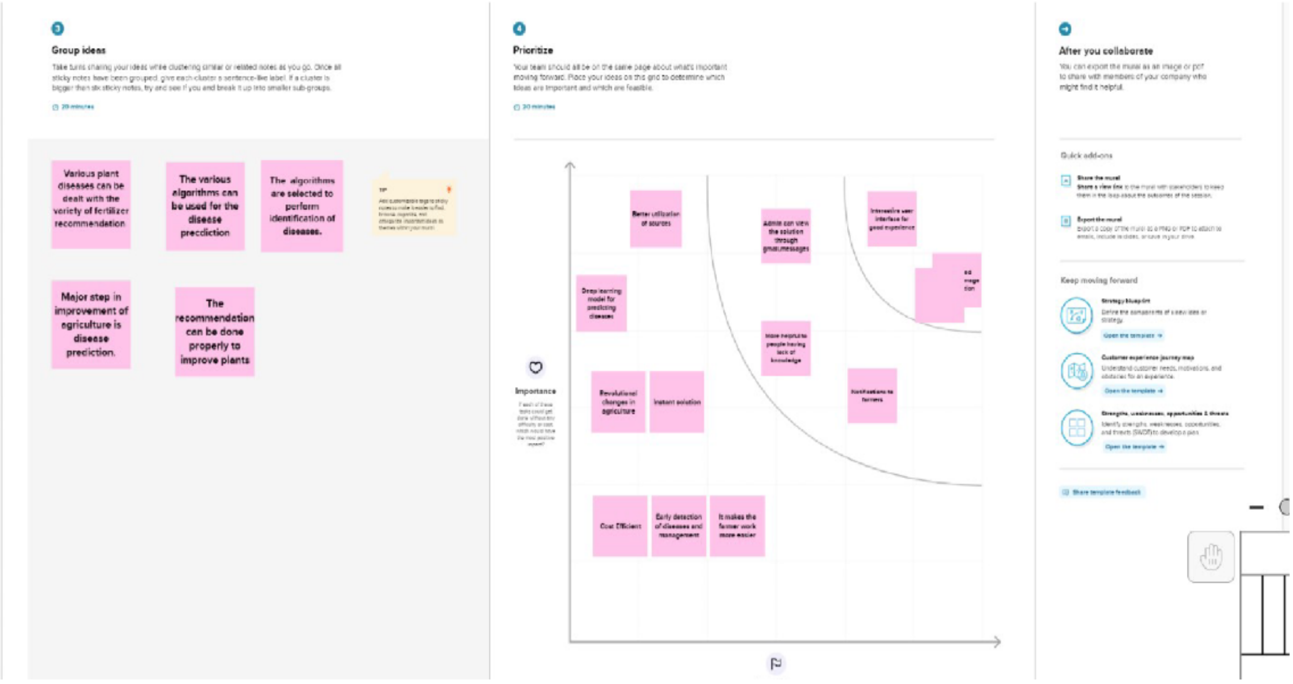
3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try

20 minutes

Various plant diseases can be dealt with the variety of fertilizer recommendation

Major step in improvement of agriculture is disease prediction.



3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Various plant diseases can be dealt with the variety of fertilizer recommendation

The various algorithms can be used for the disease precdiction

The algorithms are selected to perform identification of diseases.

Major step in improvement of agriculture is disease prediction.

The recommendation can be done properly to improve plants

TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

Better utilization of sources
Admin can view the solution through gmail,messages
Interactive user interface for good experience
ed mage tion
Deep learning model for predicting diseases
More helpful to people having lack of knowledge
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Revolutional changes in agriculture
Instant solution
Notifications to farmers
Cost Efficient
Early detection of diseases and management
It makes the farmer work more easier

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A. Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B. Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback

3.2 Proposed Solution

The term "proposed solution" refers to the combination of all services (including any installation, implementation, training, maintenance, and support services) and any software, hardware, other items, or equipment required to achieve the objective mentioned by the vendor in its proposal.

1) Problem Statement (Problem to be solved)

To recommend fertilizers based on the plant leaf disease. Farmers have a variety of problems in agriculture, particularly because plant diseases cause the cultivation to decrease. The major objective of the research is to create a system for recommending fertiliser in response to anticipated diseases.

2) Idea / Solution description

Supplying fertiliser to the crop in a way that minimises nutrient losses to the plants while still achieving economic production and quality goals.

3) Novelty / Uniqueness

Introduction of fertilizers for different plant disease and improvement in suggestion of fertilizers with proper guidance.

4) Social Impact / Customer Satisfaction

The nutrients that crops remove from the soil and replace with fertilisers. Crop yields and agricultural output would be much lower without the addition of fertilisers. Therefore, fertilisers are crucial today for increased output. The nutrients that crops remove from the soil and replace with fertilisers. Crop yields and agricultural output would be much lower without the addition of fertilisers. Therefore, fertilisers are crucial today for increased output.

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5) Business Model (Revenue Model)

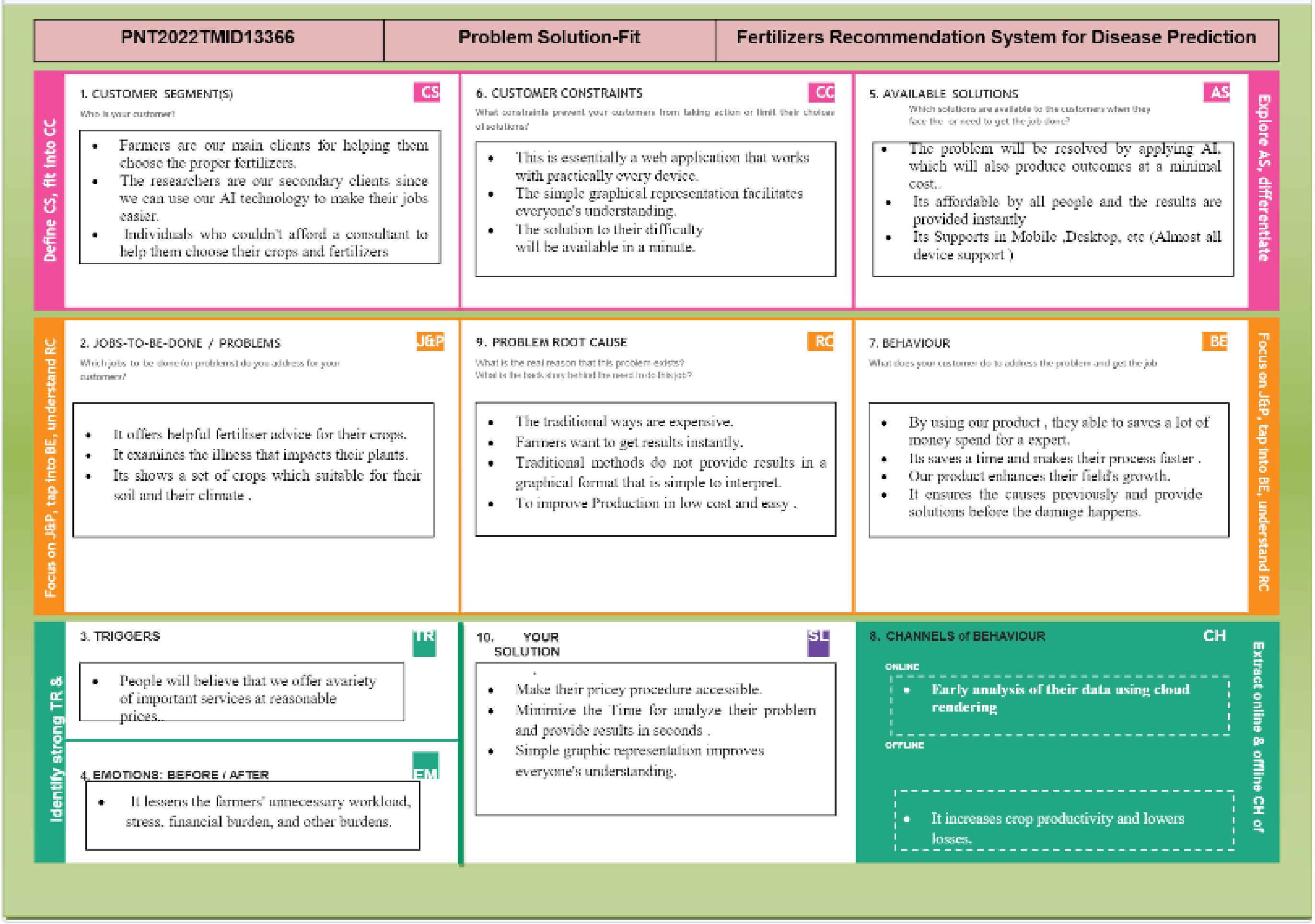
A fast forward system for recommendation of fertilizers. It connects farmers and retailers through digital signals. The system may reach revenue more than the investment in 2 years.

6) Scalability of the Solution

We can achieve drought-tolerant agriculture with this system. The system's accuracy has to be improved.

3.4 Problem Solution Fit

Business owners, marketers, and corporate innovators use the Problem-Solution technique to identify ideas with a higher possibility of being adopted, reduce testing time, and gain a better understanding of the existing situation. This information, which is often gathered on the next few rounds of revision and client interviews, is crucial to the success of your company. This canvas has all the information you need to spot patterns, figure out what might work and why based on the principles of Lean Startup and User Experience design. Simply go to where your clients are and address a genuine need, whether it is handling the same problem in a different way or delivering a novel idea in a well-known way. These specifications apply to this project.



PNT2022TMID13366 | Problem Solution-Fit | Fertilizers Recommendation System for Disease Prediction

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?

- Farmers are our main clients for helping them choose the proper fertilizers.
- The researchers are our secondary clients since we can use our AI technology to make their jobs easier.
- Individuals who couldn't afford a consultant to help them choose their crops and fertilizers

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions?

- This is essentially a web application that works with practically every device.
- The simple graphical representation facilitates everyone's understanding.
- The solution to their difficulty will be available in a minute.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the or need to get the job done?

- The problem will be resolved by applying AI, which will also produce outcomes at a minimal cost..
- Its affordable by all people and the results are provided instantly
- Its Supports in Mobile ,Desktop, etc (Almost all device support)

Explore AS, differentiate

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

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs to be done (or problems) do you address for your customers?

- It offers helpful fertiliser advice for their crops.
- It examines the illness that impacts their plants.
- Its shows a set of crops which suitable for their soil and their climate .

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?

- The traditional ways are expensive.
- Farmers want to get results instantly.
- Traditional methods do not provide results in a graphical format that is simple to interpret.
- To improve Production in low cost and easy .

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job

- By using our product , they able to saves a lot of money spend for a expert.
- Its saves a time and makes their process faster .
- Our product enhances their field's growth.
- It ensures the causes previously and provide solutions before the damage happens.

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

Identify strong TR &

3. TRIGGERS TR

- People will believe that we offer avariety of important services at reasonable prices..

4. EMOTIONS: BEFORE / AFTER EM

- It lessens the farmers' unnecessary workload, stress, financial burden, and other burdens.

10. YOUR SOLUTION SL

- Make their pricey procedure accessible.
- Minimize the Time for analyze their problem and provide results in seconds .
- Simple graphic representation improves everyone's understanding.

8. CHANNELS of BEHAVIOUR CH

ONLINE

- **Early analysis of their data using cloud rendering**

OFFLINE

- It increases crop productivity and lowers losses.

Extract online & offline CH of

CHAPTER 4

REQUIREMENT ANALYSIS

Determining user expectations for a new or modified product is the process known as requirements analysis, sometimes known as requirements engineering. These characteristics, also known as criteria, must be precise, pertinent, and quantitative. Such specifications are sometimes referred to as functional requirements in software engineering. Project management includes requirements analysis as a key component.

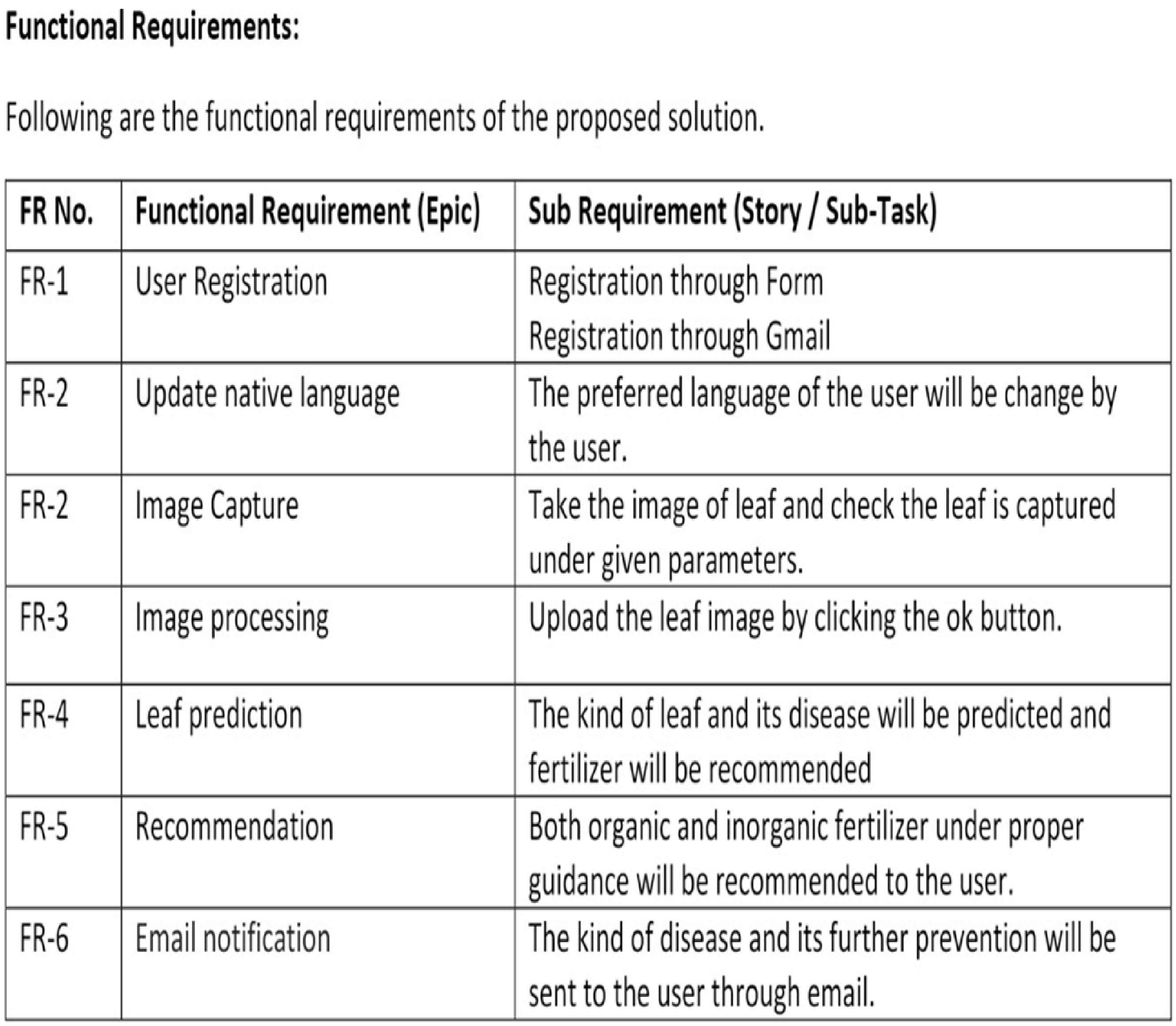
In order to resolve disagreement or ambiguity in requirements as needed by different users or groups of users, eliminate feature creep, and document every step of the project development process from beginning to end,

requirements analysis requires continuous communication with system users. Instead of attempting to shape user expectations to fit the final system or product, effort should be focused on ensuring that it adheres to client demands.
requirements.

Requirements analysis is a collaborative endeavour that requires knowledge in hardware, software, and human factors engineering in addition to interpersonal skills. The goal of the requirements analysis phase is to translate the needs and high-level requirements defined in prior phases into requirements that are clear, complete, consistent, traceable, and approved by all relevant stakeholders.

4.1 Functional Requirement

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



Functional Requirements:

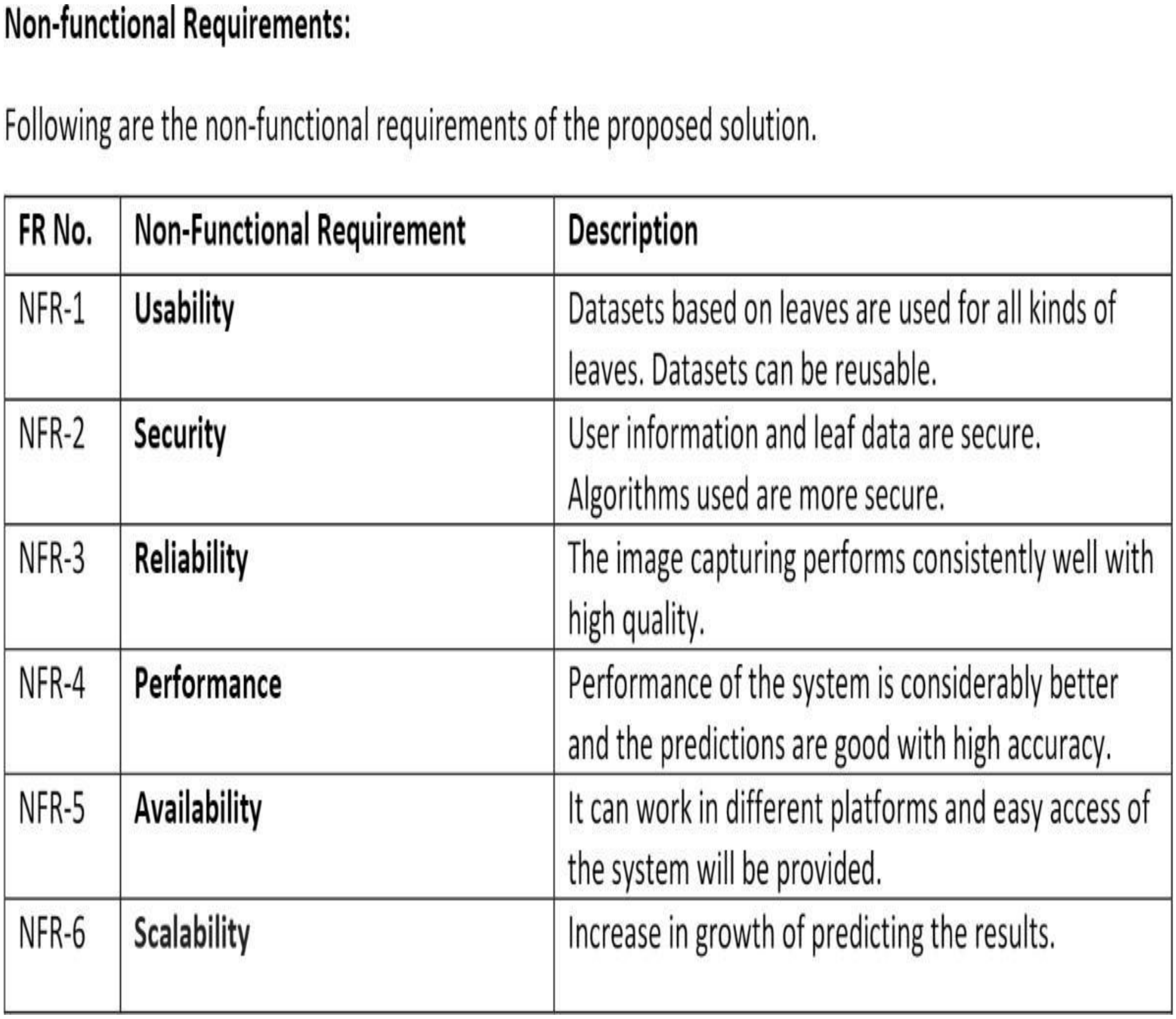
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	Update native language	The preferred language of the user will be change by the user.
FR-2	Image Capture	Take the image of leaf and check the leaf is captured under given parameters.
FR-3	Image processing	Upload the leaf image by clicking the ok button.
FR-4	Leaf prediction	The kind of leaf and its disease will be predicted and fertilizer will be recommended
FR-5	Recommendation	Both organic and inorganic fertilizer under proper guidance will be recommended to the user.
FR-6	Email notification	The kind of disease and its further prevention will be sent to the user through email.

4.1 FUNCTIONAL REQUIREMENTS

4.2 Non Functional Requirement

A non-functional requirement (NFR) is a requirement that, rather than describing specific behaviours, sets criteria that can be used to assess how well a system performs. Functional requirements, on the other hand, define particular behaviours or functions. The system design includes a thorough plan for putting functional requirements into practise. Because they are typically architecturally significant requirements, the system architecture includes a thorough plan for implementing non-functional requirements.



Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Datasets based on leaves are used for all kinds of leaves. Datasets can be reusable.
NFR-2	**Security**	User information and leaf data are secure. Algorithms used are more secure.
NFR-3	**Reliability**	The image capturing performs consistently well with high quality.
NFR-4	**Performance**	Performance of the system is considerably better and the predictions are good with high accuracy.
NFR-5	**Availability**	It can work in different platforms and easy access of the system will be provided.
NFR-6	**Scalability**	Increase in growth of predicting the results.

4.2 NON FUNCTIONAL REQUIREMENT

CHAPTER 5

PROJECT DESIGN

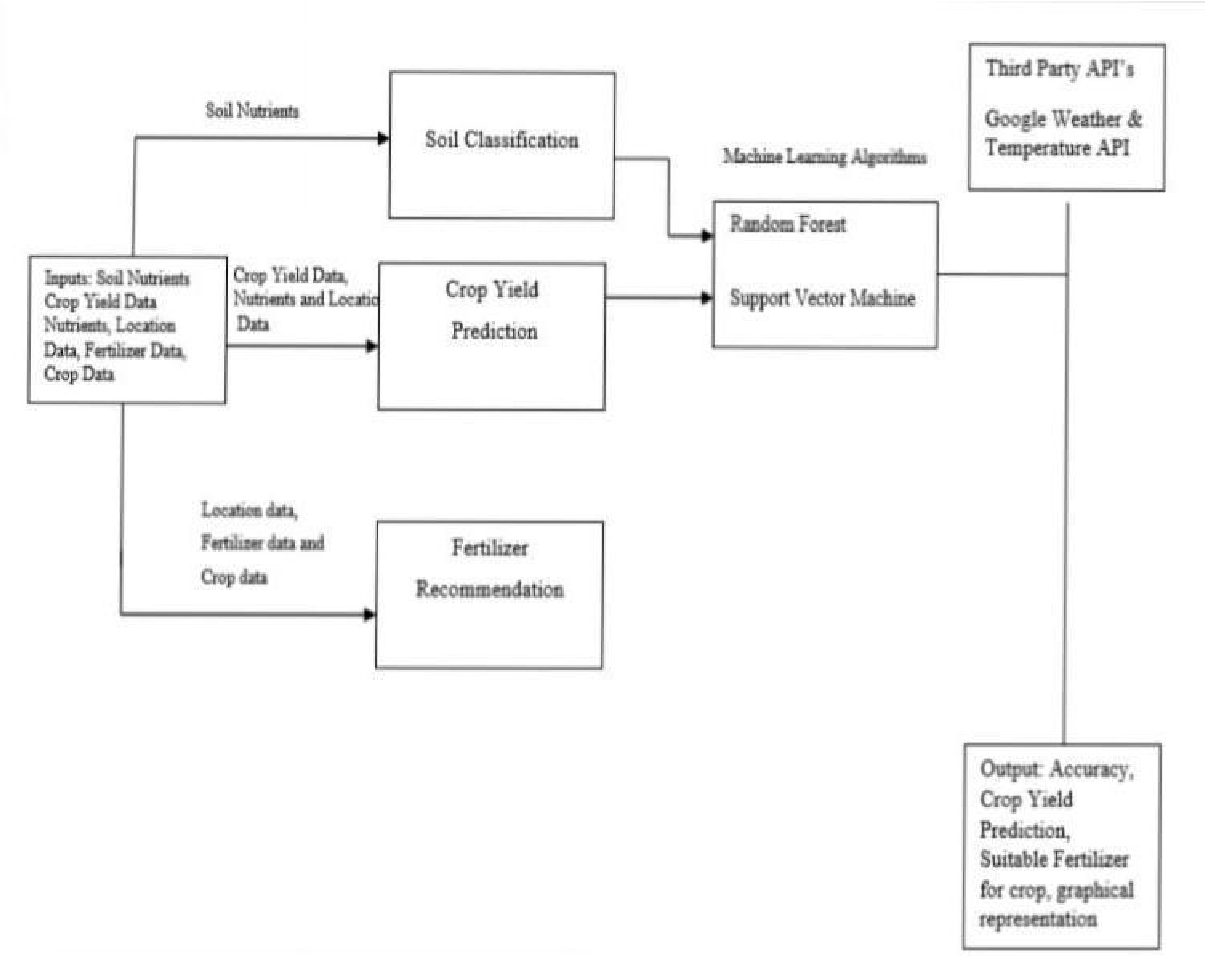
The classic visual representation of how information moves through a system is a data flow diagram (DFD). A tidy and understandable DFD can graphically represent the appropriate quantity of the system demand. It can be done manually, automatically, or both.

It demonstrates how information enters and exits the system, what modifies the data, and where information is kept. A DFD's goal is to outline the boundaries and scope of a system as a whole. It can be utilised as a communication tool between a system analyst and any participant in the sequence that serves as the foundation for system redesign. The DFD is also known as a bubble chart or data flow graph.

A location for the collecting of data items is indicated by a series of parallel lines. A data store denotes the storage of data that can be used later or by various processes in a different order. The data storage may contain one or more components. Any level of abstraction for a system or piece of software can be performed using the DFD. Levels that correspond to increasing information flow and functional detail may be partitioned into DFDs. The system is then broken down and represented as a DFD with several bubbles. The system components that each of these bubbles represents are then broken down and documented as ever-more-detailed DFDs.

5.1 Data Flow Diagrams

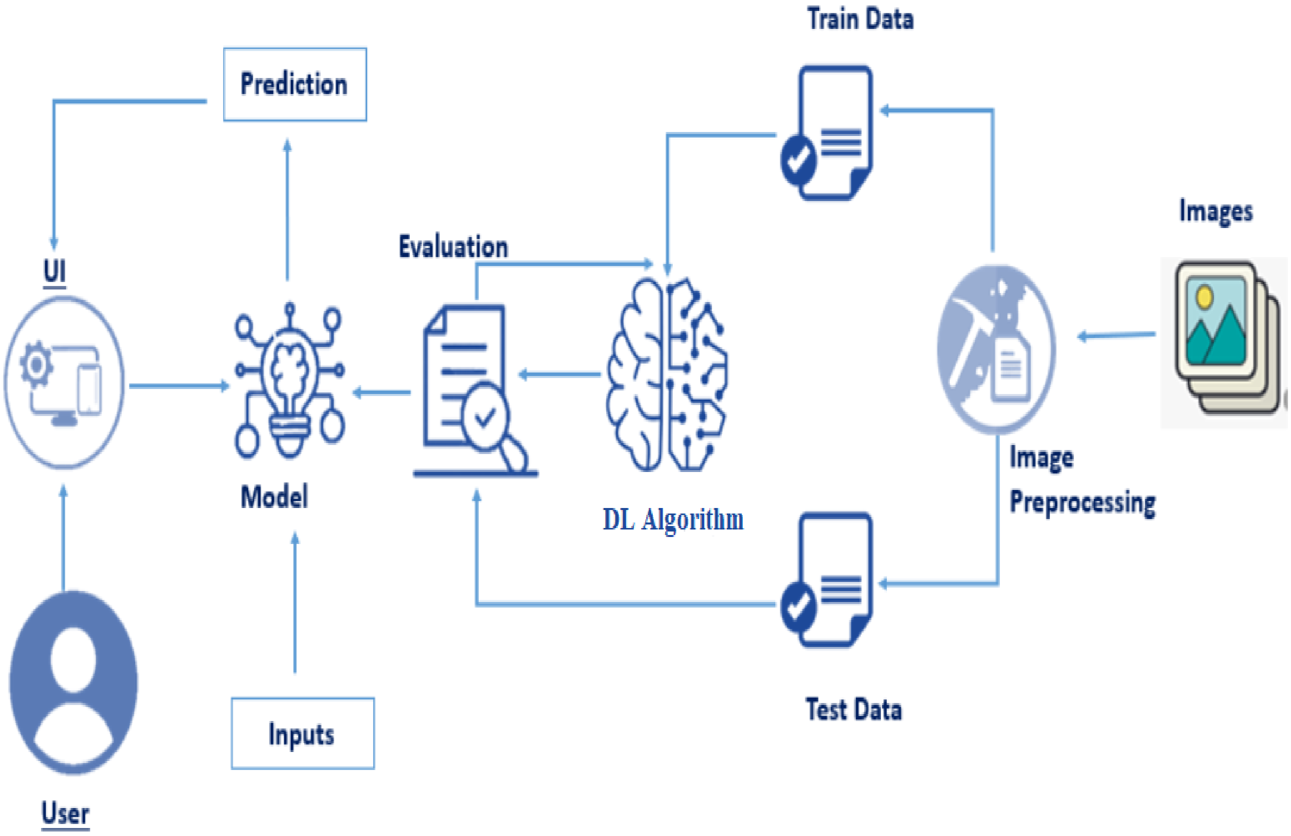
In a data flow diagram, the information flows inside a system are typically represented visually (DFD). A clear and unambiguous DFD can graphically express the right amount of system need. It illustrates how data enters and departs the system, where it is stored, and what changes the data.


Soil Nutrients
Soil Classification
Machine Learning Algorithms
Third Party API's
Google Weather & Temperature API
Random Forest
Support Vector Machine
Inputs: Soil Nutrients Crop Yield Data Nutrients, Location Data, Fertilizer Data, Crop Data
Crop Yield Data, Nutrients and Locatio Data
Crop Yield Prediction
Location data, Fertilizer data and Crop data
Fertilizer Recommendation
Output: Accuracy, Crop Yield Prediction, Suitable Fertilizer for crop, graphical representation

5.1 DATA FLOW DIAGRAM

5.2 Solution &Technical Architecture

Assuring that all parties, including stakeholders, are on the same page and going in the same direction at all times, solution architects are most like project managers. All tasks resulting in the effective implementation of a new application are managed by technical architects.



5.2 SELECTION & TECHNIC ARCHITECTURE

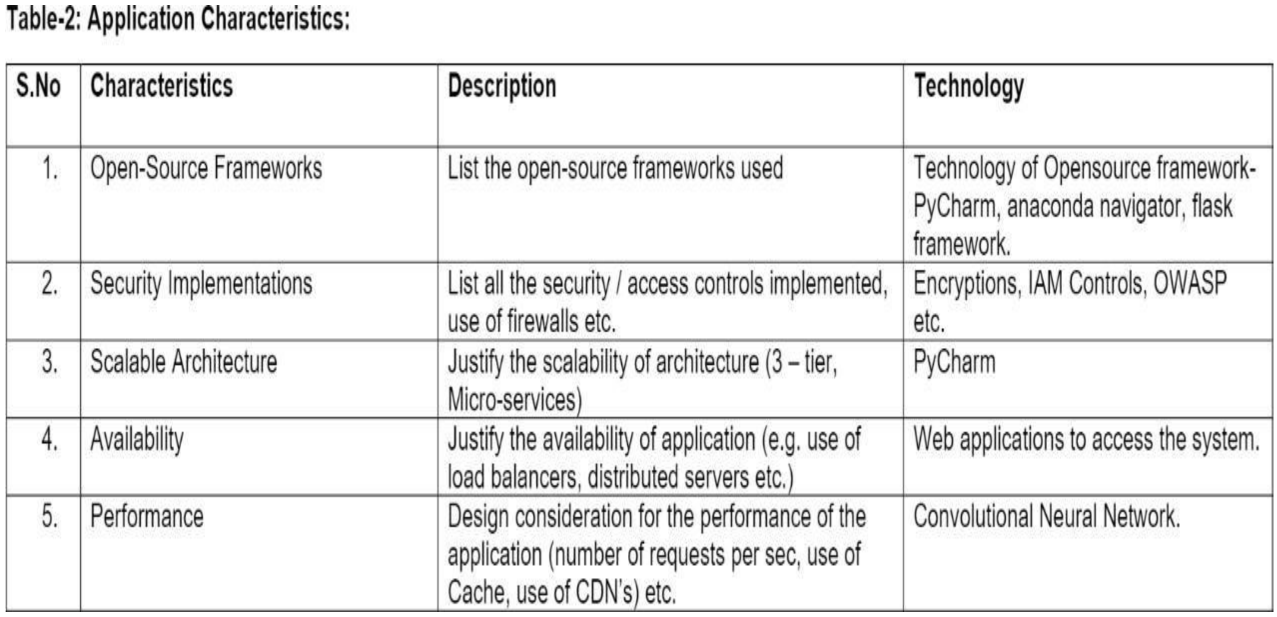


Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework-PyCharm, anaconda navigator, flask framework.
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	PyCharm
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Web applications to access the system.
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Convolutional Neural Network.

5.2.2 APPLICATION CHARACTERISTICS

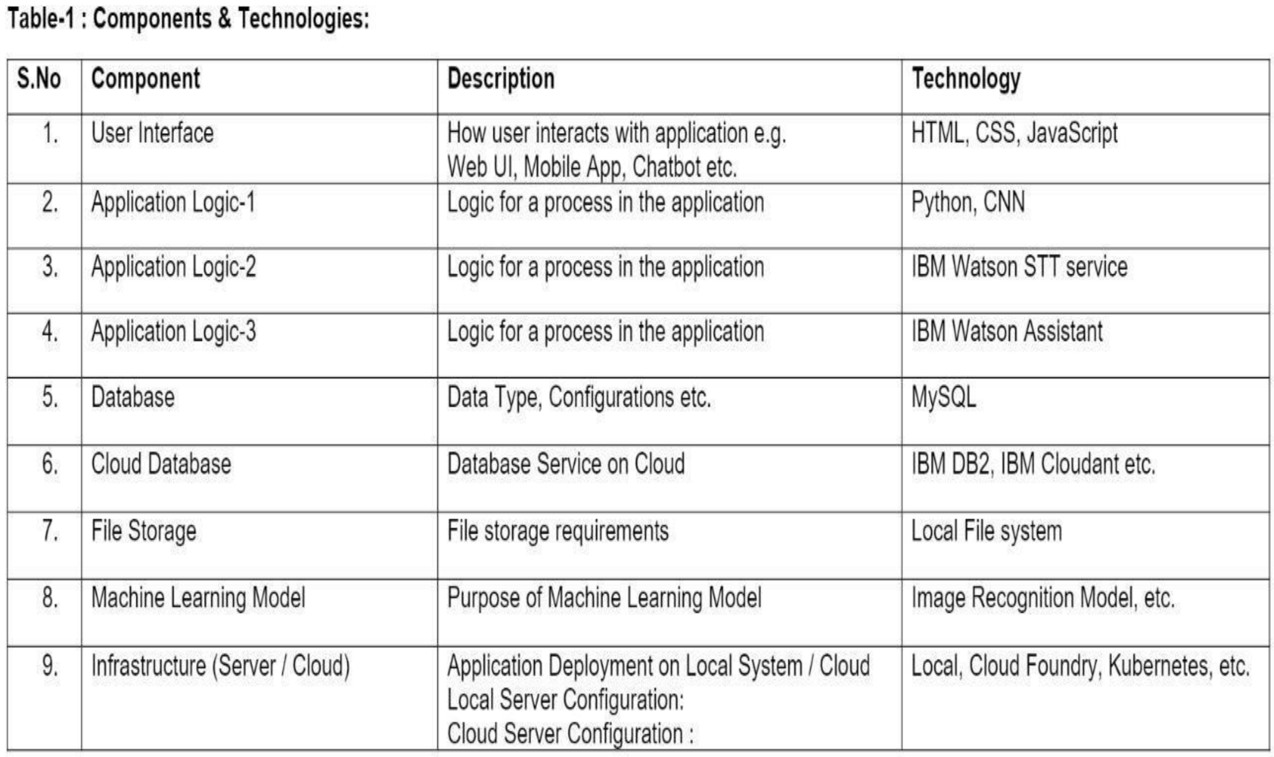


Table-1 : Components & Technologies:

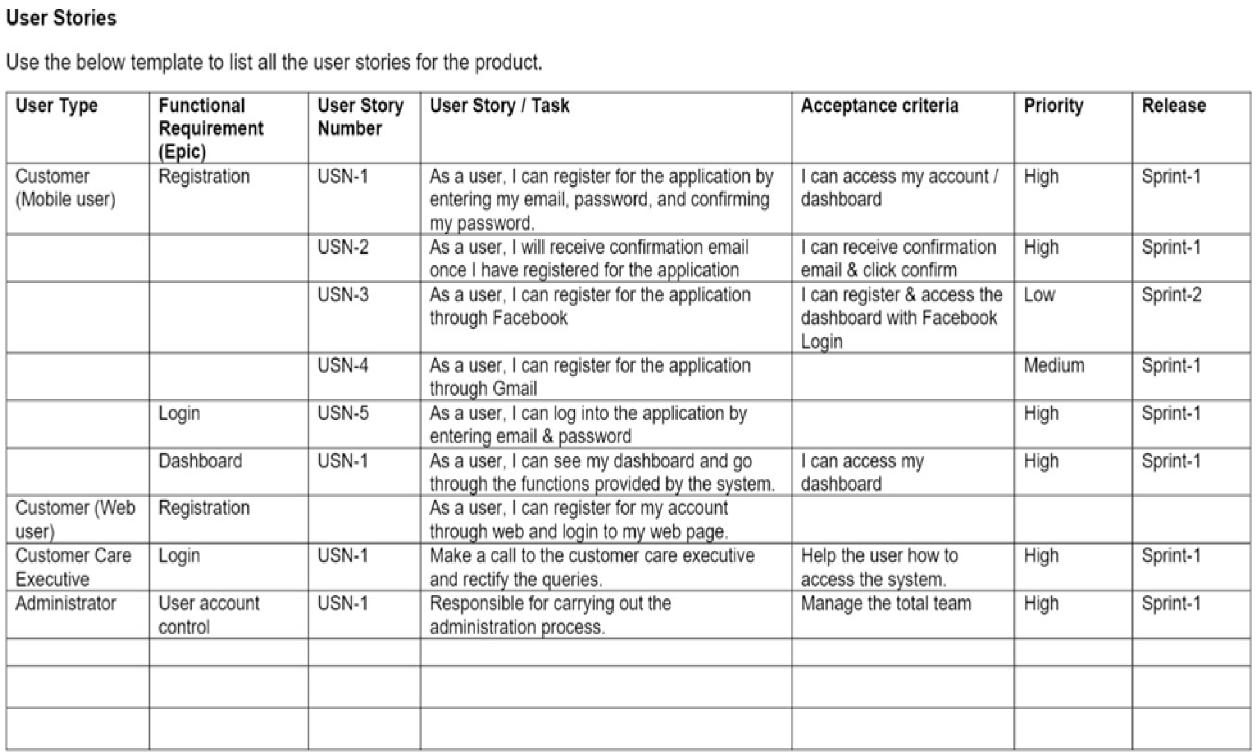
S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript
2.	Application Logic-1	Logic for a process in the application	Python, CNN
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	Local File system
8.	Machine Learning Model	Purpose of Machine Learning Model	Image Recognition Model, etc.
9.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

5.2.3 COMPONENTS AND TECHNOLOGIES

5.3 User Stories

The smallest piece of work in an agile system is a user story. It is a final objective, not a feature, as seen through the eyes of a software user. A user story is a casual, all-inclusive description of a software feature written from the viewpoint of the client or end user.

A user story's objective is to describe how a piece of work will provide the customer with a specific value. Keep in mind that "customers" don't always have to be end users on the outside in the conventional sense; they might also be colleagues or internal customers within your company who depend on your team. User stories are short, straightforward statements that describe the desired result. They don't get specific. Requirements are added after the team has approved them.



User Stories

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

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-1	As a user, I can see my dashboard and go through the functions provided by the system.	I can access my dashboard	High	Sprint-1
Customer (Web user)	Registration		As a user, I can register for my account through web and login to my web page.			
Customer Care Executive	Login	USN-1	Make a call to the customer care executive and rectify the queries.	Help the user how to access the system.	High	Sprint-1
Administrator	User account control	USN-1	Responsible for carrying out the administration process.	Manage the total team	High	Sprint-1

5.3 USER STORIES

CHAPTER 6

PROJECT PLANNING & SCHEDULING

Planning

Planning pertains to the process of creating a plan of which materials and resources will be required to fulfill incoming and forecasted demand. This step is crucial to ensure that you have enough materials and resource capacity available to produce your orders on time. This component pertains to the 'what' and 'how' of any project: what exactly needs to be achieved and how it will be accomplished.

Scheduling

Scheduling pertains to establishing the timing of the use of specific resources of that organization. In production, scheduling involves developing schedules for workers, equipment, and materials. It reflects on the 'when' of a project, by assigning the appropriate resources to get the production plan completed within a period of time. Creating optimized production schedules ensures that your facility is able to reduce costs, increase productivity, and deliver goods to customers on time.

In order to create accurate and realistic production plans that allow manufacturers to react quickly to changes, it is important to have a production plan that is aligned with the resource and material scheduling process. Having any discrepancy or divergence between the planning and scheduling process creates inefficiencies that can be costly for your business.

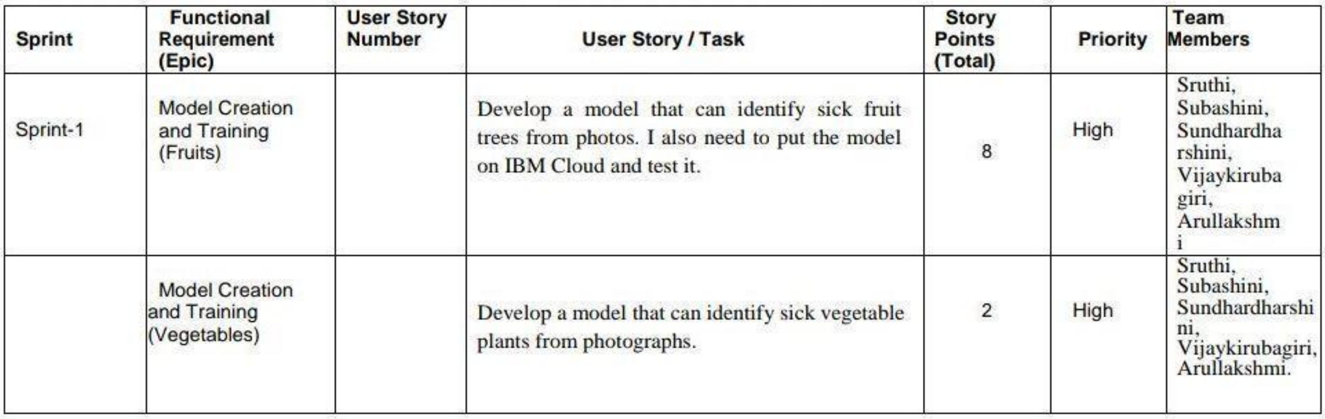
6.1 Sprint Planning & Estimation

Planning

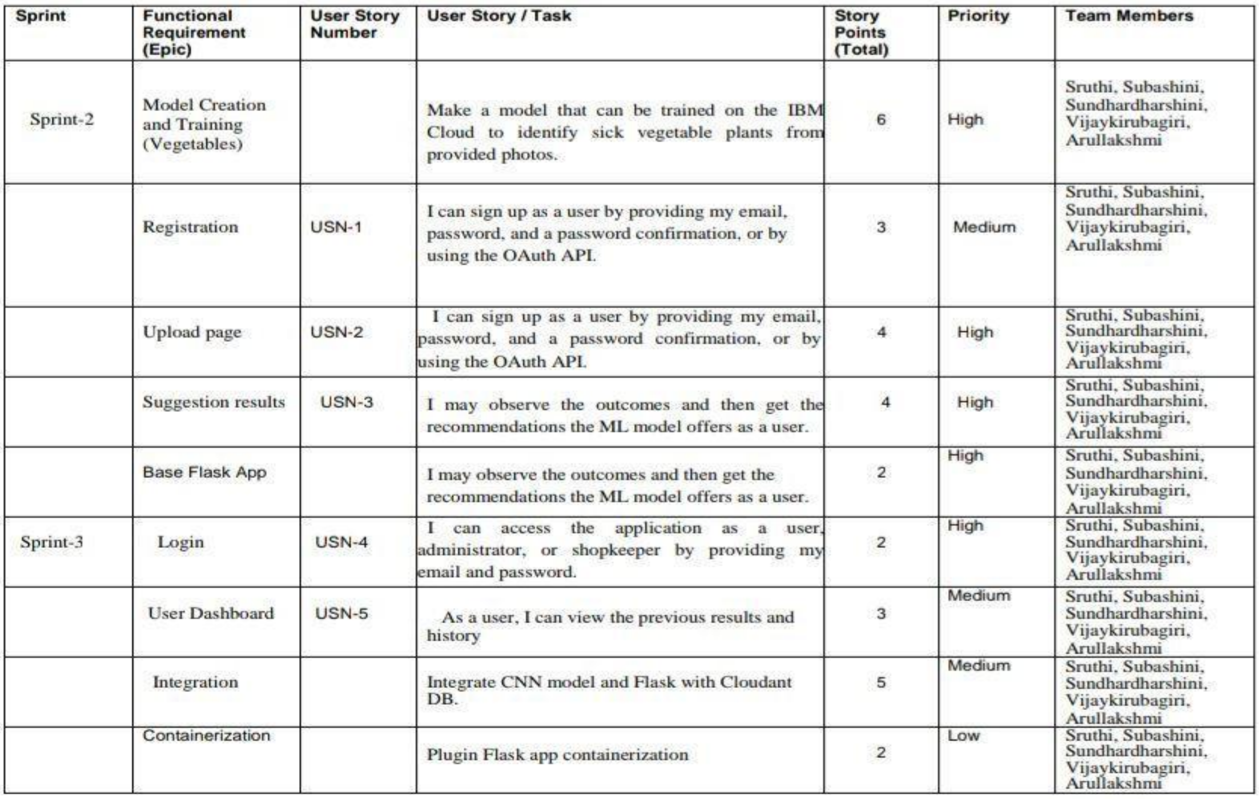
The team decides what it will develop and how it will build it during the sprint planning phase. After breaking user stories down into tasks and performing task-level estimation, the team commits to the Sprint target. The Product Owner, Scrum Master, and Team coordinate sprint planning. Each project in Scrum is divided into sprints, which are time chunks that are typically 2-4 weeks long. The Scrum Team, Scrum Product Manager, and Scrum Master gather for a sprint planning meeting to decide which backlog items will be tackled during the following sprint.

Estimation

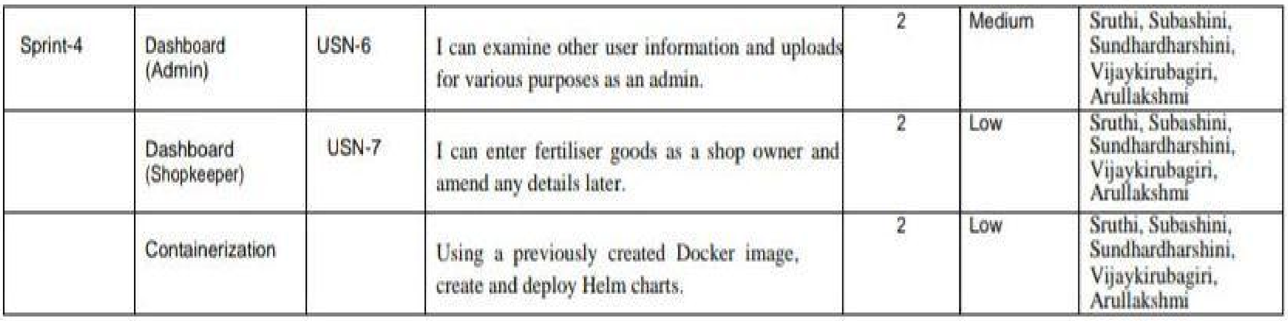
During the Sprint Planning Meeting, the entire team estimates in Scrum projects. The goal of the estimation would be to prioritise the User Stories for the Sprint and assess the team's capacity to complete them inside the Sprint's Time Box. The prioritised User Stories are moved to the top of the Product Backlog by the Product Owner, who also makes sure they are clear and can be estimated. The Scrum Team will take care to choose the User Stories for the Sprint based on the size of the Product Increment and the effort necessary for the same, as the Scrum Team as a whole is accountable for the delivery of the product increment.



Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-1	Model Creation and Training (Fruits)		Develop a model that can identify sick fruit trees from photos. I also need to put the model on IBM Cloud and test it.	8	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Model Creation and Training (Vegetables)		Develop a model that can identify sick vegetable plants from photographs.	2	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi.



Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-2	Model Creation and Training (Vegetables)		Make a model that can be trained on the IBM Cloud to identify sick vegetable plants from provided photos.	6	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Registration	USN-1	I can sign up as a user by providing my email, password, and a password confirmation, or by using the OAuth API.	3	Medium	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Upload page	USN-2	I can sign up as a user by providing my email, password, and a password confirmation, or by using the OAuth API.	4	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Suggestion results	USN-3	I may observe the outcomes and then get the recommendations the ML model offers as a user.	4	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Base Flask App		I may observe the outcomes and then get the recommendations the ML model offers as a user.	2	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
Sprint-3	Login	USN-4	I can access the application as a user, administrator, or shopkeeper by providing my email and password.	2	High	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	User Dashboard	USN-5	As a user, I can view the previous results and history	3	Medium	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Integration		Integrate CNN model and Flask with Cloudant DB.	5	Medium	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Containerization		Plugin Flask app containerization	2	Low	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi



Sprint-4	Dashboard (Admin)	USN-6	I can examine other user information and uploads for various purposes as an admin.	2	Medium	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Dashboard (Shopkeeper)	USN-7	I can enter fertiliser goods as a shop owner and amend any details later.	2	Low	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi
	Containerization		Using a previously created Docker image, create and deploy Helm charts.	2	Low	Sruthi, Subashini, Sundhardharshini, Vijaykirubagiri, Arullakshmi

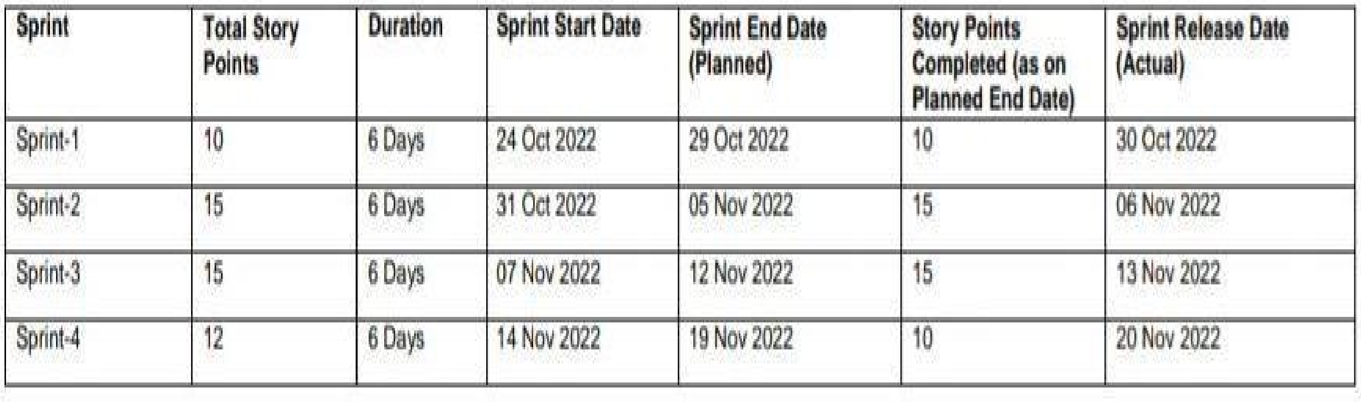
6.1 SPRINT PLANNING & ESTIMATION

6.2 Sprint Delivery Schedule

Sprints are time-limited events, thus it's important to cut down on wastage during planning and production. And this is the very situation in which sprint scheduling comes into play.

If you're not familiar, a sprint schedule is a written summary of the entire sprint planning process. It's one of the initial steps in the agile sprint planning process, and it calls for sufficient investigation, preparation, and coordination.

When there are too many schedules created by a team, problems can arise. Conflict can result from this, and projects may get derailed in the middle of their cycles. One schedule makes sense to make sure everything proceeds as planned.



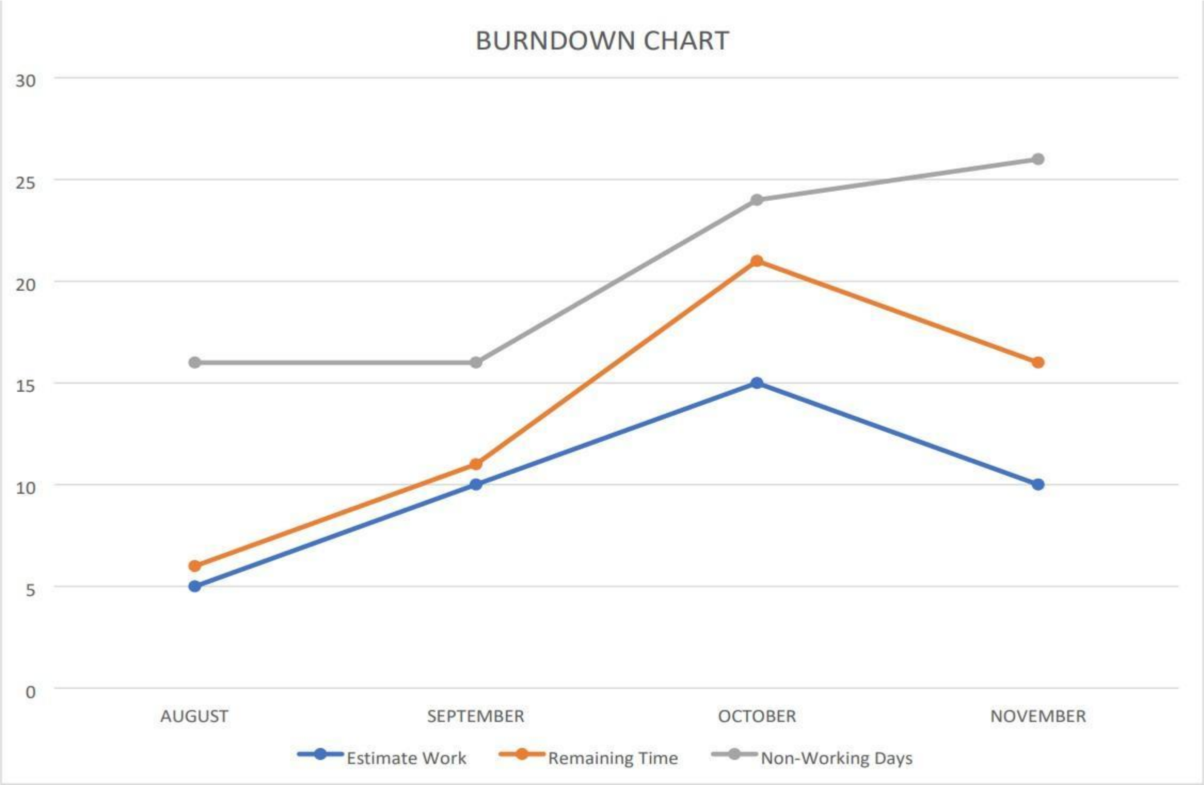
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	10	6 Days	24 Oct 2022	29 Oct 2022	10	30 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	06 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	13 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	10	20 Nov 2022

6.2 SPRINT DELIVERY SCHEDULE

6.3 Reports form JIRA

A burn down chart plots the amount of work remaining to perform against the amount of time. In agile software development approaches like Scrum, it is frequently employed. Burn down charts, however, can be used for any project that makes observable progress over time.

A burn down chart typically has time along the horizontal axis and the amount of unfinished work on the vertical axis. When estimating when all of the work will be finished, it is helpful. The Development Team updates the Sprint Burn Down and plans the day's remaining tasks at the Daily Scrum.



6.3 REPORT FROM JIRA

CHAPTER 7

CODING & SOLUTIONING

7.1 Feature 1

```
from flask import Flask, render_template, flash, request, session,send_file
from flask import render_template, redirect, url_for, request
import warnings
import datetime
import cv2
app = Flask(_name_)
app.config['DEBUG']
app.config['SECRET_KEY'] = '7d441f27d441f27567d441f2b6176a'
@app.route("/")
def homepage():
   return render_template('index.html')
@app.route("/Training")
def Training():
   return render_template('Tranning.html')
@app.route("/Test")
def Test():
   return render_template('Test.html')
@app.route("/train", methods=['GET', 'POST'])
def train():
   if request.method == 'POST':
       import model as model
       return render_template('Tranning.html')
@app.route("/testimage", methods=['GET', 'POST'])
def testimage():
```

```
if request.method == 'POST':
    file = request.files['fileupload']
    file.save('static/Out/Test.jpg')
    img = cv2.imread('static/Out/Test.jpg')
    if img is None:
        print('no data')
    img1 = cv2.imread('static/Out/Test.jpg')
    print(img.shape)
    img = cv2.resize(img, ((int)(img.shape[1] / 5), (int)(img.shape[0] / 5)))
    original = img.copy()
    neworiginal = img.copy()
    cv2.imshow('original', img1)
    gray = cv2.cvtColor(img1, cv2.COLOR_BGR2GRAY)
    img1S = cv2.resize(img1, (960, 540))
    cv2.imshow('Original image', img1S)
    grayS = cv2.resize(gray, (960, 540))
    cv2.imshow('Gray image', grayS)
    gry = 'static/Out/gry.jpg'
    cv2.imwrite(gry, grayS)
    from PIL import  ImageOps,Image
    im = Image.open(file)
    im_invert = ImageOps.invert(im)
    inv = 'static/Out/inv.jpg'
    im_invert.save(inv, quality=95)
    dst = cv2.fastNlMeansDenoisingColored(img1, None, 10, 10, 7, 21)
    cv2.imshow("Nosie Removal", dst)
    noi = 'static/Out/noi.jpg'
    cv2.imwrite(noi, dst)
```

```
import warnings
warnings.filterwarnings('ignore')
import tensorflow as tf
classifierLoad = tf.keras.models.load_model('model.h5')
import numpy as np
from keras.preprocessing import image
test_image = image.load_img('static/Out/Test.jpg', target_size=(200, 200))
img1 = cv2.imread('static/Out/Test.jpg')
# test_image = image.img_to_array(test_image)
test_image = np.expand_dims(test_image, axis=0)
result = classifierLoad.predict(test_image)
out = ''
fer = ''
if result[0][0] == 1:
    out = "Apple___Black_rot"
    fer = 'Griffin  Fertilizer  reducing the fungus'
elif result[0][1] == 1:
    out = "Apple___healthy"
elif result[0][2] == 1:
    out = "Corn_(maize)___healthy"
elif result[0][3] == 1:
    out = "Corn_(maize)___Northern_Leaf_Blight"
    fer = 'Griffin  Fertilizer  reducing the fungus'
elif result[0][4] == 1:
    out = "Peach___Bacterial_spot"
    fer = 'Compounds available for use on peach and nectarine for bacterial spot include copper, oxytetracycline (Mycoshield and generic equivalents), and syllit+captan; however, repeated applications are typically necessary for even
```

```
minimal disease control.'
    elif result[0][5] == 1:
      out = "Peach___healthy"
    if result[0][6] == 1:
      out = "Pepper_bell___Bacterial_spot"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][7] == 1:
      out = "Pepper_bell___healthy"
    elif result[0][8] == 1:
      out = "Potato___Early_blight"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][9] == 1:
      out = "Potato___healthy"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][10] == 1:
      out = "Potato___Late_blight"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][11] == 1:
      out = "Tomato___Bacterial_spot"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][12] == 1:
      out = "Tomato___Late_blight"
      fer = 'Spraying fungicides is the most effective way to prevent late bligh'
    elif result[0][13] == 1:
      out = "Tomato___Leaf_Mold"
      fer = 'Griffin  Fertilizer  reducing the fungus'
    elif result[0][14] == 1:
      out = "Tomato___Septoria_leaf_spot"
```

```
            fer = 'Griffin  Fertilizer  reducing the fungus'
        org = 'static/Out/Test.jpg'
        gry ='static/Out/gry.jpg'
        inv = 'static/Out/inv.jpg'
        noi = 'static/Out/noi.jpg
        return
render_template('Test.html',fer=fer,result=out,org=org,gry=gry,inv=inv,noi=no)
if _name_ == '_main_':
    app.run(debug=True, use_reloader=True)
```

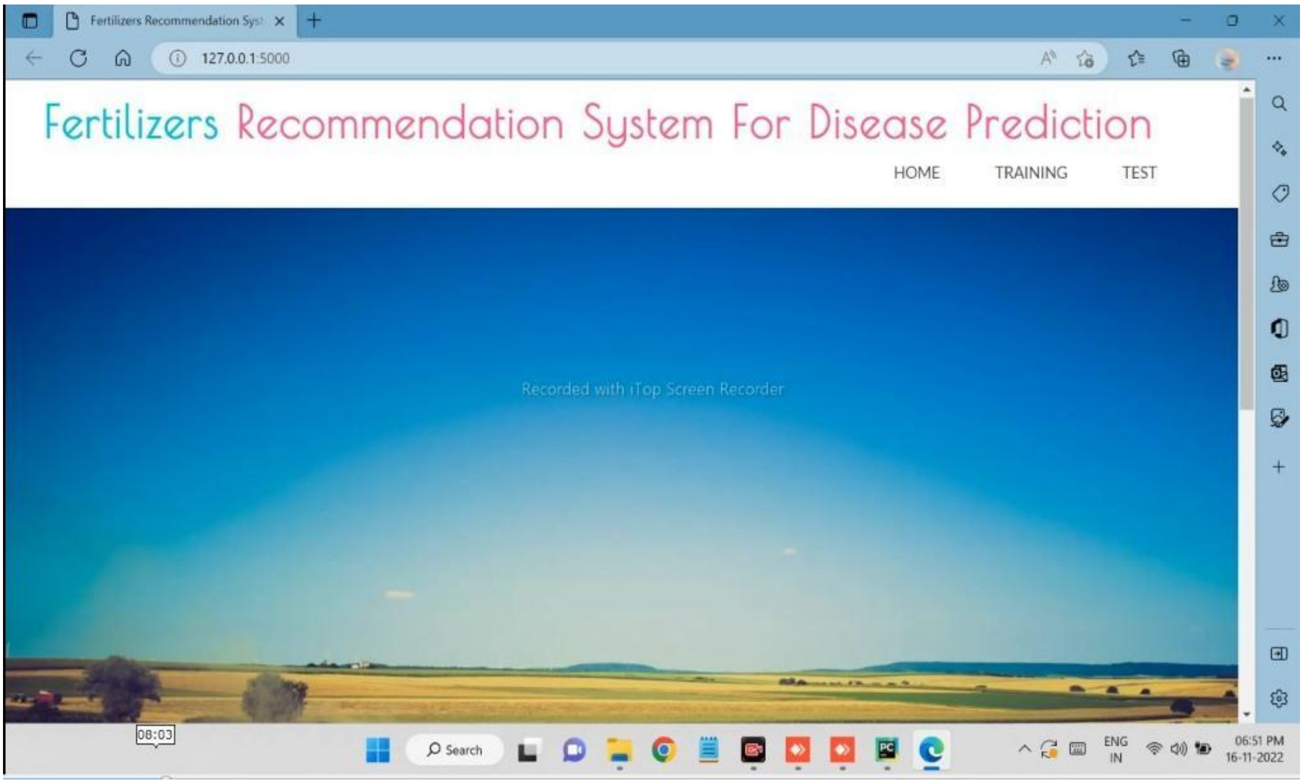
Running on : http://127.0.0.1:5000

7.2 Feature 2

```
# Importing the Keras libraries and packages
from keras.models import Sequential
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense
from keras.models import model_from_json
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
batch_size = 32
from tensorflow.keras.preprocessing.image import ImageDataGenerator
# All images will be rescaled by 1./255
```

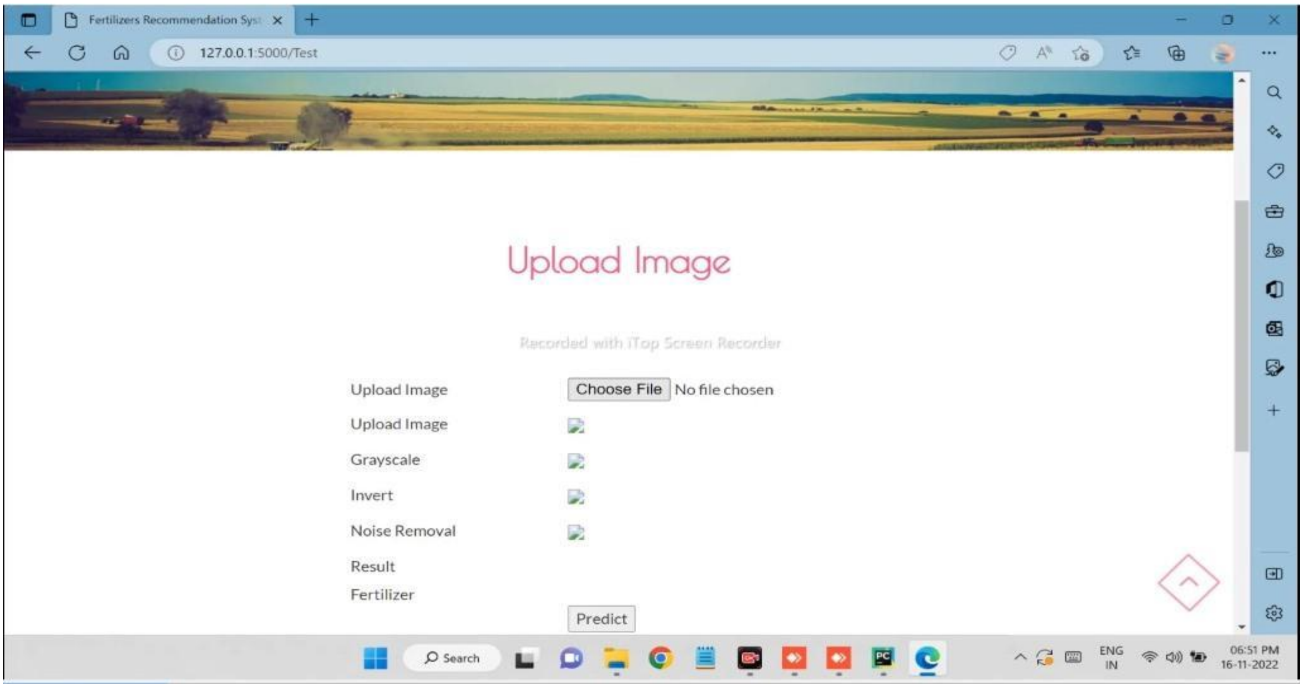
```
train_datagen = ImageDataGenerator(rescale=1/255)
# Flow training images in batches of 128 using train_datagen generator
train_generator = train_datagen.flow_from_directory(
        'DataSet',  # This is the source directory for training images
        target_size=(200, 200),  # All images will be resized to 200 x 200
        batch_size=batch_size,
        # Specify the classes explicitly
        classes =
['Apple__Black_rot','Apple_healthy','Corn(maize)__healthy','Corn(maize)
___Northern_Leaf_Blight',
'Peach__Bacterial_spot','Peach_healthy','Pepper_bell_Bacterial_spot','Pepp
er_bell_healthy','Potato__Early_blight',
'Potato__healthy','Potato_Late_blight','Tomato_Bacterial_spot','Tomato__
Late_blight',
'Tomato__Leaf_Mold','Tomato__Septoria_leaf_spot'],
        # Since we use categorical_crossentropy loss, we need categorical
labels
        class_mode='categorical')

import tensorflow as tf
model = tf.keras.models.Sequential([
    # Note the input shape is the desired size of the image 200x 200 with 3
bytes color
    # The first convolution
    tf.keras.layers.Conv2D(16, (3,3), activation='relu', input_shape=(200,
200, 3)),
    tf.keras.layers.MaxPooling2D(2, 2),
    # The second convolution
    tf.keras.layers.Conv2D(32, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    # The third convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    # The fourth convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    # The fifth convolution
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    # Flatten the results to feed into a dense layer
    tf.keras.layers.Flatten(),
    # 128 neuron in the fully-connected layer
    tf.keras.layers.Dense(128, activation='relu'),
    # 5 output neurons for 5 classes with the softmax activation
    tf.keras.layers.Dense(15, activation='softmax')
])
model.summary()

from tensorflow.keras.optimizers import RMSprop
early = tf.keras.callbacks.EarlyStopping(monitor='val_loss',patience=5)
model.compile(loss='categorical_crossentropy',
              optimizer=RMSprop(lr=0.001),
            metrics=['accuracy'])
total_sample=train_generator.n
n_epochs = 10

history = model.fit_generator(
        train_generator,
        steps_per_epoch=int(total_sample/batch_size),
        epochs=n_epochs,
        verbose=1)
model.save('model.h5')
acc = history.history['accuracy']
loss = history.history['loss']
epochs = range(1, len(acc) + 1)
# Train and validation accuracy
plt.plot(epochs, acc, 'b', label=' accurarcy')
plt.title('  accurarcy')
plt.legend()
plt.figure()
# Train and validation loss
plt.plot(epochs, loss, 'b', label=' loss')
plt.title('  loss')
plt.legend()
plt.show()
```

Output



Fertilizers Recommendation System For Disease Prediction

Fertilizers Recommendation Syst
127.0.0.1:5000
HOME
TRAINING
TEST
Recorded with iTop Screen Recorder
08:03
Search
ENG
IN
06:51 PM
16-11-2022



Upload Image

Upload Image — Choose File No file chosen

Upload Image

Grayscale

Invert

Noise Removal

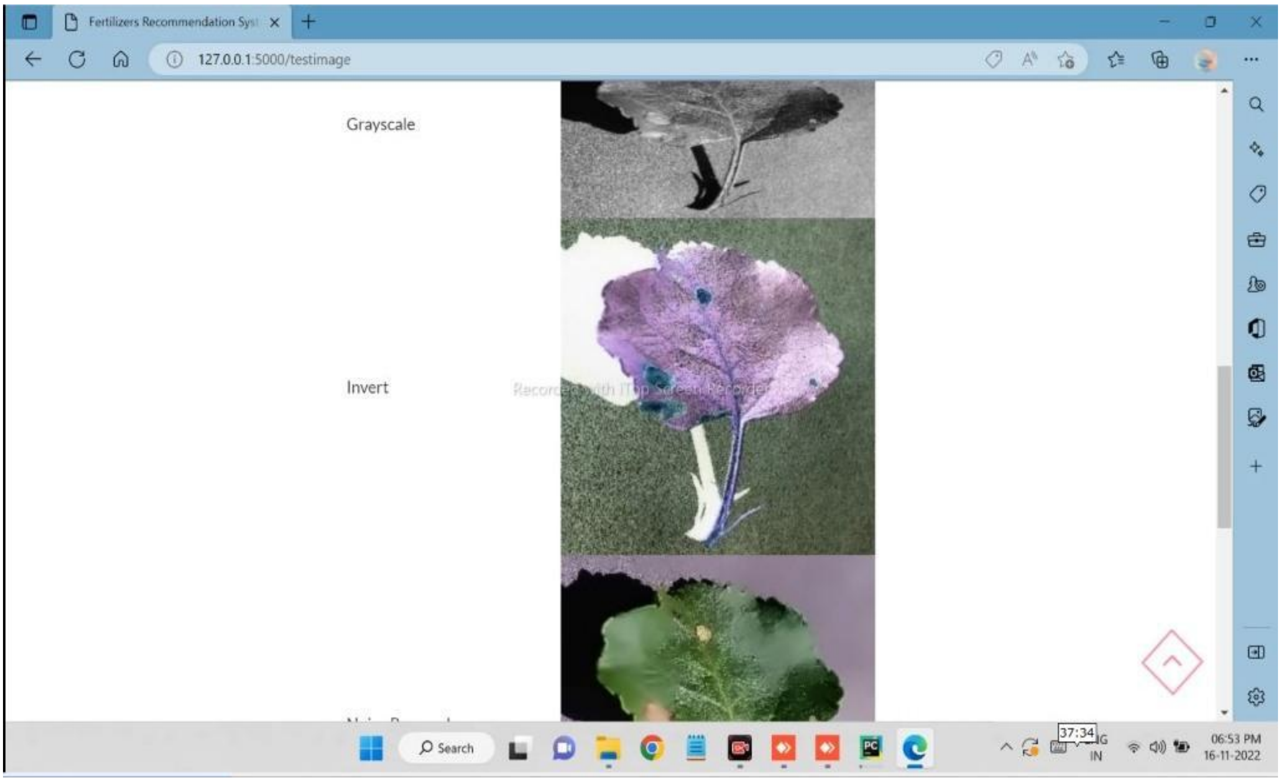
Result

Fertilizer

Predict

Fertilizers Recommendation Syst
127.0.0.1:5000/Test
Recorded with iTop Screen Recorder
Search
ENG
IN
06:51 PM
16-11-2022

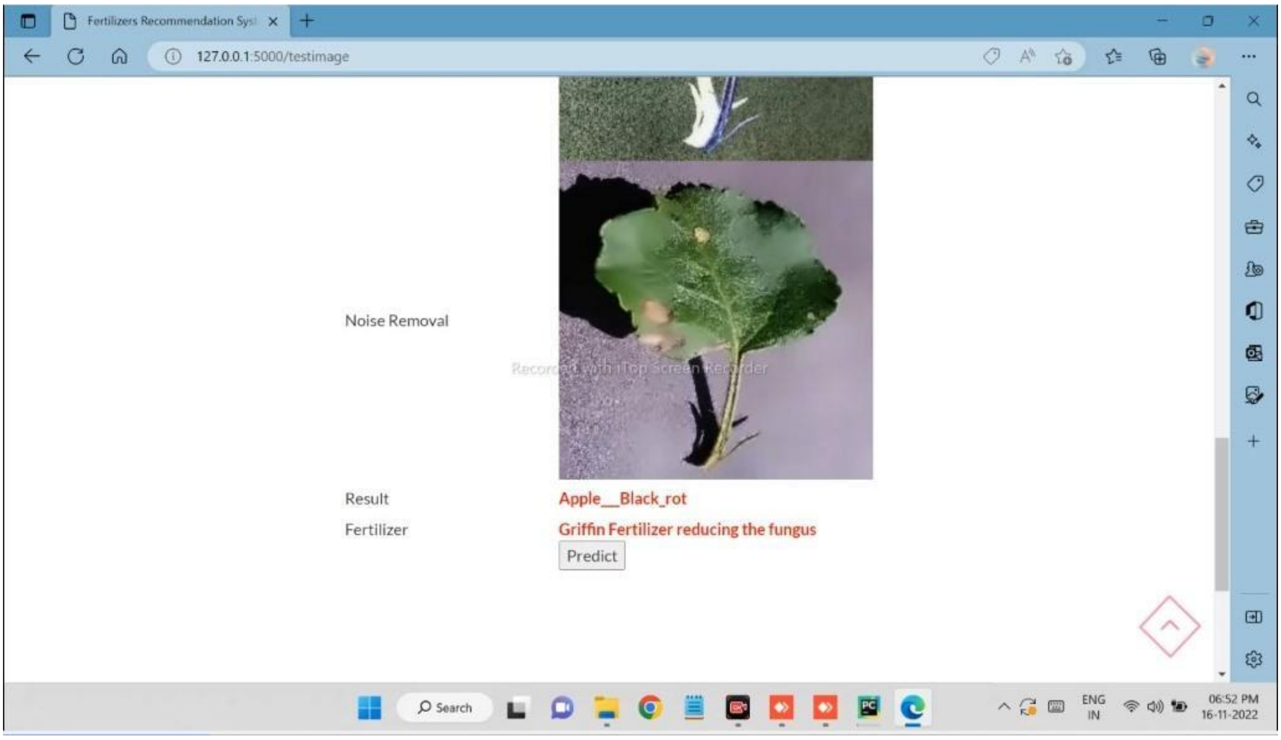
37


Fertilizers Recommendation Syst
127.0.0.1:5000/testimage
Recorded with iTop Screen Recorder
Search
37:34
ENG
IN
06:53 PM
16-11-2022

Grayscale

Invert

38


Fertilizers Recommendation Syst
127.0.0.1:5000/testimage
Recorded with iTop Screen Recorder
Search
ENG
IN
06:52 PM
16-11-2022

Noise Removal

Result Apple__Black_rot

Fertilizer Griffin Fertilizer reducing the fungus

Predict

CHAPTER 8

TESTING

8.1 Test Cases

A test case is a series of operations carried out on a system to see if it complies with software requirements and operates properly. Preconditions, case name, input requirements, and anticipated outcome are all included in test case design. A test case is an activity at the first level that comes from test scenarios.

Input	Actual output	Expected output

Tomato_Septoria_leaf_spot.jpg	Leaf: Tomato-->Disease: Septoria leaf spot-->Suggestion: Most fungicides registered for use on tomatoes would effectively control Septoria leaf spot. These include maneb, mancozeb, chlorothalonil, and benomyl. Captan is not effective and zineb may be difficult to purchase	Leaf: Tomato-->Disease: Septoria leaf spot-->Suggestion: Most fungicides registered for use on tomatoes would effectively control Septoria leaf spot. These include maneb, mancozeb, chlorothalonil, and benomyl. Captan is not effective and zineb may be difficult to purchase

Pepper_bell___Bacterial_spot.jpg	Leaf:Pepper bell-->Disease:Bacterial spot-->Suggestions:Washing seeds for 40 minutes in diluted Clorox (two parts Clorox plus eight parts water) is effective in reducing the bacterial population on a seed surface	Leaf:Pepper bell-->Disease:Bacterial spot-->Suggestions:Washing seeds for 40 minutes in diluted Clorox (two parts Clorox plus eight parts water) is effective in reducing the bacterial population on a seed surface
Potato___healthy	Leaf: Potato-->Condition :healthy	Leaf: Potato-->Condition: healthy
Potato___Late_blight.jpg	Leaf: Potato leaf-->Disease: Late blight-->Suggestions: Albina is our highly efficient calcium fertilizer which improves shelf life & firmness of potato tubers and reduces susceptibility to disease & physiological disorders'	Leaf: Potato leaf-->Disease: Late blight-->Suggestions: Albina is our highly efficient calcium fertilizer which improves shelf life & firmness of potato tubers and reduces susceptibility to disease & physiological disorders'

8.2 User acceptance testing

Beta testing or end-user testing, commonly referred to as user acceptance testing (UAT), is the process of having users test software to evaluate if they will accept it or not. Once the functional, system, and regression testing is finished, this is the last testing carried out.

This testing's primary goal is to confirm that the software meets the necessary standards for the business. End users that are familiar with the business requirements perform this validation. Different types of acceptance testing include UAT, alpha testing, and beta testing.

The user acceptance test is the last testing done before the product goes live, thus it stands to reason that this is the last opportunity for the customer to evaluate the software and determine whether it is appropriate for the task at hand.

Need for user acceptance testing arises once software has undergone Unit, Integration and System testing because developers might have built software based on requirements document by their own understanding and further required changes during development may not be effectively communicated to them, so for testing whether the final product is accepted by client/end-user, user acceptance testing is needed.

- Developers code software based on requirements document which is their “own” understanding of the requirements and may not actually be what the client needs from the software.
- Requirements changes during the course of the project may not be communicated effectively to the developers.

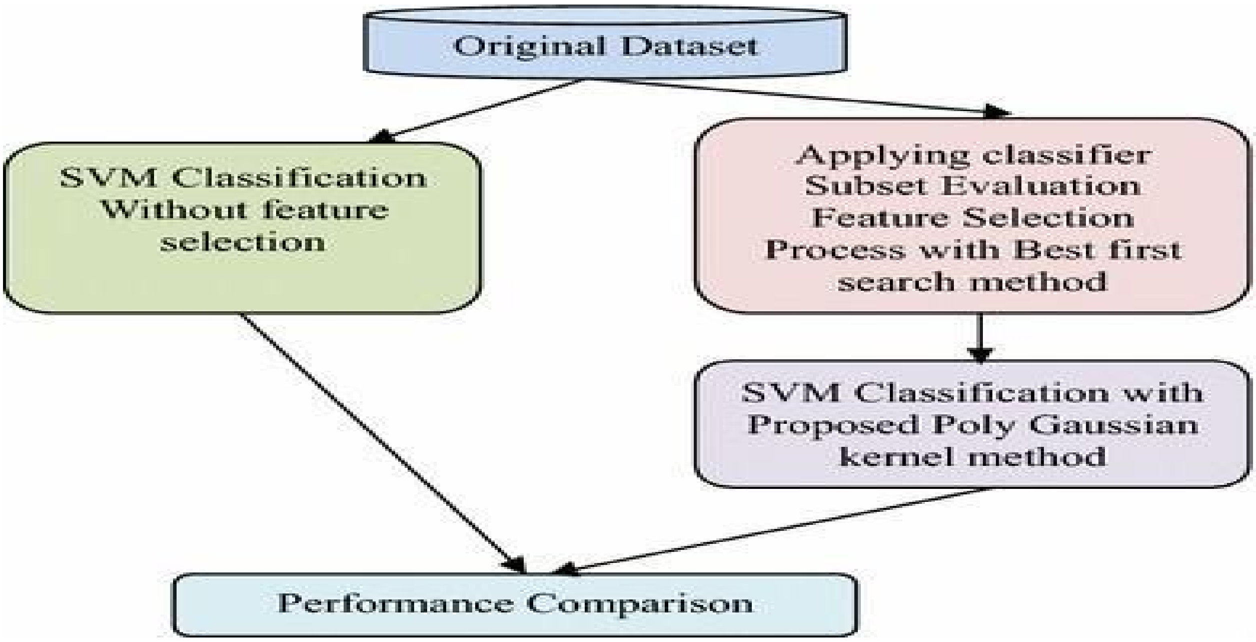
CHAPTER 9

RESULTS

9.1 Performance Metrics

Performance metrics are defined as numbers and information that are indicative of the activities, capacities, and general calibre of a company. Performance measurements can take many different forms, such as sales, profit, ROI, customer satisfaction, customer reviews, personal reviews, general quality, and reputation in the market. When evaluated through various industries, performance metrics might differ greatly.

Metrics of performance are essential to the success of an organisation. Because these metrics assist direct and assess an organization's success, it is crucial that businesses choose their primary performance measures and concentrate on these areas. Important success elements are only helpful if they are recognised and monitored.


Original Dataset
SVM Classification Without feature selection
Applying classifier Subset Evaluation Feature Selection Process with Best first search method
SVM Classification with Proposed Poly Gaussian kernel method
Performance Comparison

9.1 PERFORMANCE METRICS

CHAPTER 10

ADVANTAGES & DISADVANTAGE

Advantages

- Fertilizers are quick in providing plant nutrients and restoring soil fertility.
- They help to enhance the metabolism of plants.
- Through the recommendation system, the users can be able to get suggestions instantly.
- Fertilizers improve and increase the productivity of many crops.

Disadvantages

- Fertilizers get washed away by water easily and cause pollution.
- They harm the microbes present in soil.
- They reduce soil fertility.
- They are expensive. Recommendations are not perfect when the images are blurred and taken with a low intensity light.

CHAPTER 11

CONCLUSION

We have provided a mechanism to suggest fertiliser for the unhealthy plant leaf in this project. Different image processing techniques can forecast these various leaf signs and diseases. These many approaches make use of various core techniques like segmentation, feature extraction, and classification, among others. Most often, segmentation is used to distinguish between healthy and diseased tissues of leaves in order to forecast and diagnose leaf diseases. The suggested approach employs SVM to categorise tree leaves, pinpoint the disease, and provide fertiliser. The suggested approach is contrasted with the currently available CNN-based leaf disease prediction. When compared to the current CNN, the suggested SVM approach produces better results. SVM's accuracy is comparable to or even higher than CNN's. CNN also needs.

CHAPTER 12

FUTURE SCOPE

The proposed algorithm is being implemented in this new study using openly available datasets. Additionally, different segmentation methods might be used to increase accuracy. The suggested algorithm can be further improved to find the illness that affects different plant organs, including leaf stems, and to get a better recommendation for fertilisers.

The approach that is being offered in this project work can be expanded to include picture recognition. Python to exe software can be used to convert the complete model to application software. With the aid of the OpenCV Python package, real-time image categorization, picture recognition, and video processing are all made feasible. This project's work can be expanded to include security applications including face, iris, and figure print recognition.

CHAPTER 13

APPENDIX

Source code:

https://github.com/IBM-EPBL/IBM-Project-2729-1658481920