PROJECT REPORT

Fertilizers Recommendation for Disease Prediction

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INTRODUCTION :

- Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence, early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.

Project Overview

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

  plant protection techniques and suggest all the precautions that can be takenfor those diseases.

Purpose

- To Detect and recognize the plant diseases and to recommend fertilizer, it is necessary to identify the diseases and to recommend to get different and useful features needed for the purpose of analyzing later.

- To provide symptoms in identifying the disease at its earliest. Hence the authors proposed and implemented new fertilizers Recommendation System for Crop Disease Prediction.

LITREATURE SURVEY

Existing Problem

- Adequate mineral nutrition is central to crop production. However, it can also exert considerable Influence on disease development. Fertilizer application can increase or decrease development of diseases caused by different pathogens, and the mechanisms responsible are complex, including effects of nutrients on

  plant growth, plant resistance mechanisms and direct effects on the pathogen. The effects of mineral nutrition on plant disease and the mechanisms responsible for those effects have been dealt with

comprehensively elsewhere. In India, around 40% of land is kept and grown using reliable irrigation technologies, while the rest relies on the monsoon environment for water. Irrigation decreases reliance on the monsoon, increases food security, and boosts agricultural production.

- Most research articles use humidity, moisture, and temperature sensors near the plant's root, with an external device handling all of the data provided by the sensors and transmitting it directly to an Android application. It was created to measure the approximate values of temperature, humidity and moisture sensors
  that were programmed into a microcontroller to manage the amount of water.

References :

- Reyes Angie .K, Juan C. Caicedo, and Jorge E. Camargo, "Fine-tuning Deep Convolutional Networks for Plant Recognition", In CLEF (Working Notes), 2015.
- Hamrouni .L, Aiadi .O, Khaldi .B and Kherfi .M.L, "Plants Species Identification using Computer Vision Techniques", Revue des Bioressources 7, no. 1, 2018.
- Naresh, Y. G., and H. S. Nagendraswamy, "Classification of medicinal plants: an approach using modified LBP with symbolic representation", Neurocomputing 173, pp: 1789-1797, 2016.

Problem Statement Definition :

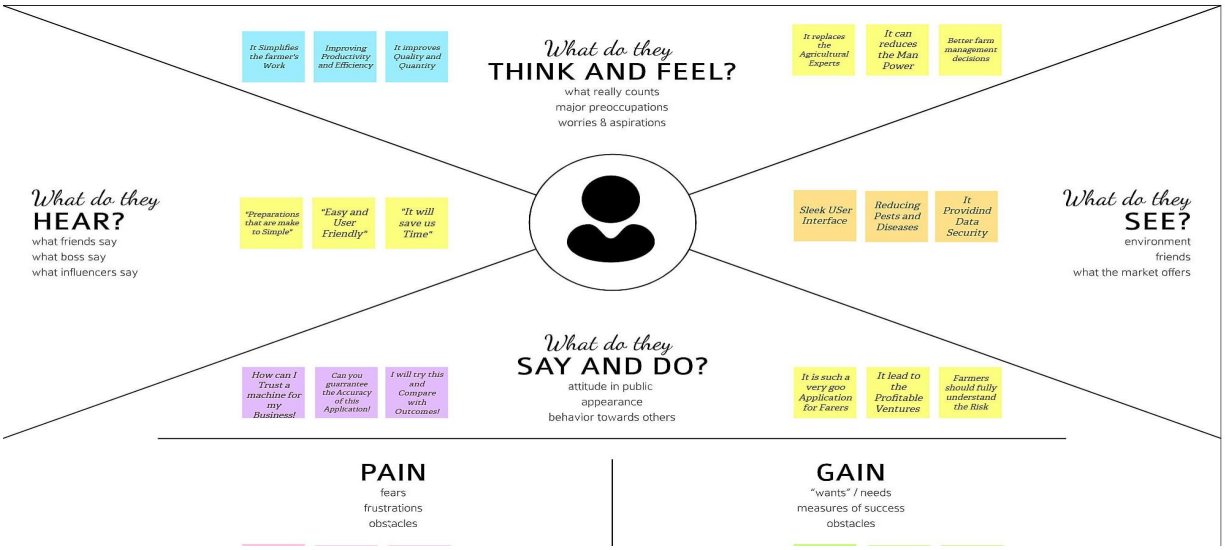
- The solution to the problem is Machine learning, which is one of the applications of Artificial Intelligence, is being used to implement the proposed system. Crop recommendation is going to recommend you the best crop you can grow in your land as per the soil nutrition value and along with as per the climate in that region. And recommending the best fertilizer for every particular crop is also a challenging task. And the other and most important issue is when a plant gets caught by heterogeneous diseases that effect on less amount of agriculture production and compromises with quality as well. To overcome all these issues this recommendation has been proposed .

- Nowadays a lot of research and work is being implemented in the

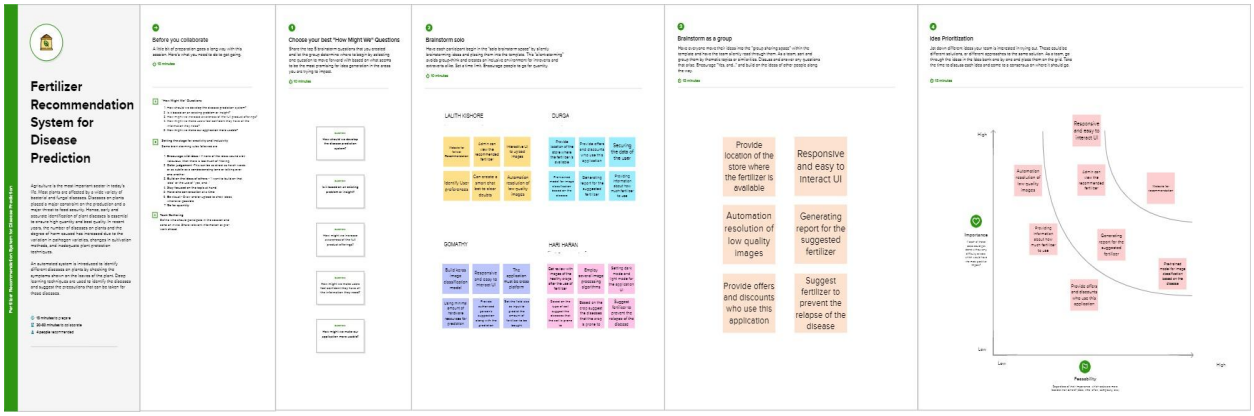
smart and modern agriculture domain. Crop recommendation is characterized by a soil database comprised of Nitrogen, Phosphorus, potassium. The ensembles technique is used to build a recommendation model that combines the prediction of multiple machine learning. Models to recommend the right crop based on soil value and the best fertilizer to use.

IDEATION & PROPOSED SOLUTION :

Empathy Map Canvas :



Ideation & Brainstorming :



Proposed Solution :

- The idea of the proposed solution uses Deep learning and Machine algorithm to classify leaves and identify the diseases and siggest the fertilizers. The deep learning process includes the MobileNetV2 and VGG19 training Models.

- Based on the leaf disease detected , the model recommendation for fertilizers for the prevention. The farmers and researchers are the end users get benefied by the system.

- More accurate in others. The system is more robust corporating more image data sets with wider variations. This system also estimates the probability of infected plant.
- Plant growth can be enhanced. Ensure plants are getting supplied with every nutrient they need also and multiple cross in grow in every yields for every season. It also helps people's nutritional needs.

Problem Solution Fit

- This Learn and Build phase has proven to be the most important, parallel phase that successful startups follow. It contains the very first activity that startups should follow if they have an idea: Find prospective customers to talk to. Usually, this idea is already translated to a software product, which should always be a Minimum Viable Product (MVP) a version of the product that requires the least

amount of development time with a minimum amount of effort.

- An MVP is based on requirements desired by potential customers, but to obtain these requirements, the startup should talk as early as possible with those customers. The startup then requires to prioritise the 'must haves', which are the minimum necessary requirements for the MVP. Once the MVP is ready for customer feedback, the second most important activity is performed by the startup foreveryone.

REQUIREMENT ANALYSIS :

Functional Requirements

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 Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Specific characteristics	It identifies the diseases especially rice bran diseases
FR-4	Functions	The proposed methods uses the SVM to classify tree leaves, identify the diseases and suggest the fertilizer.
FR-5	Fault tolerance	This study enables a possible prediction of crop yield from the historic data collected and offers a suggestion to farmers.
FR-6	Analyze	It helps us to classify the data based on the diseases, and data extracted from the classifier is used to predict soil and crop.

Non Functional Requirements

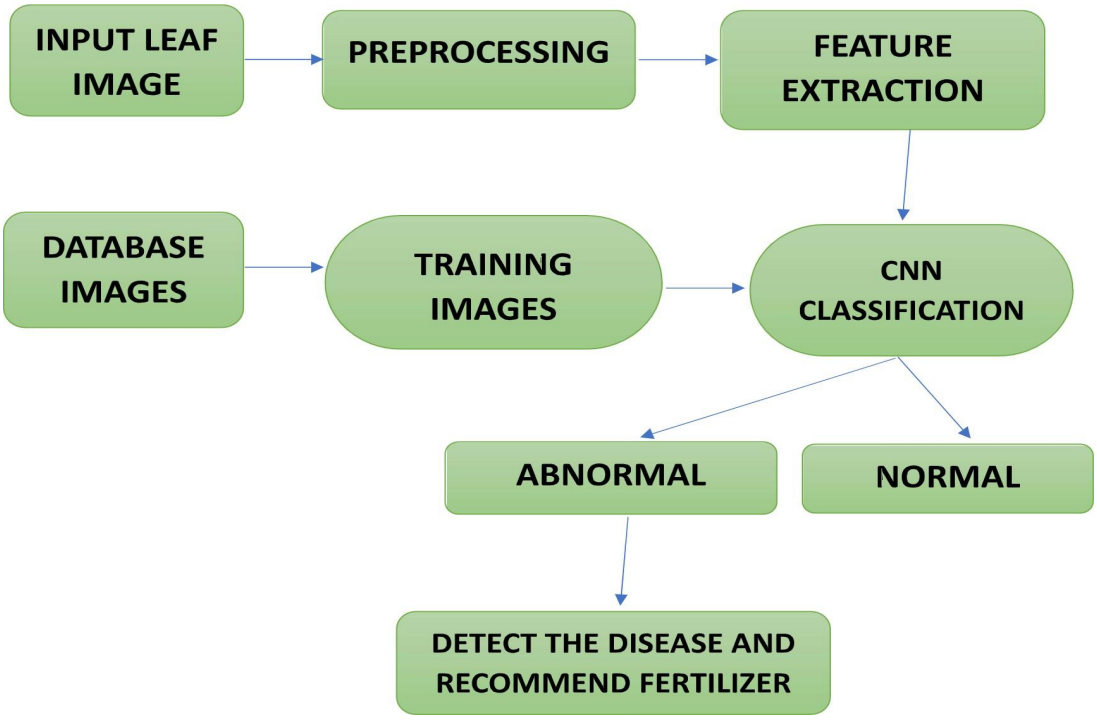
Non-functional Requirements:

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

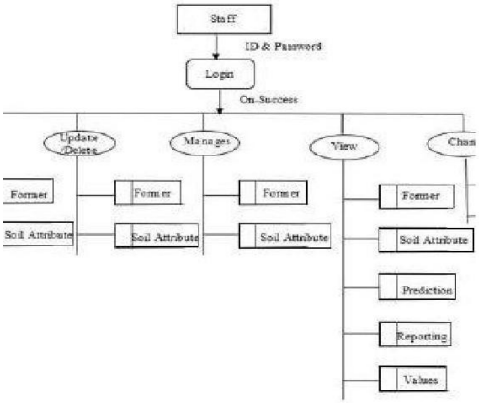
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Crop and fertilizer recommendation system help the farmer to identify the diseases.
NFR-2	**Security**	The proposed method combines two major aspects in farming , pest identification and insecticide recommendation.
NFR-3	**Reliability**	It is easy use so that health issues can be avoided.
NFR-4	**Performance**	Precision fertilizer and precision crops is mostly used. They used to predict the crop in artificial intelligence.
NFR-5	**Availability**	reduces the losses as ammonia , nitrate leaching, apply the right rate, apply accurately.
NFR-6	**Scalability**	If the soil is not replenised with nutrients through fertilizing ,crop yields will deteriorate over time.

PROJECT DESIGN :

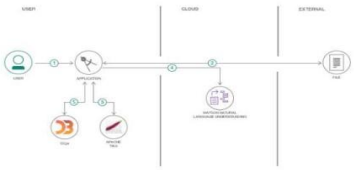
Solution & Technical Architecture



Data Flow Daigrams



Flow



1. User configures credentials for the Watson Natural Language Understanding service and starts the app.
2. User selects data file to process and load.
3. Apache Tika extracts text from the data file.
4. Extracted text is passed to Watson NLU for enrichment.
5. Enriched data is visualized in the UI using the D3.js library.

User Stories

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

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Dashboard	USN-6	As a user, can see the task obtained for their project	I can register and open the dashboard	High	Sprint-1
Customer (Web user)	Mobile Responsiveness	USN-7	A story that produces working code that has actual, demonstrable user value.	The conditions that a software product must meet to be accepted by a user, a customer, or other systems.	Low	Sprint-2
Customer Care Executive	Authentication	USN-8	As user, want to invite their friends and they do their work.	Applying the minimum amount of fertilizer necessary to maximize yield in the current year.	Medium	Sprint-1
Administrator	Transaction	USN-9	As a user, should transact their current payments.	User should accept the transaction	low	Sprint-2
	Handling	USN-10	As a user, should handle their project with correct manner	Team member should be ready to handle	Low	Sprint-2
	Business Rules	USN-11	As a user should know about the business rules.	I can handle the business rules.	Medium	Sprint-1
	Certification Requirement	USN-12	As a user, should need the certificate.	I can work for my project to get the certificate.	High	Sprint-1

PROJECT PLANNING & SCHEDULING :

Sprint Planning and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-1	Model Creation and Training (Fruits)		Create a model which can classify diseased fruit plants from given images. I also need to test the model and deploy it on IBM Cloud	8	High	Lalith Kishore Hari haran Durga Gomathy
	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images	2	High	Lalith Kishore Hari haran Durga Gomathy

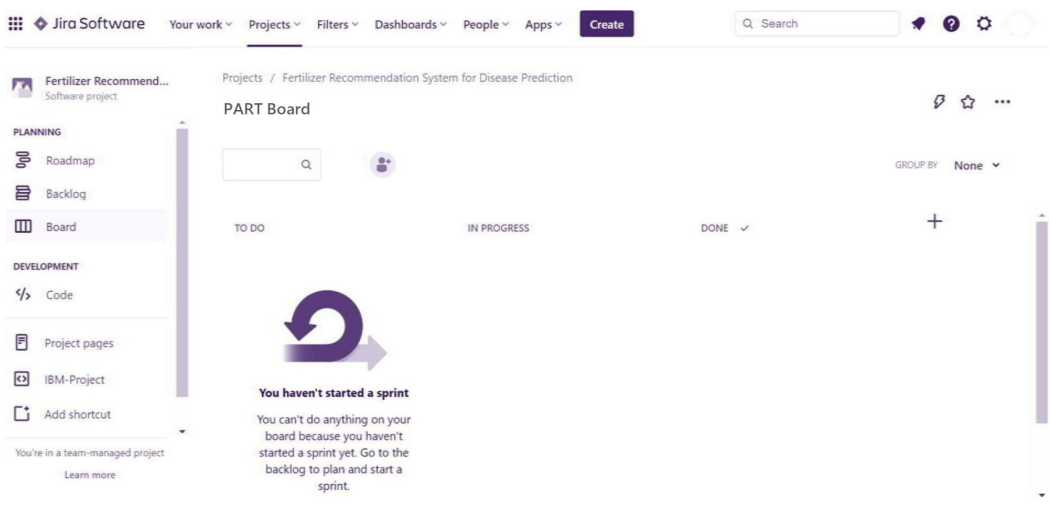
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (Total)	Priority	Team Members
Sprint-2	Model Creation and Training (Vegetables)		Create a model which can classify diseased vegetable plants from given images and train onIBM Cloud	6	High	Lalith Kishore Hari haran Durga Gomathy
	Registration	USN-1	As a user, I can register by entering my email, password, and confirming my password or via OAuth API	3	Medium	Lalith Kishore Hari haran Durga Gomathy
	Upload page	USN-2	As a user, I will be redirected to a page where Ican upload my pictures of crops	4	High	Lalith Kishore Hari haran Durga Gomathy
	Suggestion results	USN-3	As a user, I can view the results and then obtainthe suggestions provided by the ML model	4	High	Lalith Kishore Hari haran Durga Gomathy
	Base Flask App		A base Flask web app must be created as an interface for the ML model	2	High	Lalith Kishore Hari haran Durga Gomathy
Sprint-3	Login	USN-4	As a user/admin/shopkeeper, I can log into the application by entering email & password	2	High	Lalith Kishore Hari haran Durga Gomathy
	User Dashboard	USN-5	As a user, I can view the previous results and history	3	Medium	Lalith Kishore Hari haran Durga Gomathy
	Integration		Integrate Flask, CNN model with Cloudant DB	5	Medium	Lalith Kishore Hari haran Durga Gomathy

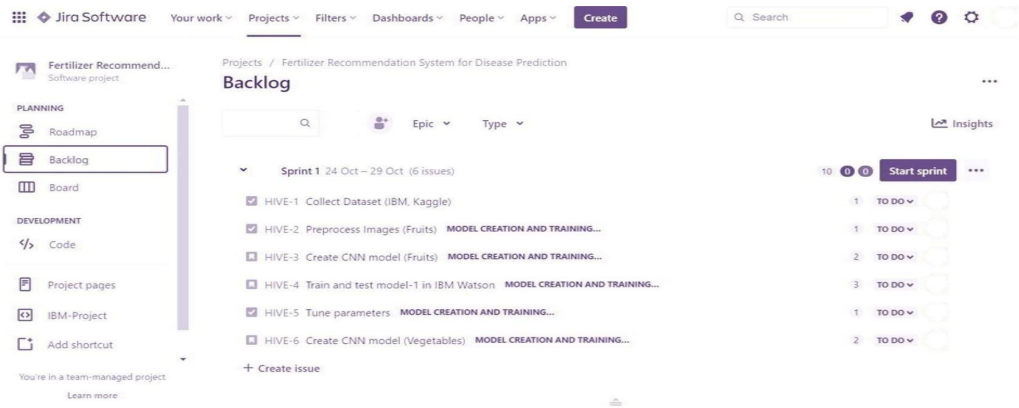
Sprint-4	Dashboard (Admin)	USN-6	As an admin, I can view other user details and uploads for other purposes	2	Medium	Lalith Kishore Hari haran Durga Gomathy
	Dashboard (Shopkeeper)	USN-7	As a shopkeeper, I can enter fertilizer productsand then update the details if any	2	Low	Lalith Kishore Hari haran Durga Gomathy
	Containerization		Create and deploy Helm charts using Docker Image made before	2	Low	Lalith Kishore Hari haran Durga Gomathy

Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	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

Reports from JIRA





CONCLUSION :

- The core strategy of this project is to predict the crop based on the soil nutrient content and the location where the crop is growing. This system will help he farmers to choose the right crop for their land and to give the suitable amount of fertilizer to produce the maximum yield. The Support Vector Machine algorithm helps to predict the crop the precisely based on the pre-processed crop data. This system will also help the new comers to choose the crop which will grow in their area and produce them a good profit. A decent amount of profit will attract more people towards the agriculture.

FUTURE SCOPE :

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

Github I'd : https://github.com/IBM-EPBL/IBM-Project-35181-

1660282254

Project Demo Link : https://youtu.be/ooVLcaN5Vrg