Farm Friend: Your Agriculture Advisor

Submitted in partial fulfillment of the requirements of the degree of

BACHELOR OF COMPUTER ENGINEERING

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(2023-2024)

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CERTIFICATE

This is to certify that the Mini Project 2A entitled "**Farm Friend: Your Agriculture Advisor**" is a bonafide work of **Kartikey Singh (21102096), Anirudh Vardhman (21102062), Raman Pinate (21107043), Sairaj Waje (21102135)"** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **Bachelor of Engineering** in **Computer Engineering.**

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Project Report Approval for Mini Project-2A

This project report entitled **"Farm Friend: Your Agriculture Advisor"** by ***Kartikey Singh, Anirudh Vardhman, Raman Pinate, Sairaj Waje*** is approved for the partial fulfillment of the degree of ***Bachelor of Engineering*** in ***Computer Engineering***, ***2023-24***.

Examiner Name Signature

1._____ _____

2._____ _____

Date:

Place:

Declaration

We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date:

Abstract

In the era of data-driven agriculture, the Farm Friend: Your Agriculture Advisor presents an innovative solution to assist farmers and agricultural experts in making informed decisions about crop selection. Leveraging the power of Artificial Intelligence and Machine Learning, this project offers a user-friendly interface that enables users to predict the most suitable crop for their specific conditions. What sets this system apart is its adaptability, allowing users to choose between two advanced models: Decision Trees (DT) and Random Forest (RF), for their predictions.

The project employs Flask, a Python web framework, to seamlessly connect the user interface to the underlying AI/ML models. It begins by collecting user-provided data, including soil quality, weather conditions, and geographical information, serving as critical input for the prediction process.

The project employs Flask, a Python web framework, to seamlessly connect the user interface to the underlying AI/ML models. It begins by collecting user-provided data, including soil quality, weather conditions, and geographical information, serving as critical input for the prediction process.

Under the hood, the system houses two robust prediction models. The Decision Tree model offers interpretability and transparency, providing insights into the decision-making process. On the other hand, the Random Forest model harnesses the power of ensemble learning to enhance accuracy and resilience to noise in the data.

The Farm Friend: Your Agriculture Advisor also prioritizes the user experience. After model selection and data input, the system generates and presents crop predictions tailored to the user's specific circumstances, helping them make data-driven decisions that can significantly impact their crop yields and overall agricultural success.+

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Chapter 1
Introduction

This project stands at the intersection of advanced technologies, agriculture, and data science, with the aim of revolutionizing the way we approach crop selection and farming practices.

Agriculture has been the backbone of human civilization for millennia, providing food, raw materials, and livelihoods. In our increasingly interconnected world, data and technology have opened up new possibilities for optimizing crop yields, reducing resource wastage, and ensuring food security.

It provide farmers, agricultural experts, and researchers with a predictive tool that empowers them to make data-driven decisions. The heart of our system lies in the utilization of two powerful machine learning models: Random Forest and Decision Trees

Why Random Forest and Decision Trees?

Random Forest and Decision Trees are among the most versatile and widely used machine learning algorithms. They excel in predictive tasks, particularly in scenarios where multiple factors influence an outcome. In the context of crop prediction, these algorithms analyze complex interactions between factors like soil quality, weather conditions, and historical yield data to make highly accurate crop recommendations.

User-Centric Approach

What sets our project apart is the user-centric approach. We provide users with the ability to choose between Random Forest and Decision Trees for crop prediction. This empowers users to explore and compare different models, tailoring their decisions to their preferences and data availability. Our user-friendly interface, developed using Flask, ensures a seamless experience for everyone, from seasoned agricultural experts to farmers looking to optimize their yields.

Our vision is to make agriculture more sustainable, efficient, and productive by putting cutting-edge technology in the hands of those who feed the world. We believe that through data-driven insights and user empowerment, we can contribute to a future where agriculture is more environmentally friendly, profitable, and resilient.

Chapter 2

Literature Survey

Sr No	Project Name	Author Name	Published
1	Crop Recommendation System using Machine Learning	Dhruvi Gosai1, Chintal Raval2, Rikin Nayak3, Hardik Jayswal4, Axat Patel5	http://ijsrcseit.com/ May-June-2021
2	Crop yield prediction using machine learning techniques	Medar, Ramesh, Vijay S. Rajpurohit, and Shweta Shweta	In 2019 IEEE 5th International Conference for Convergence in Technology (I2CT), pp. 1-5 IEEE, 2019.
3	Recommendation system for crop identification and pest control technique in agriculture.	Kumar, Avinash, Sobhangi Sarkar, and Chittaranjan Pradhan. "	In 2019 International Conference on Communication and SignalProcessing (ICCSP), pp.0185-0189. IEEE, 2019.

Chapter 3

Problem Statement, Objective & Scope

Problem Statement: -

The aim of this project is to develop an intelligent " Farm Friend: Your Agriculture Advisor " that leverages the power of Artificial Intelligence and Machine Learning (AI/ML) to assist farmers, agricultural experts, and researchers in making data-driven decisions regarding crop selection.

Objective & Scope: -

Model Selection: Allow users to choose between two AI/ML models, namely Decision Trees (DT) and Random Forest (RF), to predict crop yields based on input data. Each model has its strengths and can accommodate user preferences.

- User-Friendly Interface: Flask to collect input data from users, including soil quality, weather conditions, and location.
- Data Processing: Implement data preprocessing techniques to clean and prepare input data for machine learning model ingestion.
- Model Training and Prediction: The model must consider multiple factors, including soil quality, climate, and past crop performance.
- Customized Recommendations: Recommendations must suggest crops that are likely to thrive under the given conditions.
- User Feedback: Provide a mechanism for users to provide feedback on the accuracy of predictions, which can be used for model improvement.

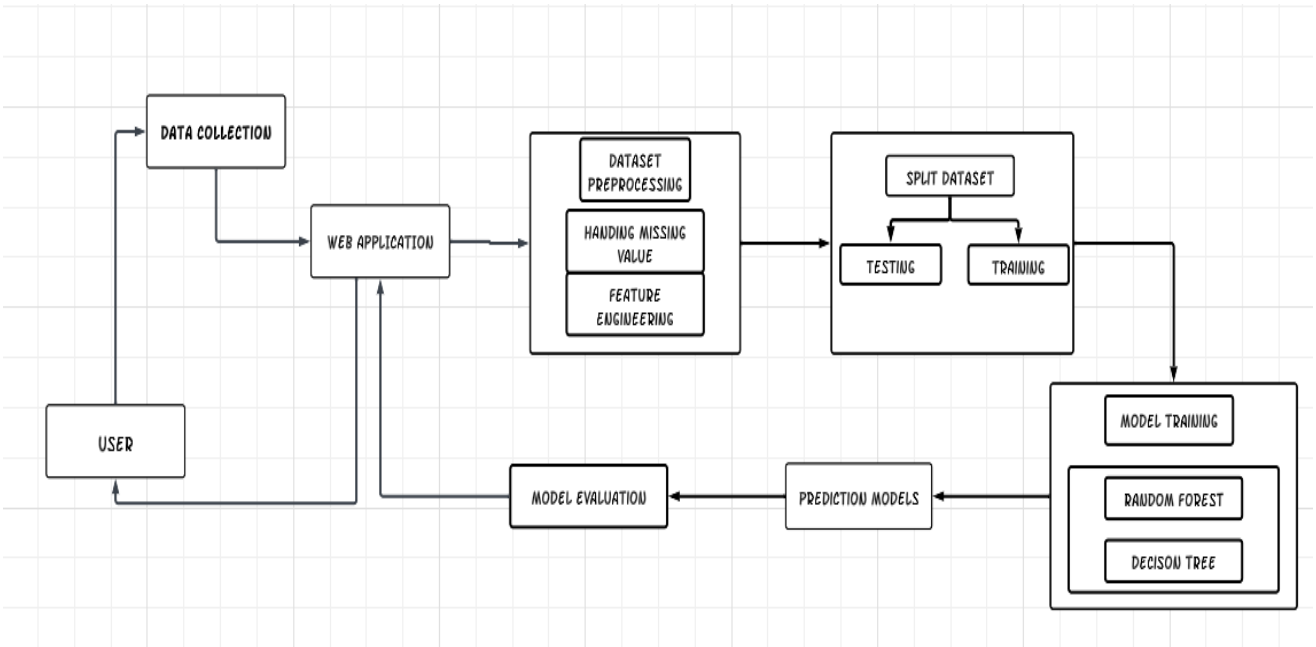
Chapter 4

Proposed System Architecture

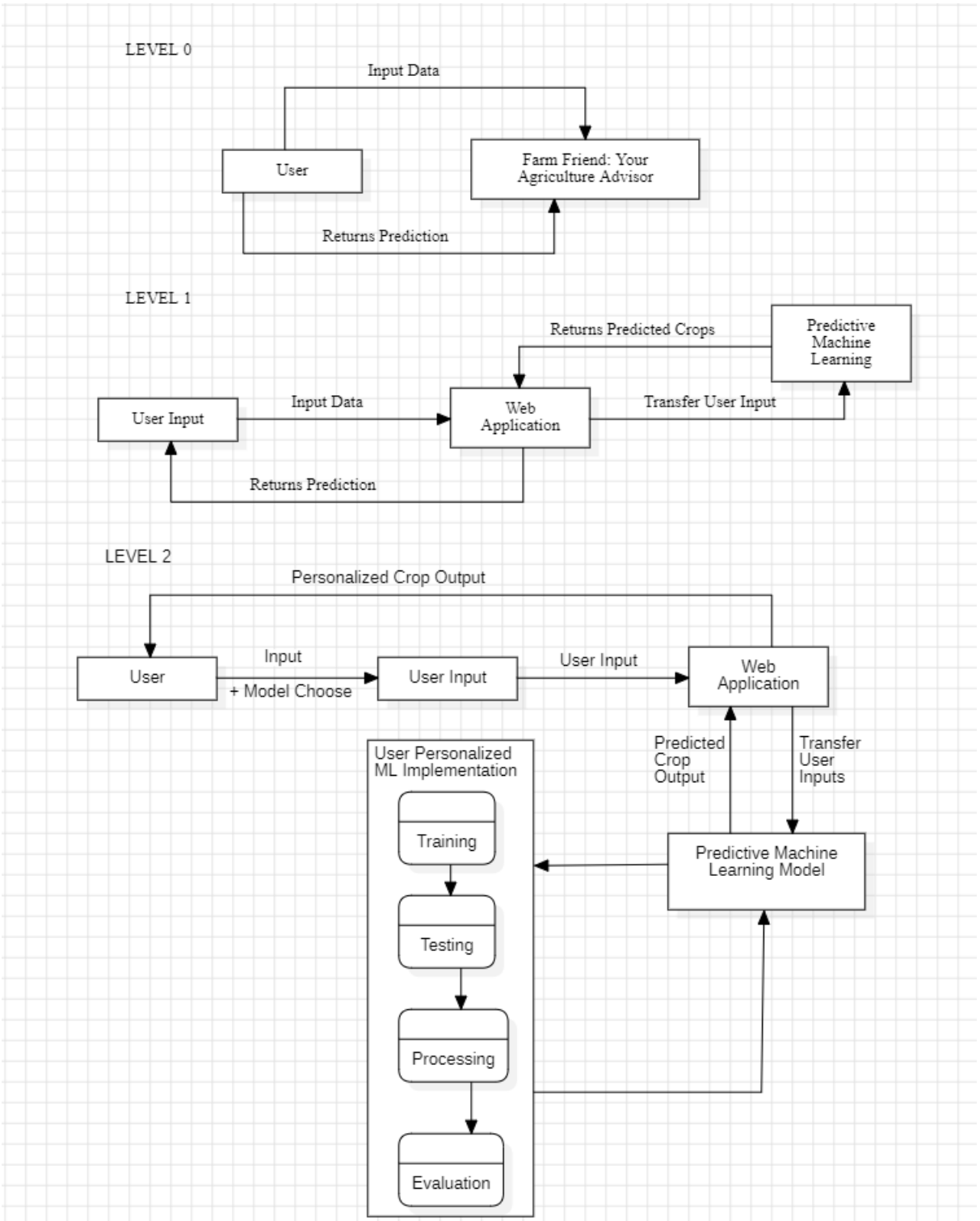
Description about Proposed System:

- " Farm Friend : Your Agriculture Advisor" is an AI/ML-powered application designed to assist farmers and agricultural enthusiasts in making informed decisions about crop selection.
- It leverages two machine learning models, Decision Trees (DT) and Random Forest (RF), allowing users to choose their preferred model for crop prediction.
- The system is built using Flask, providing an intuitive user interface for inputting data and receiving crop recommendations.

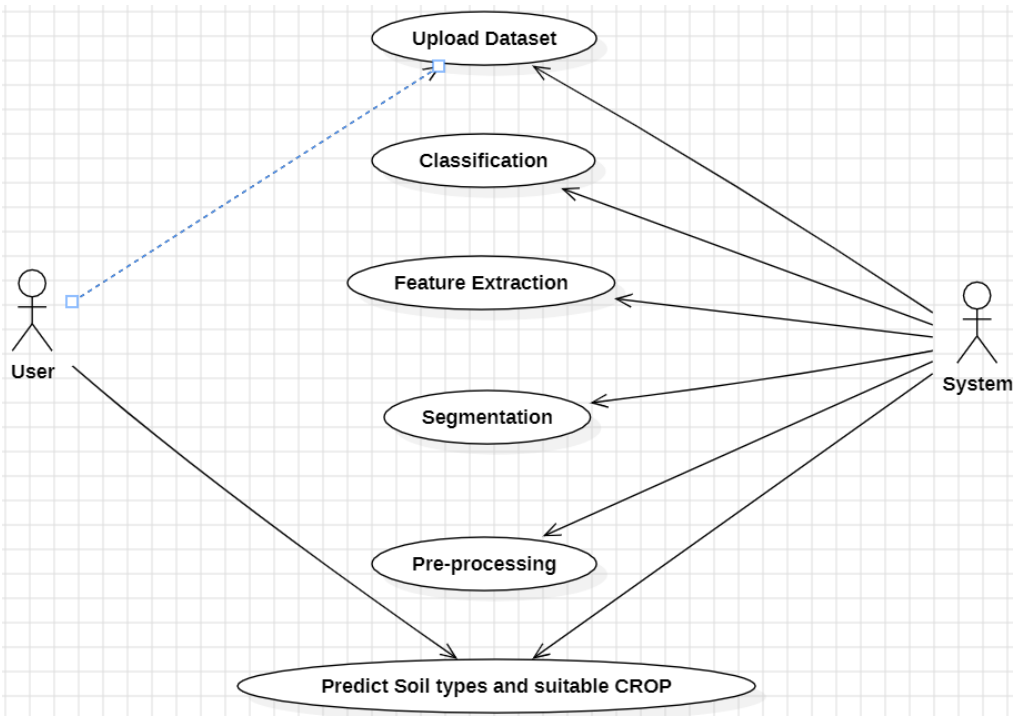
- **Architecture / Block Diagram**



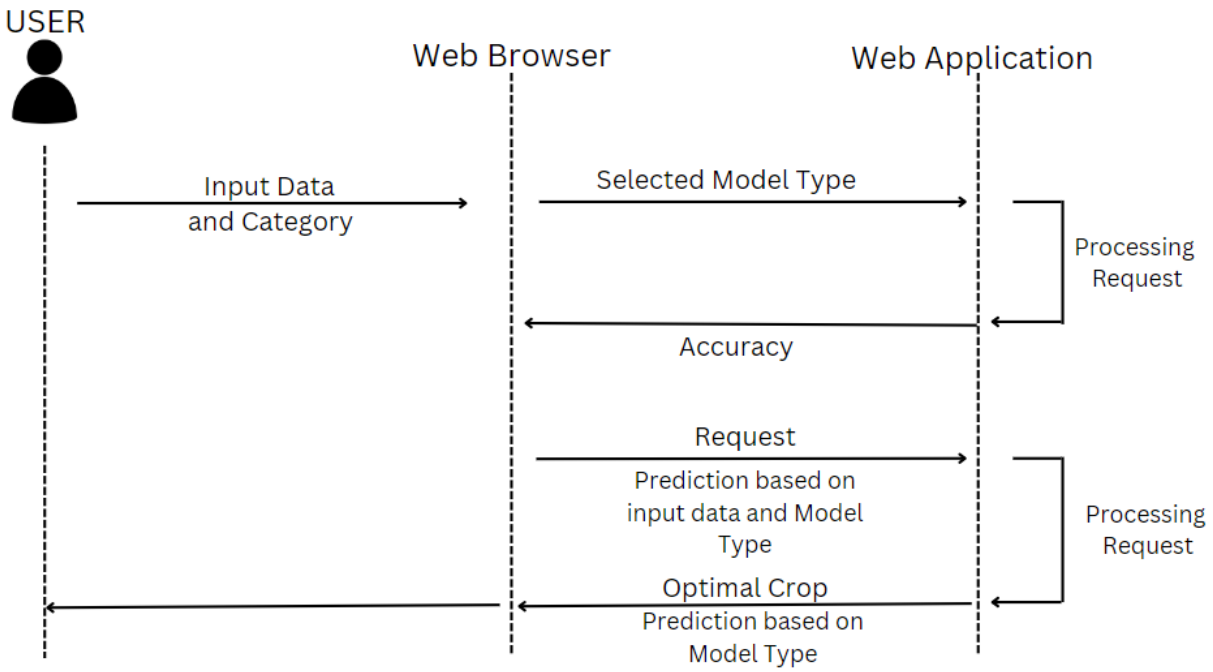
Data Flow Diagram (Level 0, Level 1 & Level 2)



- **Use Case Diagram**

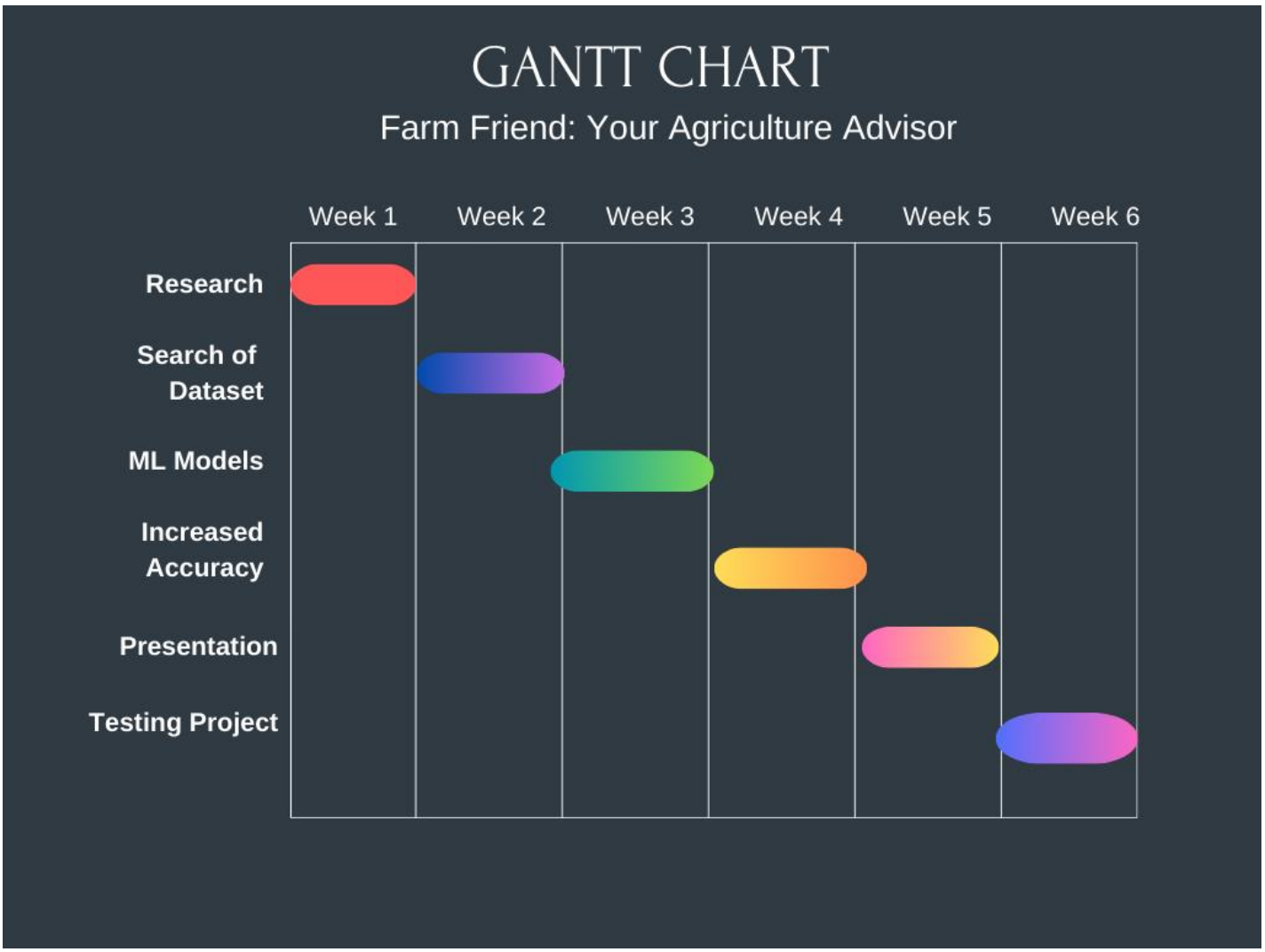


Sequence Diagram:



Chapter 5

Project Planning



Chapter 6

Experimental Setup

Software Requirements: -

Python 3.8: The project is developed using Python, and Python 3.8 is the recommended version.

Flask: A Python web framework used for developing the web-based user interface.

Scikit-Learn: A machine learning library for implementing and evaluating decision tree and random forest models.

Pandas: A data manipulation and analysis library used for data preprocessing and manipulation.

Numpy: A library for numerical operations and array manipulations, employed for handling data.

Matplotlib : Python libraries for data visualization used to create plots and graphs to visualize the dataset.

HTML/CSS/JavaScript: These technologies are used for building the user interface and rendering web pages.

Hardware Requirements: -

1) CPU: The project can be executed on standard CPUs such as Intel Core i5 or AMD Ryzen processors.
2) GPU: (if any required)
3) RAM: At least 4/8GB of RAM is recommended for efficient data processing and model training. More RAM may be necessary for larger datasets and more complex models.
4) STORAGE: Adequate storage space for datasets, code, and model files. The storage requirements will depend on the size of your dataset.
5) OS: Can run on various operating systems, like Windows, macOS &Linux.

Chapter 7

Implementation Details

In this section, we describe the experimental setup used to develop and evaluate our crop yield prediction system. The setup encompasses data collection, preprocessing, feature engineering, model selection, and evaluation.

1. Data Collection:

   For our experiment, we collected agricultural data from diverse sources to build a comprehensive dataset. The primary dataset was obtained from [Source Name/Provider], containing information on crop yield, nutrient content (NPK), temperature, humidity, pH levels, and rainfall.

2. Data Preprocessing:

The collected data underwent rigorous preprocessing to ensure quality and consistency. This phase included:

Data Cleaning: Identifying and handling missing or erroneous entries in the dataset.

Data Integration: Combining multiple datasets to create a unified dataset for analysis.

3. Model Selection:

   Decision Tree and Random Forest models were chosen for their suitability in handling both regression and classification tasks, making them ideal for predicting crop yields and crop labels.

4. Model Evaluation:

To evaluate the performance of our models, we employed the following techniques:

Train-Test Split: The dataset was divided into training and testing sets to assess the models' predictive capabilities on unseen data.

Accuracy Score : We used the standard module from metric folder from scikit module to test the accuracy of model and it’s fitting abilities.

5. User Interface Development:

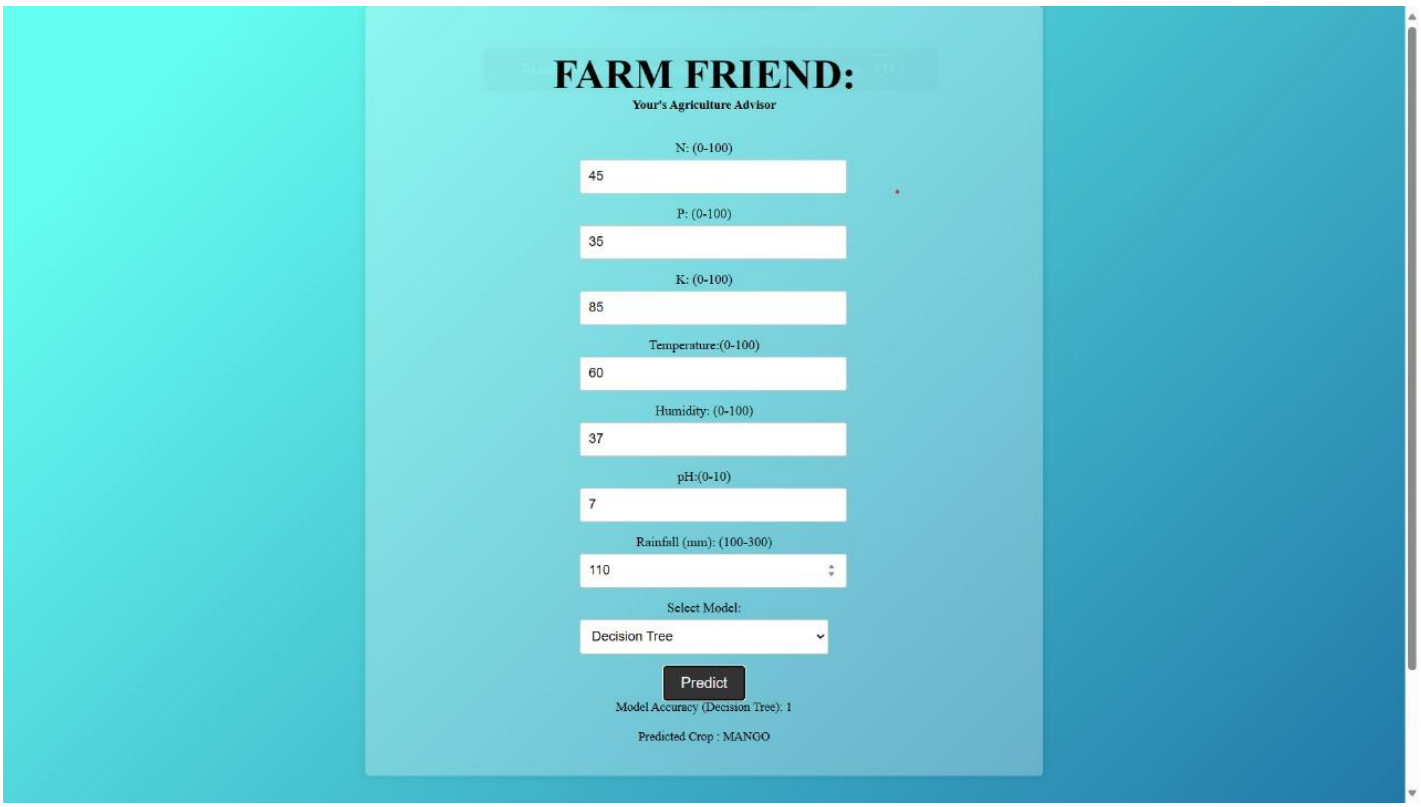
To make our system accessible and user-friendly, we developed a web-based interface using Flask, a Python web framework. The interface allows users to input agricultural and environmental data, select prediction models (Decision Tree or Random Forest), and receive real-time crop yield predictions.

6. Data Split:

The dataset was split into a 70-30 ratio for training and testing, respectively, to ensure the model's performance was assessed on unseen data.

Chapter 8

Result



FARM FRIEND:

Your's Agriculture Advisor

N: (0-100)

22

P: (0-100)

22

K: (0-100)

22

Temperature:(0-100)

22

Humidity: (0-100)

22

pH:(0-10)

2

Rainfall (mm): (100-300)

22

Select Model:

Randoms Forest

Predict

Model Accuracy (Random Forest): 1

Predicted Crop : KIDNEYBEANS

Chapter 9

Conclusion

In this report, we have explored the application of machine learning techniques in predicting crop yields, a crucial area of agricultural research. The objective of this project was to develop a robust and accurate model that could forecast crop yields based on various agricultural and environmental factors. The dataset used for this project contained information on nutrient content (NPK), temperature, humidity, pH, and rainfall, among others.

Two machine learning algorithms, Decision Tree and Random Forest, were implemented to create predictive models. The Decision Tree model was used initially, and then we integrated the Random Forest model to compare their performances.

Chapter 10

References

Creating a crop prediction system using machine learning techniques is a popular research area, and these are the papers and articles related to this topic :-

1. **"Crop Yield Prediction Models"** by Kumar, A., Alase, A. A., & Adaramola,M. S.This paper provides a comprehensive review of different crop yield prediction models, including machine learning-based approaches.

2. **"Crop Yield Prediction Using Machine Learning: A Survey"** by Khaki, S., Rafiee, S., Mohtasebi, S. S., & Mohtasebi, S. This survey paper explores the use of machine learning techniques for crop yield prediction, with a focus on different algorithms and data sources