AMRIT CAMPUS

AFFILIATED TO TRIBHUVAN UNIVERSITY

CROP RECOMMENDATION SYSTEM

WITH INTEGRATED CROP CURE AND MARKETPLACE

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Introduction

01. An effort to solve agricultural problem with a robust software solution

02. Comprises of three major subsystem to provide help in a complete crop cycle

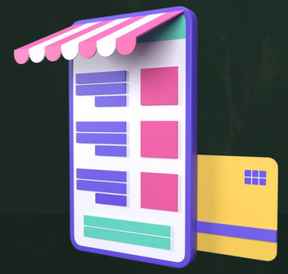
03. Use of Random Forest Classifier for data driven decision making

04. Highly Beneficial for farmer and consumer

Problem Statement

Lack of expertise on crop selection, lack of expertise during cultivation and lack of online platform for selling agro products are some problems in current agriculture scenario.

This projects aims to solve this issue with unified software solution which can recommend crop based on soil nutrient, recommend crop cure ideas and provide online platform for selling agro products.



Objectives

To digitalize crop selection process

Crop Recommendation System

To provide ideas in curing the plant

Plant Cure Recommendation

To develop platform for trading agricultural products.

E-commerce Functionality

Methodology Used

XP

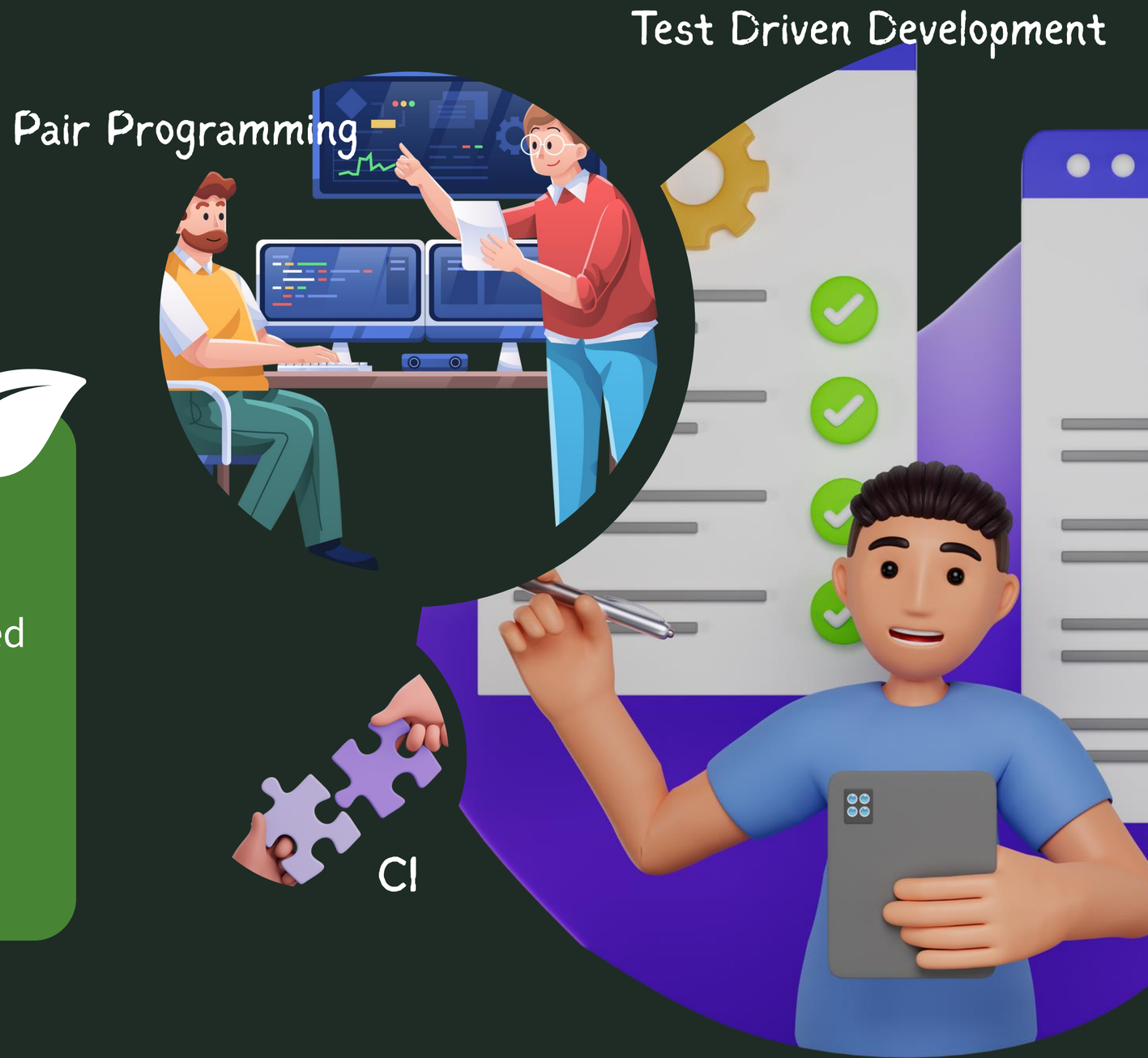
Programming

Extreme Programming Methodology was adopted

Pair Programming was practiced

Continuous Integration (CI) was done

Test Driven Development (TDD) was practice.



System Design

Kishan Saathi App

- Crop Recommendation System 
- Plant cure Recommendation System 
- Online Marketplace for Agricultural Products 

System Design

Crop Recommendation System

Plant cure Recommendation System

Online Marketplace for Agricultural Products

Dataset of 2200 data

Random Forest Classfier

CART Algo for decision tree

Data Sample

	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice

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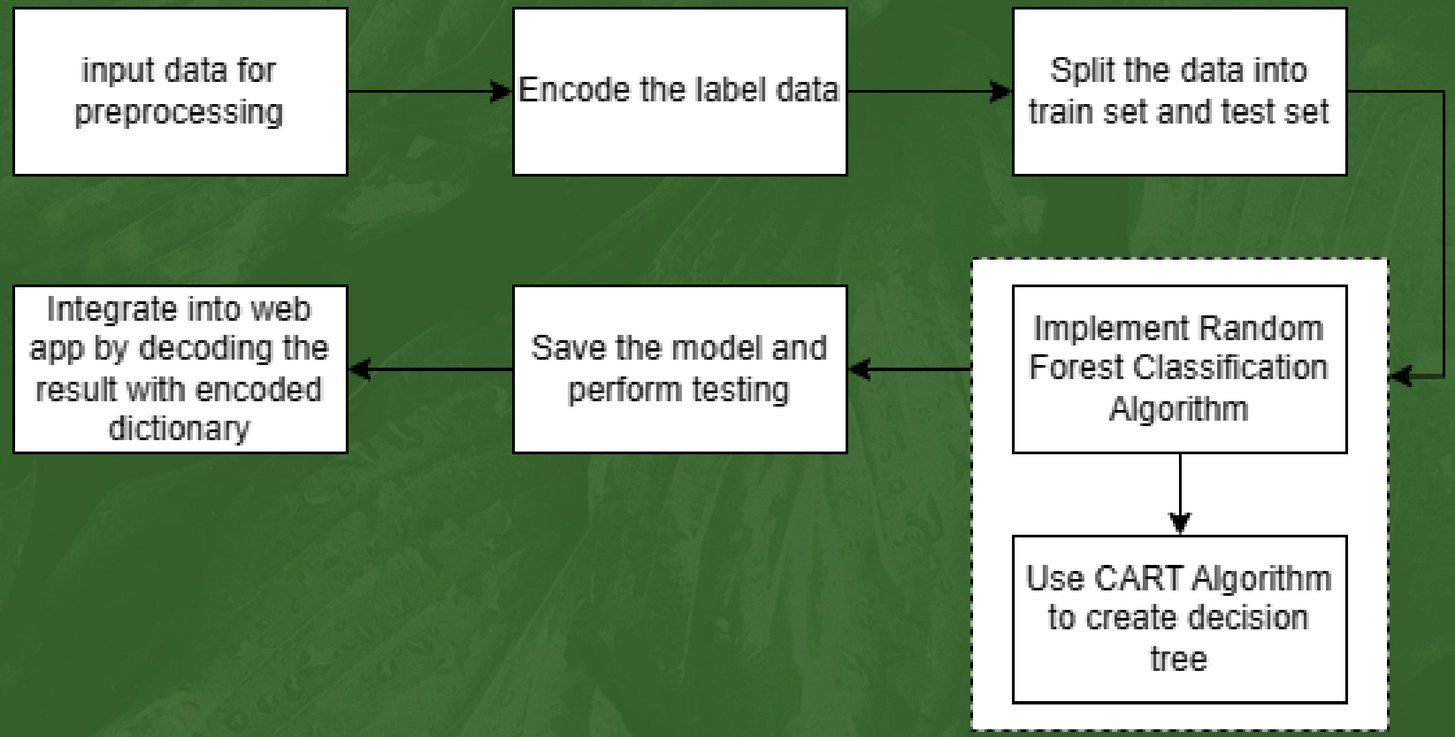
Flow of Crop Recommendation System



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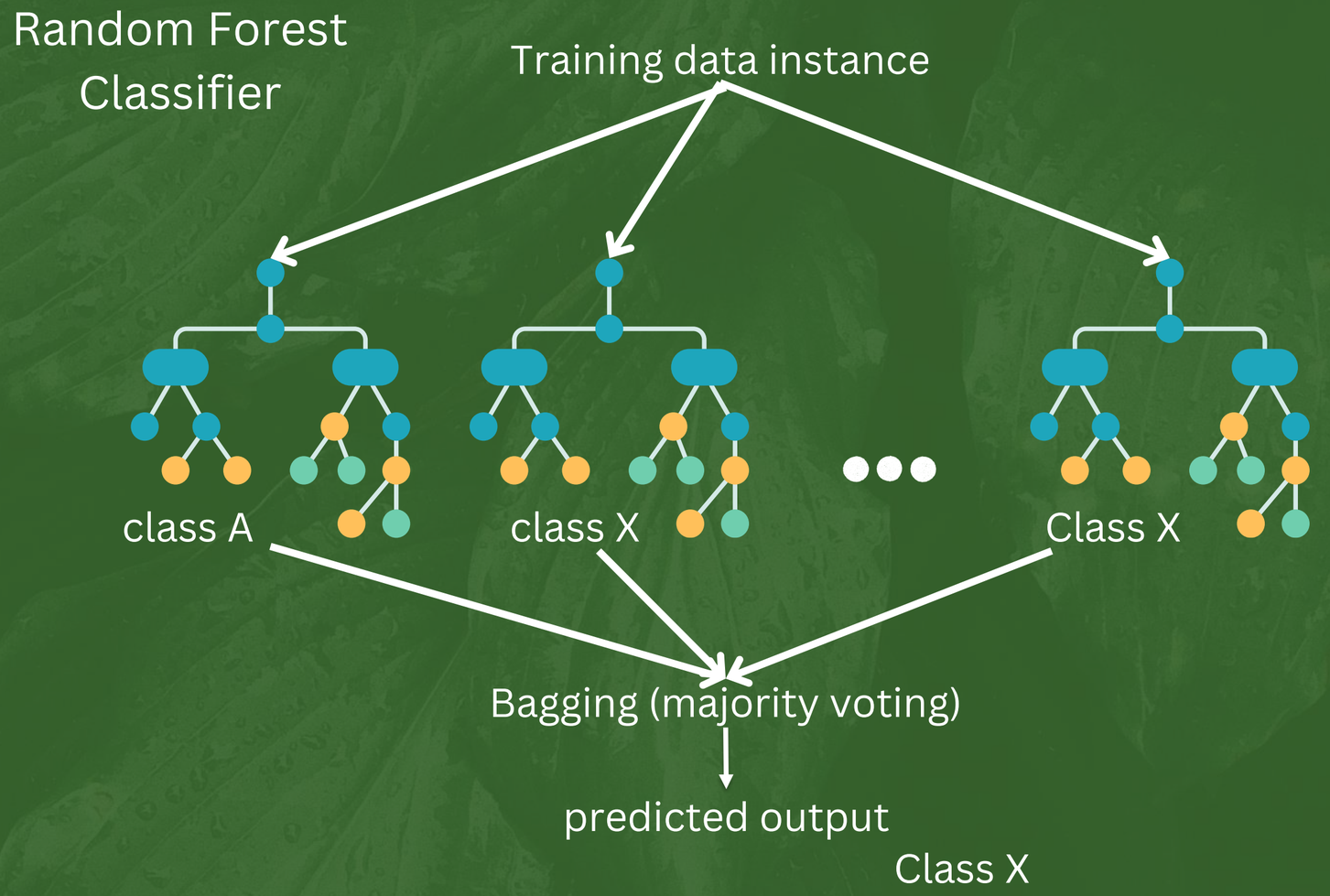

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CART Algorithm

Decision Tree made by CART is always binary

1. Calculate Gini index of data set

$$Gini = 1 - \sum_{i=1}^{C} (p_i)^2$$

2. Calculate Gini Index of each features
   a. For each feature, find a best split of attributes to make two branches of node. To do so, find all possible split. Calculate gini for each possible split. And choose split with less gini as best split

$$gini_A(D) = \frac{|D_1|}{|D|} gini(D_1) + \frac{|D_2|}{|D|} gini(D_2)$$

3. Calculate reduction in impurity to choose the best node.

$$\Delta gini(A) = gini(D) - gini_A(D)$$

4. Best node have two edges made up of two attributes. For each edge, take new dataset consisting of that particular attribute and do same to get next node of final class.

	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
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Result Analysis

Crop Recommendation System

Plant cure Recommendation System

Online Marketplace for Agricultural Products

Crop Recommendation

K-Fold cross validation was used for performane evaluation

Data were tested against 8 different train-test split percentages. Following result was obtained.

train data ratio %	10	20	30	40	50	60	70	80
accuracy	0.9626	0.9869	0.9870	0.9893	0.9945	0.9931	0.9909	0.993

Result Analysis

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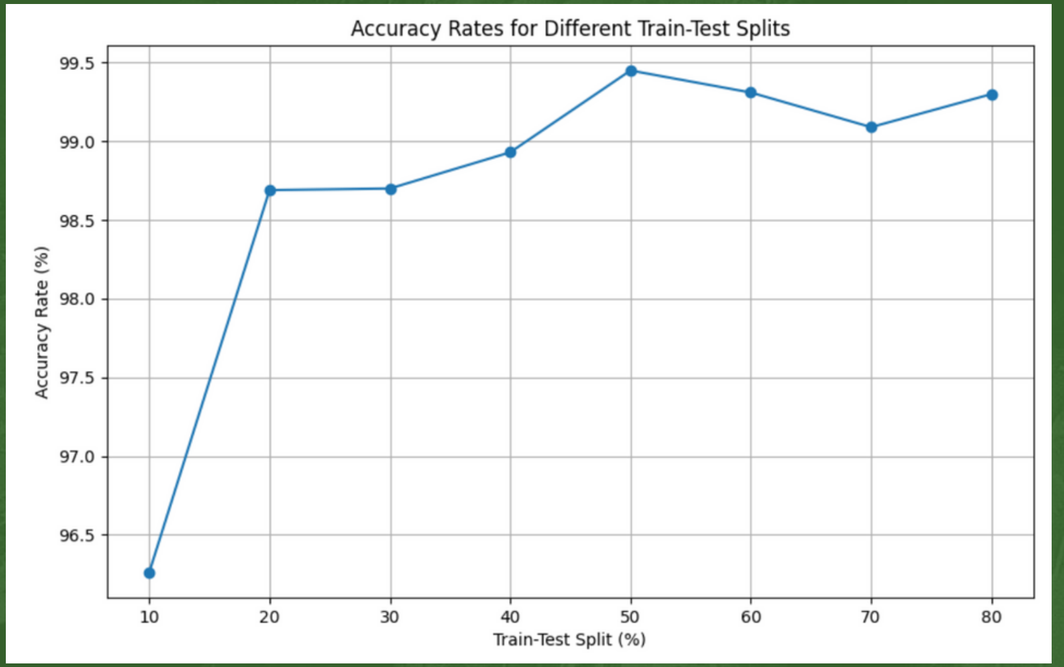

Interpretation

- Accuracy consistently improves as the proportion of training data increases
- Highest accuracy of 99.45% obtained when using a 50-50 split
- Even with smaller training proportions, the algorithm demonstrates robust performance, indicating its effectiveness in predicting suitable crops across different scenarios.
- The results suggest that the algorithm can provide reliable crop recommendations with high accuracy

System Design

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Cure Recommendation System

Sample data

	A	B	C	D	E
1		Crop	N	P	K
2	0	rice	80	40	40
3	3	maize	80	40	20
4	5	chickpea	40	60	80
5	12	kidneybea	20	60	20
6	13	pigeonpea	20	60	20

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Flow of Cure Recommendation System

Take N, P, K and crop name as input from user → Compare given N, P, K with dataset and find out which one is adequate or not enough → Based on which one is high or low, show cure recommendation as per in dictionary

Sample dictionary

```
fertilizer_dic = {
        'NHigh': """The Nitrogen value of soil is high and might give rise to weeds.
        <br/> Please consider the following suggestions:

        <br/><br/> 1. <i> Manure </i> - adding manure is one of the simplest ways to amend your soil with nitrogen. Be careful as there are various types of manu

        <br/> 2. <i>Coffee grinds </i> - use your morning addiction to feed your gardening habit! Coffee grinds are considered a green compost material which is

        <br/>3. <i>Plant nitrogen fixing plants</i> - planting vegetables that are in Fabaceae family like peas, beans and soybeans have the ability to increase

        <br/>4. Plant 'green manure' crops like cabbage, corn and brocolli

        <br/>5. <i>Use mulch (wet grass) while growing crops</i> - Mulch can also include sawdust and scrap soft woods""",

        'Nlow': """The Nitrogen value of your soil is low.
        <br/> Please consider the following suggestions:
        <br/><br/> 1. <i>Add sawdust or fine woodchips to your soil</i> - the carbon in the sawdust/woodchips love nitrogen and will help absorb and soak up and

        <br/>2. <i>Plant heavy nitrogen feeding plants</i> - tomatoes, corn, broccoli, cabbage and spinach are examples of plants that thrive off nitrogen and wi

        <br/>3. <i>Water</i> - soaking your soil with water will help leach the nitrogen deeper into your soil, effectively leaving less for your plants to use.

        <br/>4. <i>Sugar</i> - In limited studies, it was shown that adding sugar to your soil can help potentially reduce the amount of nitrogen is your soil. S
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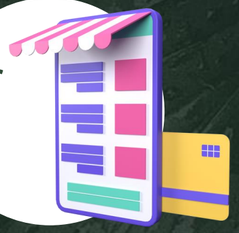
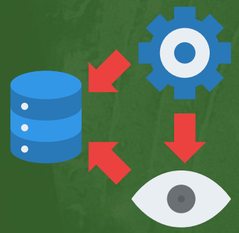


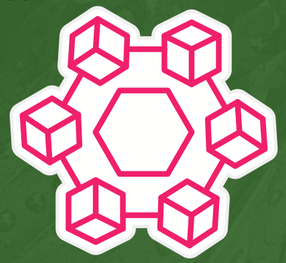
E-commerce system

01. Build with MERN Stack technology

02. Followed MVC pattern



03. Seperation of concern was realized.



04. Powerful CMS for amazing user experience.

Limitation

01. Farmer have to manually input soil nutrients data and weather parameter. Sensors could have been implemented to take real time data from farm.

02. System can only predict 22 different crops. Model could have been trained in larger dataset in order to make more diverse prediction.

03. Cure recommendations is only based on N, P, K high or low. Other parameters such as pH, micronutrients, climate, etc also should have been taken under consideration.

04. E-commerce functionality could have been equipped with advance recommendations system like collaborative filtering, content based filtering, etc.

PROJECT DEMO

RUN CROP RECOMMENDATION SYSTEM WITH CROP CURE AND ECOMMERCE

THANK YOU

CROP RECOMMENDATION SYSTEM WITH CROP CURE AND ECOMMERCE

ANY QUESTIONS?