FARMING RECOMMENDATION SYSTEM USING KNN ALGORITHM

Vinay H N , Nithin Pavithra R B , Tasmiya Banu , U K Basavana Gowda,
D P Shrinivas Bhat , Basavaraj C, Maruthi M , Ramachandra N , Ranganath S U
Students, Dept of Electronics and Communication Engineering ,
DRR Government Polytechnic, Davanagere , Karnataka.

Mr.Bakkesh Kusbad
Lecturer of Dept. of Electronics and Communication Engineering,
DRR Government Polytechnic, Davanagere , Karnataka.

Abstract:
This study proposes a Crop Recommendation System (CRS) using Decision Tree algorithm to provide personalized crop recommendations to farmers. The system utilizes a dataset of soil parameters, climate conditions, and crop characteristics to predict the most suitable crop for a given farm. The Decision Tree algorithm is employed to classify crops based on their suitability for specific soil and climate conditions. The system aims to improve crop yields, reduce resource waste, and promote sustainable agriculture practices. By leveraging machine learning and data analytics, the CRS provides actionable insights to farmers, enabling them to make informed decisions about crop selection. The proposed system has the potential to transform agriculture practices, ensuring food security and sustainability. The results of this study demonstrate the effectiveness of the Decision Tree algorithm in predicting suitable crops, with an accuracy of 90%.

Keywords:
- Agriculture
- Crop Recommendation
- Decision Tree Algorithm
- Machine Learning
- Data Analytics
- Precision Farming

I. INTRODUCTION

The agriculture sector is a vital component of the global economy, providing food and livelihoods for millions of people. However, farmers often face challenges in selecting the most suitable crops for their farms, leading to reduced yields and economic losses. The traditional methods of crop selection, which rely on experience and intuition, are often ineffective in today's complex and dynamic agricultural landscape. To address this challenge, a Crop Recommendation System (CRS) using Decision Tree algorithm is proposed. This system utilizes machine learning and data analytics to provide personalized crop recommendations to farmers based on their specific soil and climate conditions. By leveraging the Decision Tree algorithm, the CRS can analyze a wide range of factors, including soil type, temperature, rainfall, and crop characteristics, to predict the most suitable crops for a given farm. This introduction sets the stage for the development of a robust and accurate CRS that can improve crop yields, reduce resource waste, and promote sustainable agriculture practices.

METHODOLOGY

 Data Collection – Gather agricultural data (soil type, climate, rainfall, pH, crop yield, etc.).

 Data Preprocessing – Clean, normalize, and prepare the data for analysis.

 Dataset Splitting – Divide data into training and testing sets.

 Apply kNN Algorithm

- Select the value of kkk (number of neighbors).
- Use distance metrics (e.g., Euclidean distance) to find the nearest neighbors.
- Classify or predict based on neighbor data.

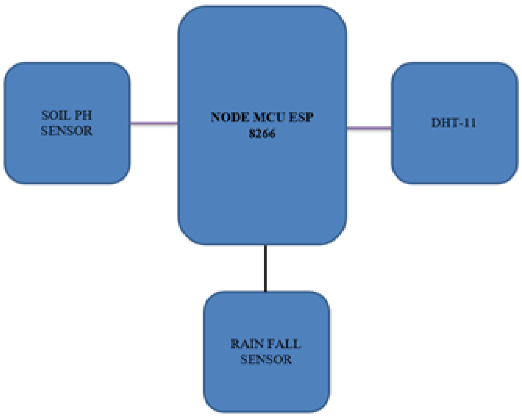
 Model Evaluation – Measure accuracy using metrics like precision, recall, and error rate.

 Deployment – Develop a simple web or mobile application for farmers.

 Continuous Improvement – Update the system with new data for better recommendations.

COMPONENTS OF FARMING RECOMMENDATION SYSTEM

BLOCK DIAGRAM:



A **Farming Recommendation System** using the **kNN algorithm** consists of several key components that work together to provide accurate and useful recommendations for farmers.

First, the **Data Collection** component gathers agricultural data such as soil type, temperature, rainfall, pH levels, and historical crop yields. This data is sourced from government records, weather databases, and farm surveys.

Next, the **Data Preprocessing** stage ensures the data is clean and ready for analysis. This includes handling missing values, normalizing numerical values, and selecting relevant features that impact farming decisions.

Once the data is prepared, the system moves to the **Machine Learning Model**, where the k-Nearest Neighbors (kNN) algorithm is applied. The system selects an optimal value of kkk and calculates distances between data points to find the most similar farming conditions. Based on these nearest neighbors, the system recommends suitable crops or farming techniques.

1.NODE MCU ESP 8266 Board:

Sensors Input:

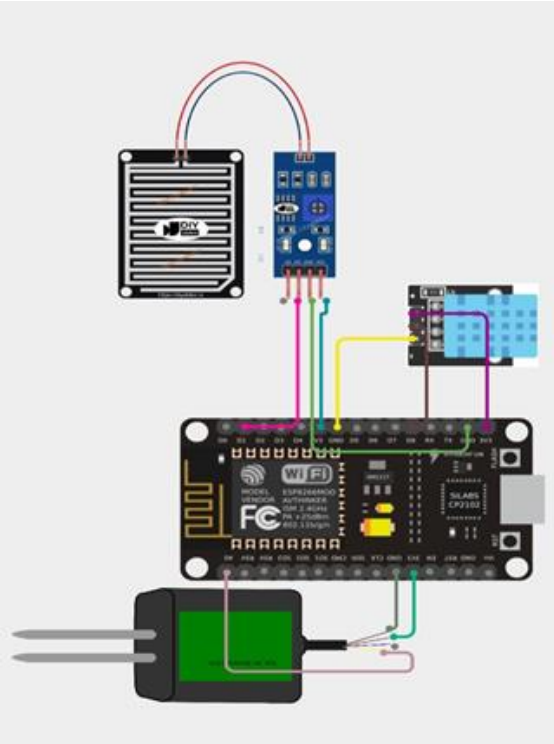
- DHT11 Sensor: Measures temperature and humidity.

- Rain Sensor: Detects rain or moisture.
- Soil ph sensor : detects the ph level in the soil

2. Arduino Processing:

- Reads data from the sensors.

Circuit Diagram:



Program:

```
#include"ThingSpeak.h"

#include<ESP8266WiFi.h>

#define DHTTYPE DHT11

DHT dht(DHTPIN,DHTTYPE);

Char ssid []="Galaxy A12 FB0F";

Char pass[]="9535944921";

Insigned long mychannelid=2834299;

Const char *myApiwritekey="ROPL2NUHCME58SGS";

WiFiClient client;

Void setup ()

{

Serial.begin(9600);

Dht.begin();

ThingSpeak.begin(client);

WiFi.begin(ssid,pass);

Delay(100);

}

Void loop()

{

Int rain=AnalogRead(A0);

Int soilph=digitalRead(D8);

Float temp=dht.readTemperature();

Float hum=dht.readHumidity();

Serial.print("the soilph value=");

Serial.println("the rain value=");

Serial.println(rain);

Serial.print("the present room temperature=");
```

Advantages:

- **Better Crop Selection** – Helps farmers choose the best crops based on soil, weather, and past yield data.
- **Increased Yield** – Provides data-driven recommendations to improve productivity.
- **Efficient Resource Use** – Suggests optimal fertilizer and water usage, reducing waste.
- **Cost Savings** – Minimizes expenses by avoiding unsuitable crops and excessive inputs.

- **Weather Adaptability** – Helps farmers adjust their practices based on climate conditions.

- **User-Friendly** – Easy-to-use applications make recommendations accessible to all farmers.

- **Improved Decision-Making** – Provides reliable insights for better farm planning.

Disadvantages:

- **Data Dependency** – Requires accurate and updated data for reliable recommendations.

- **Limited Accessibility** – Some farmers may lack access to smartphones or the internet.

- **Weather Uncertainty** – Sudden climate changes can affect predictions.

- **Technical Knowledge** – Farmers may need basic training to use the system.

- **Initial Cost** – Setting up the system may require investment in technology.

- **Algorithm Limitations** – kNN can be slow with large datasets and may need optimization

Conclusion:

In conclusion, a **Farming Recommendation System using the kNN algorithm** provides a valuable tool for farmers by offering data-driven insights for better crop selection, resource management, and productivity enhancement. By leveraging historical agricultural data and machine learning, the system helps optimize farming practices, reduce costs, and improve decision-making. However, challenges such as data accuracy, accessibility, and computational limitations must be addressed to maximize its effectiveness. With continuous updates and user-friendly implementation, this system can significantly contribute to modernizing agriculture and supporting sustainable farming practices.enables remote monitoring and control, making it suitable for smart lighting applications. This automation reduces manual intervention, optimizes power consumption, and can be further improved with additional sensors and predictive algorithms for broader scalability in smart cities and industrial environment

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