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Crop Recommendation using Support Vector Machine (SVM)

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ABSTRACT-India's primary industry is agriculture. Climate change has a negative effect on the majority of crops. This project will help farmers decide which crop is ideal for their particular plot of land. To recommend the best crop to plant, the SVM algorithm is utilized. The issues we face in regard to weather, temperature, humidity, rainfall, humidity, nitrogen, and phosphorus content in soil are now not being adequately addressed by inventions or solutions. Numerous diverse types of expanding economic growth, notably in the agriculture sector, are occurring in countries like India. Additionally, the process is useful for suggesting crops for suitable terrain.

KEYWORDS - Machine Learning, Support Vector Machine, Kernel Function, Min-Max Scaler.

I. INTRODUCTION

Crop recommendation using machine learning is a process that involves the use of algorithms and models to predict the most suitable crops for a particular region or farm. This is done by considering various factors such as soil type, weather conditions, and market demand, with the aim of helping farmers maximize their yields and profits by planting crops that are well-suited to their land and climate.Several machine learning techniques, such as decision trees, random forests, k-nearest neighbors, and support vector machines, can be used to recommend crops (SVM). The crop recommendation system's unique objectives as well as the quantity and quality of the available data will determine which algorithm is best to use.

It's critical to compile a sizable and varied dataset that contains details on various crops, soil types, weather patterns, and market demand before developing a crop recommendation system. The machine learning algorithm can be trained using this data, and its performance can be improved. Once trained, the algorithm can be used to forecast which crops will thrive under a specific set of circumstances. Through the use of data visualization tools, for instance, these predictions can be communicated to farmers in a simple and understandable manner.

To further comprehend the underlying patterns in the data and to simplify the data for simpler presentation and interpretation, further data analysis techniques like clustering and dimensionality reduction can also be applied.

These developments bring us back to the round-faced environmental and population pressures on our civilization. Studies predict a need for a significant increase in global agricultural productivity in order to feed an expanding population on a warming world. The metric capacity unit, weary of the realm of yield forecasting, uses some relatively remote sensing information over the farm for the majority of the task. Agriculture attempts to improve and increase crop productivity and, by extension, crop quality to support human life.

In general, crop suggestion utilising machine learning is a useful tool for farmers and agricultural organizations, allowing them to make educated decisions about what crops to plant and how to maximize their yields and revenues.

Data Acquisition

Data acquisition is the cornerstone of a successful crop recommendation system. To make accurate and effective recommendations, the system must gather a wide range of information that affects crop growth and productivity.



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Here are the key data points that are usually collected in a crop recommendation system:

- Climate information: Temperature, precipitation, wind patterns, and other weather-related factors play a critical role in crop growth and development. Climate data can be obtained from weather stations, satellite imagery, or other sources.
- Soil characteristics: Soil type, pH, nutrient levels, and other soil properties are important determinants of which crops are best suited for a particular area. Soil samples can be analyzed to provide this information.
- Crop performance data: The system must have a clear understanding of how different crops perform in terms of yield and growth rate. This information can be obtained from previous crop trials, farm records, or from farmers themselves.
- Market demand: Understanding market demand and prices is crucial for determining which crops are most profitable to grow. This data can be obtained from government agencies, market research firms, or other sources.
- Agricultural practices: Understanding the agricultural practices used by farmers, such as irrigation, fertilization, pest control, and others, can help improve crop recommendations. This information can be gathered through surveys, direct observation, or other means.

By bringing together all of these data points, a crop recommendation system can provide farmers with tailored and informed recommendations on which crops are most appropriate for their specific location, taking into account local climate, soil conditions, market demand, and other critical factors.

II. PROPOSED SYSTEM

This flowchart outlines the project's whole procedure. The first stage is to gather and clean the data, and the second is to extract features, alternatively we can utilize feature selection. The third phase involves utilising the Support Vector Machine Algorithm to train the model. We use 80% of the data to train the model, and 20% of the data to test the model's accuracy. The crop recommendation is then made by the model based on the input parameters.



Fig 1: Flowchart of model

Support Vector Machine

One of the most well-liked supervised learning algorithms, Support Vector Machine, or SVM, is used to solve Classification and Regression problems. However, it is largely employed in Machine Learning Classification issues. The SVM algorithm's objective is to establish the best line or decision boundary that can divide n-dimensional space into classes, allowing us to quickly classify fresh data points in the future.

A hyper plane is the name given to this optimal decision boundary. SVM selects the extreme vectors and points that aid in the creation of the hyper plane. The approach is referred described as a "support vector machine" because of these extreme circumstances.

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Fig 2: Support Vector Machine (SVM)

Kernel Function

A collection of mathematical operations known as the kernel are used by SVM algorithms. Data is inputted into the kernel, which then transforms it into the desired form. Different kernel functions are utilized by various SVM algorithms. There are various kernel functions, including sigmoid, polynomial, radial basis function (RBF), linear, and non-linear. RBF is the most popular kernel function.

It becomes challenging to classify the data points using a single line when an algorithm has numerous features and we need to do so. We utilize kernel function to raise the data points' dimension so that using a hyper plane, we can easily separate them.



Fig 3: Kernel Function used for separating datapoints



Fig 4: Some Kernel Functions

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Min Max Scaler

MinMaxScaler is a preprocessing technique in machine learning used to scale a dataset to a specific range. The purpose of MinMaxScaler is to transform the values of the features in the dataset to a specific range, usually between 0 and 1. This is achieved by subtracting the minimum value of each feature from all its values and then dividing the result by the range (difference between the maximum and minimum values).

The main advantage of using MinMaxScaler is that it ensures that all features are on a similar scale, which can improve the performance of machine learning algorithms that are sensitive to the scale of the input features. Additionally, MinMaxScaler can help address the problem of features with different units or ranges, which can cause some features to dominate others in the model.

MinMaxScaler is particularly useful for algorithms that are sensitive to the scale of the input features, such as neural networks and k-nearest neighbors. It is also commonly used as a preprocessing step in data normalization.

IV. CONCLUSION

The current study demonstrated the usefulness of data mining approaches in crop recommendation based on input characteristics from the climate. The suggested approach assists farmers in selecting the best crop by offering information that typical farmers do not monitor, reducing the likelihood of crop failure and increasing output. Additionally, it stops them from suffering losses. In the future, we might integrate weather API and location API and create a more user-friendly mobile application that can be available in multiple local languages. The constructed website is user-friendly and requires the farmer to give all data by themselves.

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