

Crop Recommendation System using Machine Learning

Objective

The primary goal of this project is to develop an intelligent system that can recommend the most suitable crop to be cultivated based on a variety of environmental and soil conditions such as nitrogen (N), phosphorus (P), potassium (K), temperature, humidity, pH, and rainfall using machine learning algorithms.

Introduction

Agriculture is a key component of the global economy. In a country like India, where agriculture is a primary occupation, farmers often face challenges in choosing the right crop due to the lack of expert advice and limited knowledge of climatic conditions and soil fertility. Machine learning techniques provide an effective solution to this by predicting the best crop based on the input data.

Dataset Description

The dataset used is publicly available on Kaggle under the title "Crop Recommendation Dataset".

Features: N, P, K, temperature, humidity, pH, rainfall, label (crop name). It has 2200 records and 22 unique crops.

Technology Used

Programming Language: Python

Libraries: pandas, numpy, matplotlib, seaborn, scikit-learn, joblib, streamlit

Algorithm: Random Forest Classifier

System Architecture

1. Input Parameters
2. Data Processing
3. Model Training
4. Prediction
5. Display

Crop Recommendation System using Machine Learning

Model Implementation

1. Load and preprocess data
2. Train a Random Forest Classifier
3. Evaluate model with accuracy ~98.7%
4. Save and use the model for prediction

Results and Evaluation

Model: Random Forest Classifier

Accuracy: ~98.7%

Advantages: Fast, accurate, handles multi-class well

Web Interface (Optional)

Built using Streamlit. Users can input soil and climate values and get the recommended crop instantly.

Challenges Faced

Dataset quality, algorithm selection, handling multi-class classification.

Future Enhancements

Add real-time weather APIs, GPS data, fertilizer recommendations, mobile version.

Conclusion

This project shows the usefulness of ML in agriculture. It helps farmers make informed decisions to increase productivity.

References

1. <https://www.kaggle.com/datasets/atharvaingle/crop-recommendation-dataset>
2. <https://scikit-learn.org>

Crop Recommendation System using Machine Learning

3. <https://docs.streamlit.io>