Crop Recommendation System

Overview

This project is a crop recommendation system that uses machine learning to predict the most suitable crop to grow based on various environmental factors. The system aims to help farmers make informed decisions about crop selection to optimize yield and resource utilization.

Tools and Libraries Used

- Python: Primary programming language.
- Pandas: For data manipulation and analysis.
- NumPy: For numerical computations.
- Matplotlib: For data visualization.
- Seaborn: For enhanced data visualization.
- Scikit-learn: For machine learning (Decision Tree, Naive Bayes, SVM, Logistic Regression, Random Forest), data preprocessing, and model evaluation.
- XGBoost: For gradient boosting.

Project Structure

The project is organized in a Jupyter Notebook (smart farming py.ipynb) and follows these steps:

1. Installing Libraries:
    - Installs the XGBoost library.
2. Importing Libraries:
    - Imports necessary Python libraries for data manipulation, visualization, and machine learning.
3. Data Loading:
    - Loads the crop recommendation dataset from a CSV file.
4. Exploratory Data Analysis (EDA):
    - Explores the dataset to understand its structure, features, and basic statistics.
5. Model Training and Evaluation:
    - Trains and evaluates several machine learning models:
        - Decision Tree
        - Naive Bayes
        - Support Vector Machine (SVM)
        - Logistic Regression
        - Random Forest
        - XGBoost
    - Calculates and compares the accuracy of each model.

Dataset Description

The dataset contains the following features:

- N
- P
- K
- Temperature
- Humidity
- pH
- Rainfall
- Label
- Soil Moisture
- Soil Type
- Elevation
- Organic Matter
- Irrigation Frequency
- Crop Density
- Pest Pressure
- Fertilizer Usage
- Growth Stage
- Urban Area Proximity
- Water Source Type
- Frost Risk
- Water Usage Efficiency

How to Run the Project

1. Ensure you have Python installed (preferably Python 3.6 or higher).
2. Install the required Python libraries by running:
3. pip install pandas numpy matplotlib seaborn scikit-learn xgboost

4. Download the crop recommendation dataset and save it as Crop_recommendation_expanded.csv.
5. Open the Jupyter Notebook (smart farming py.ipynb) and run each cell sequentially to reproduce the analysis.

Conclusion

This project successfully implements a crop recommendation system using machine learning. By analyzing various environmental factors, the system can provide valuable insights to farmers, helping them select the most suitable crops for their specific conditions. The results of the model evaluation demonstrate the effectiveness of the chosen algorithms in predicting crop suitability.