Mini Project Report

Title:- Crop-Soil Match Recommender

Objective:

- To develop an automated system that recommends the most suitable crop based on soil and environmental parameters.
- To utilize deep learning techniques for predicting crop suitability, improving agricultural efficiency and productivity.

Methodology:

1. Data Collection:
A dataset was collected containing soil and weather attributes such as Nitrogen (N), Phosphorus (P), Potassium (K), pH, temperature, humidity, and rainfall. The dataset included samples from multiple regions and soil types to improve model accuracy and generalization. Data was gathered from open agricultural databases and research sources to ensure reliability.

2. Data Preprocessing:
The collected data was cleaned by removing duplicate entries and handling missing values. Feature normalization was performed to bring all input variables (NPK, pH, temperature, etc.) to a similar range.The data was then divided into training and testing sets in an 80:20 ratio for model evaluation.Sequential data formatting was applied to prepare the dataset for LSTM input.

3. Model Development:
A Deep Learning model using Long Short-Term Memory (LSTM) was developed to analyze sequential patterns in soil and environmental data.
Model Architecture: Input Layer → LSTM Layers (with ReLU activation) → Dense Layer → Output Layer (Softmax activation for crop classification).The model was trained using Categorical Cross-Entropy Loss and optimized with the Adam optimizer.Training was conducted on a GPU-supported environment to achieve faster convergence and high accuracy.

4. Evaluation:
The model performance was evaluated using metrics such as Accuracy, Precision, Recall, and F1-Score.The model achieved an accuracy of 97.27% on the test dataset. The system demonstrated high efficiency in recommending suitable crops based on given soil and climatic parameters.

Conclusion:

The Crop-Soil Match Recommender successfully predicted suitable crops for given soil samples with high accuracy. This project demonstrates the effectiveness of deep learning in agriculture by assisting farmers with data-driven decisions. It also highlights the potential of integrating environmental and soil data for smart farming solutions.