AI-Based Crop Irrigation Scheduler - Quick Reference

Overview

This is a Random Forest Regressor trained to predict optimal irrigation time (minutes) for crops based on soil and weather data.

It can be integrated into Python scripts, Colab, or apps to provide actionable irrigation recommendations.

Files Included

- rf_irrigation_model.pkl -> Trained Random Forest model
- README.pdf -> One-page usage guide

Input Features

Feature	Type	Notes
Soil_Moisture_%	Numeric	0-50%
Max_Temp_C	Numeric	15-45°C
Min_Temp_C	Numeric	5-35°C
Rainfall_Past_mm	Numeric	0-50 mm
Rainfall_Forecast_mm	Numeric	0-50 mm
Humidity_%	Numeric	10-100%
Wind_Speed_m_s	Numeric	0-10 m/s
Solar_Radiation_MJ_m2	Numeric	0-30 MJ/m²
Crop_Stage	Categorical	Vegetative=0, Flowering=1, Fruiting=2
Soil_Type	Categorical	Sandy=0, Loamy=1, Clay=2

Output

Optimal_Irrigation_Time_min - Predicted irrigation duration in minutes

Suggested interpretation:

- <= 0 -> Wait
- < 15 -> Light irrigation
- >= 15 -> Normal irrigation

Example Usage in Python

```
import pandas as pd
import joblib

# Load model
model = joblib.load('rf_irrigation_model.pkl')

# Example input
data = pd.DataFrame([[25,30,20,5,0,60,3,20,0,1]],
                    columns=["Soil_Moisture_%","Max_Temp_C","Min_Temp_C",
                             "Rainfall_Past_mm","Rainfall_Forecast_mm","Humidity_%",
                             "Wind_Speed_m_s","Solar_Radiation_MJ_m2",
                      "Crop_Stage","Soil_Type"])

# Predict
predicted_time = model.predict(data)[0]
print("Predicted Irrigation Time (min):", predicted_time)
```

Next Steps / Suggestions

1. Replace example data with real field measurements.
2. Fine-tune hyperparameters if needed.
3. Integrate into UI or pipeline for real-time irrigation.
4. Optionally, add feature importance or SHAP analysis.