AICTE Cycle2(2025-26) - Smart/Automate irrigation using soil moisture and weather data

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Learning Objectives:

•Develop end-to-end **data pipelines** from sensor input to model output to decision execution.

•Apply **Machine Learning** for real-world **agricultural optimization**.

•Implement **IoT concepts** using **sensor simulation** and **data logging**.

•Integrate **Flask (Python backend)** with a lightweight **frontend** interface.

•Learn **model deployment** via joblib, API creation, and hosting on a local Flask server.

Source : www.freepik.com/

Tools and Technology used:

- **Python 3.12.8** (Data Processing, ML Model)
- VS CODE
- **Scikit-learn** (ML model: Decision Tree Classifier)
- **Flask** (Web App & API Integration)
- **HTML/CSS/JS** (Frontend Interface)
- **Pandas, NumPy** (Data Wrangling)
- **Joblib** (Model serialization)
- **Matplotlib/Seaborn** (EDA - optional extension)

Methodology:

•**Data Collection**: Used open-source datasets simulating sensor readings.

•**Preprocessing**: Cleaned, encoded, and normalized features.

•**Model Training**: Trained a Decision Tree Classifier to predict irrigation needs (Yes/No) based on:
•Temperature
•Humidity
•Moisture level
•Rainfall

•**Model Deployment**: Saved using joblib and embedded into a Flask-based API.

•**Frontend Development**: A web form allows user input; results are displayed as predictions.

Problem Statement:

- Agriculture in India still depends heavily on
  -**manual irrigation**,
  -leading to **water wastage**,
  -over-irrigation, and
  -**crop yield inefficiencies**.

- Farmers lack affordable, intelligent systems that **recommend**
  -optimal irrigation
  based on current soil and weather conditions.

Solution:

We developed an **AI-based Smart Irrigation System** that:

•Takes **real-time data inputs** like temperature, humidity, soil moisture, and rainfall.

•Uses a **trained ML model** to **predict the irrigation requirement**.

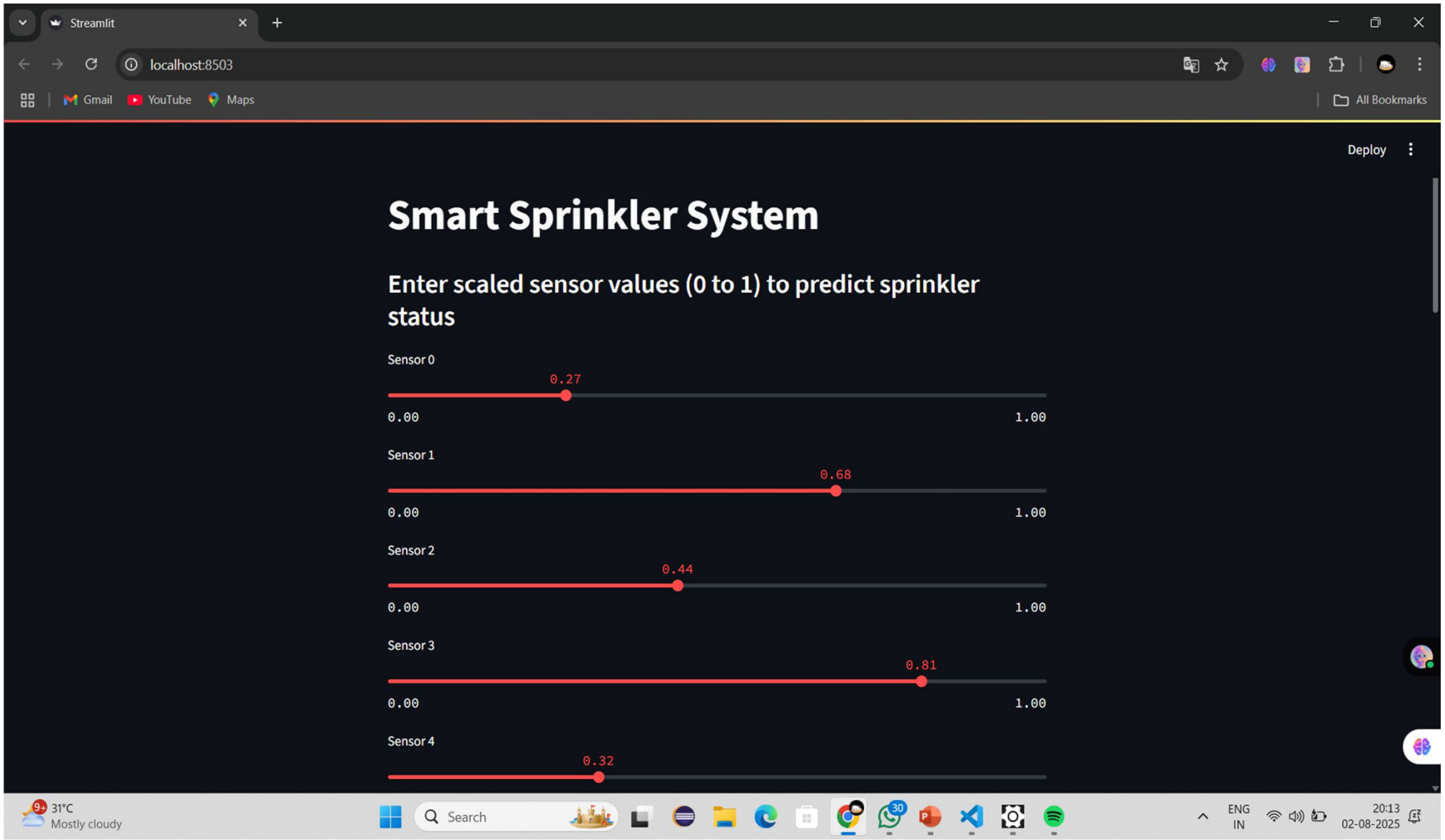
•Presents an intuitive **web dashboard** for visualization and user interaction.

•Offers **recommendations** for water usage, helping conserve resources and increase yield.

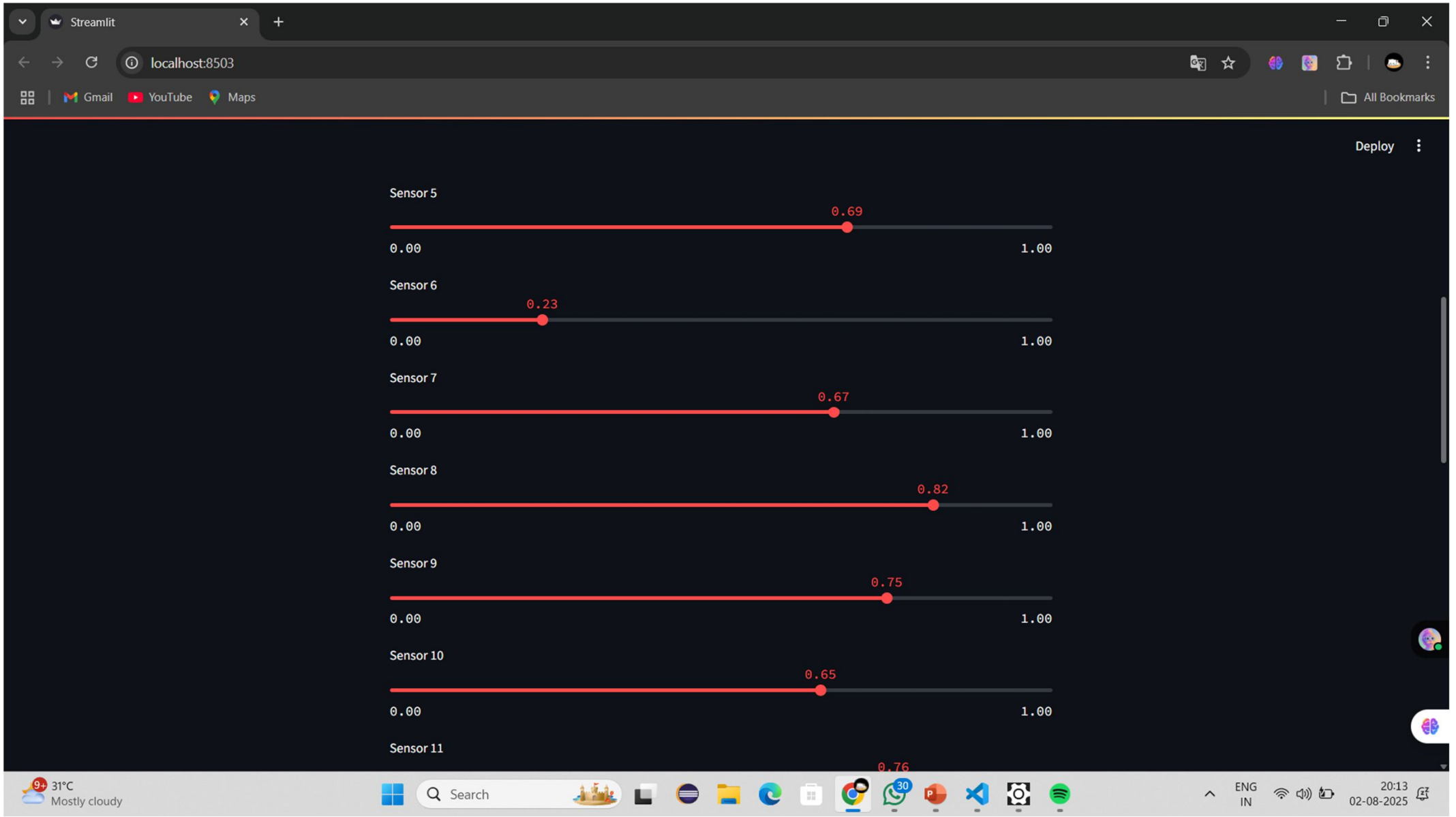
Example: For dry soil and high temperature, the model recommends watering. For wet soil or expected rainfall, it restricts unnecessary irrigation.

GitHub Link: https://github.com/CodeCraftsman-6/smart-irrigation-AICTE-shell-.git

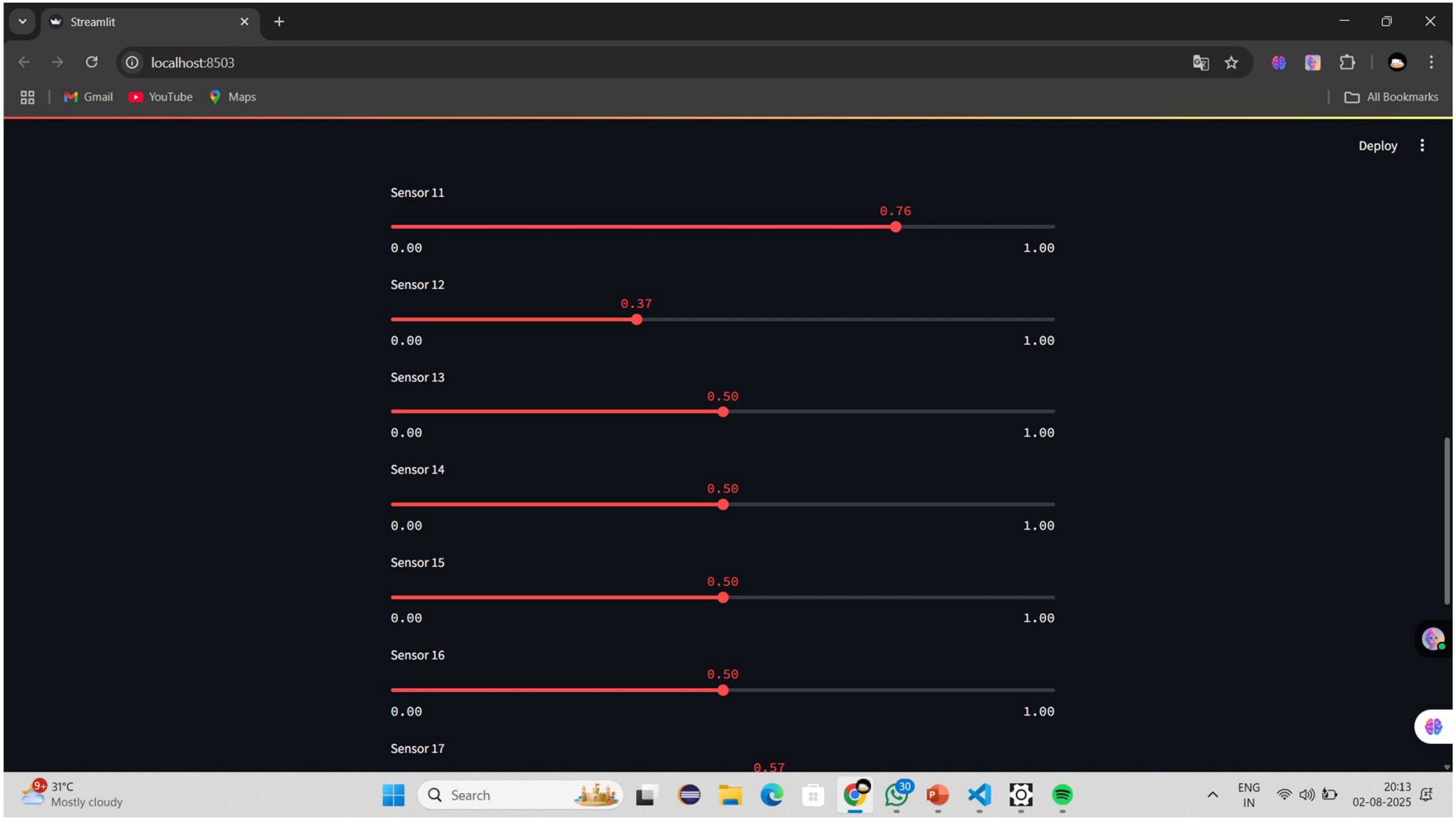
Screenshot of Output:



Screenshot of Output:



Screenshot of Output:



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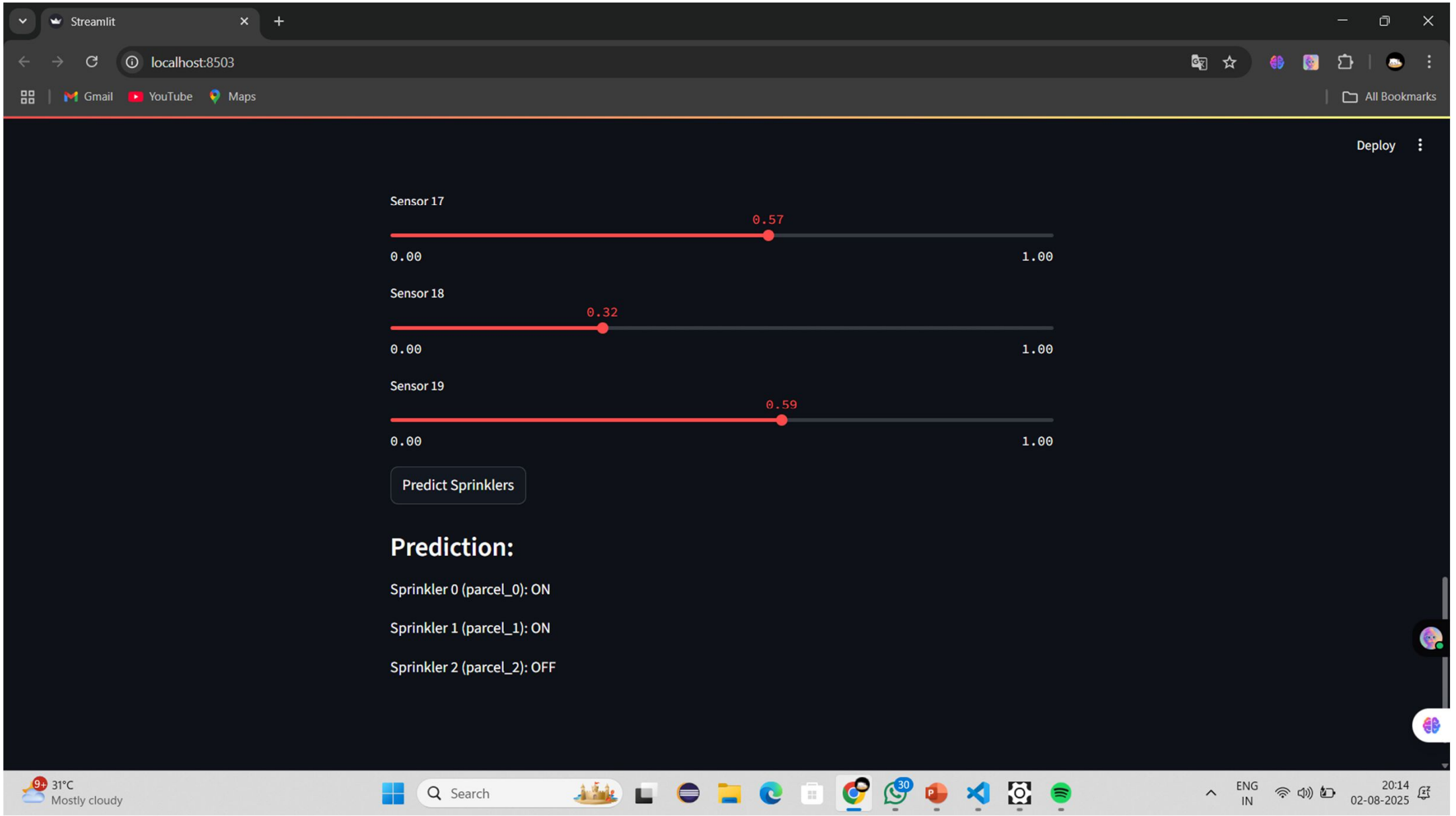

Conclusion:

This project showcases the **fusion of machine learning, IoT simulation, and web development** to solve a major rural problem in India. It is:

•**Scalable** to real-world sensor inputs via Raspberry Pi/Arduino.

•**Customizable** for crop-specific or region-specific irrigation plans.

•A **prime candidate** for government-backed smart farming initiatives.

Why It Stands Out Regionally:

🌾 Focus on Indian agriculture
🧠 Real-world ML deployment
🖥️ Functional UI with working logic
♻️ Eco-impact: Saves water, increases crop efficiency