# **Rainfall Prediction System**

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## 1. Introduction:

Rainfall plays a crucial role in agriculture, water resource management, and disaster preparedness. Predicting rainfall accurately can aid farmers, meteorological departments, and policymakers in effective planning. This project presents a **machine learning-based Rainfall Prediction System** integrated with a **web-based interface** to provide easy and real-time access to predictions.

# 2. Objective:

The primary goal is to **predict the expected rainfall** based on multiple weather-related input features using machine learning models and provide a **user-friendly web interface** for predictions.

- Train a machine learning model using real-world weather data.
- Develop a web interface using Flask for prediction.
- Implement form-based user input for rainfall features.
- Return real-time prediction on the web.

#### 3. Dataset

The dataset used is rainfall dataset.csv, which includes multiple environmental features.

## **Sample Features:**

- Temperature
- Humidity
- Wind Speed
- Pressure
- Cloud Cover
- Dew Point
- Visibility
- Solar Radiation
- Target Variable: Rainfall (in mm or a binary class indicating rainfall occurrence)

## 4. Model Used:

The primary model used for rainfall prediction is:

- XGBoost Classifier
- Logistic Regression
- Support Vector Machine (SVM)
- Random Forest

# 5. Evaluation Metrics

To assess the model's performance, the following metrics were used:

- Accuracy: Overall correctness of the prediction
- Confusion Matrix: To understand the true/false positives and negatives
- **Precision / Recall** (for classification tasks)
- Mean Squared Error (MSE) (for rainfall amount prediction)

# 6. System Architecture:

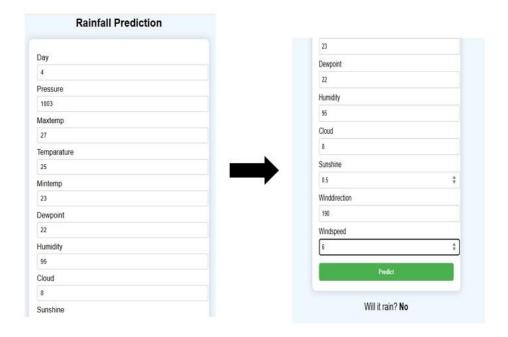
## **Backend:**

- Developed in Python using Flask framework
- Trained model and data scaler saved using pickle
- Accepts user inputs and returns prediction result

#### Frontend:

- Web-based interface using HTML, CSS, and Jinja2 templating
- User enters feature values through a form □ Result is displayed instantly after model

# inference 7. Screenshots:



# 8. Conclusion:

The **Rainfall Prediction System** successfully predicts rainfall based on meteorological features using a machine learning model (XGBoost). The system is deployed using Flask and offers a clean, functional interface for real-time rainfall prediction. With future improvements such as integration of real-time weather APIs or sensor data, the system can be extended for use in precision farming, flood alerts, and climate monitoring.