

Weather Prediction System for Smart Agriculture Startup

Part 2: Real-Time Prediction System and Visualization

Answer to Question 1 of IntelliHack 5.0

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Abstract

This report describes the design of a weather prediction system that aggregates minute-level data into daily summaries and predicts rain probability for the next 21 days. The system, built with Python, Pandas, Streamlit, and Random Forest, handles real-time data updates and sensor malfunctions. This report is provided as the answer to Question 1 of IntelliHack 5.0.

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1 Introduction

The goal is to predict rain probability for the next 21 days using minute-by-minute weather data. The system must aggregate this data daily and handle sensor malfunctions to provide reliable predictions.

2 System Overview

The system uses:

- Python and Pandas for data processing.
- Streamlit for the web interface.
- Random Forest for predictions.

3 Data Collection and Aggregation

Weather data (temperature, humidity, wind speed, pressure, rain status) is collected every minute. The data is aggregated by calculating daily averages for each feature, such as mean temperature and rain percentage.

4 Data Update Mechanism

New daily data is appended to a CSV file:

- If the CSV exists, the new data is added.
- If not, a new CSV is created with the first day's data.

5 Streamlit Web Interface

The Streamlit app visualizes predictions interactively. Users can:

- View predictions for the next 21 days.
- See trends in weather data.

To run the app:

```
pip install streamlit pandas matplotlib scikit-learn
streamlit run Q1_app.py
```

6 Weather Prediction Dashboard

Here are the three images representing the weather prediction system:

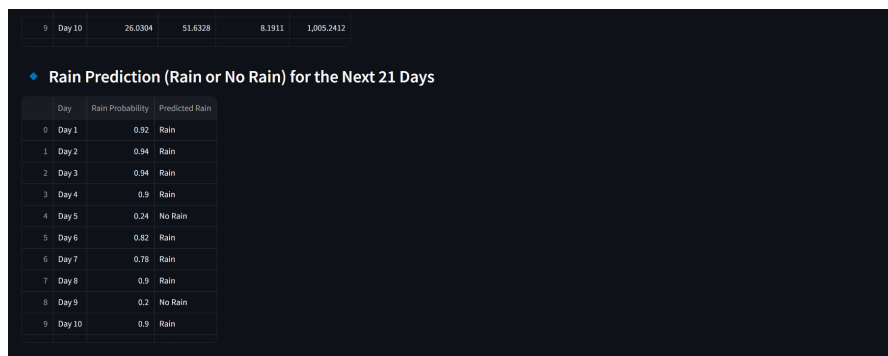


Weather Prediction for the Next 21 Days

♦ Predicted Temperature, Humidity, Wind Speed & Pressure for the Next 21 Days

	Day	Temperature (°C)	Humidity (%)	Wind Speed (m/s)	Pressure (hPa)
11	Day 12	22.6881	48.1568	4.101	1,002.3787
12	Day 13	24.5007	50.6648	3.0707	1,009.1566
13	Day 14	24.4871	52.0939	5.2971	984.7116
14	Day 15	24.3268	45.7199	9.4528	984.2972
15	Day 16	25.9611	43.7825	3.6064	997.5426
16	Day 17	22.9491	39.742	6.4396	971.3949
17	Day 18	21.2557	40.3841	7.9951	977.8188
18	Day 19	23.5795	37.0397	9.2096	990.3181
19	Day 20	20.2027	36.7007	6.765	1,038.4802
20	Day 21	20.9189	37.4115	8.2529	995.3444

Figure 1: Dashboard View 1



9 Day 10 26.0304 51.6328 8.1911 1,005.2412

♦ Rain Prediction (Rain or No Rain) for the Next 21 Days

	Day	Rain Probability	Predicted Rain
0	Day 1	0.92	Rain
1	Day 2	0.94	Rain
2	Day 3	0.94	Rain
3	Day 4	0.9	Rain
4	Day 5	0.24	No Rain
5	Day 6	0.82	Rain
6	Day 7	0.78	Rain
7	Day 8	0.9	Rain
8	Day 9	0.2	No Rain
9	Day 10	0.9	Rain

Figure 2: Dashboard View 2

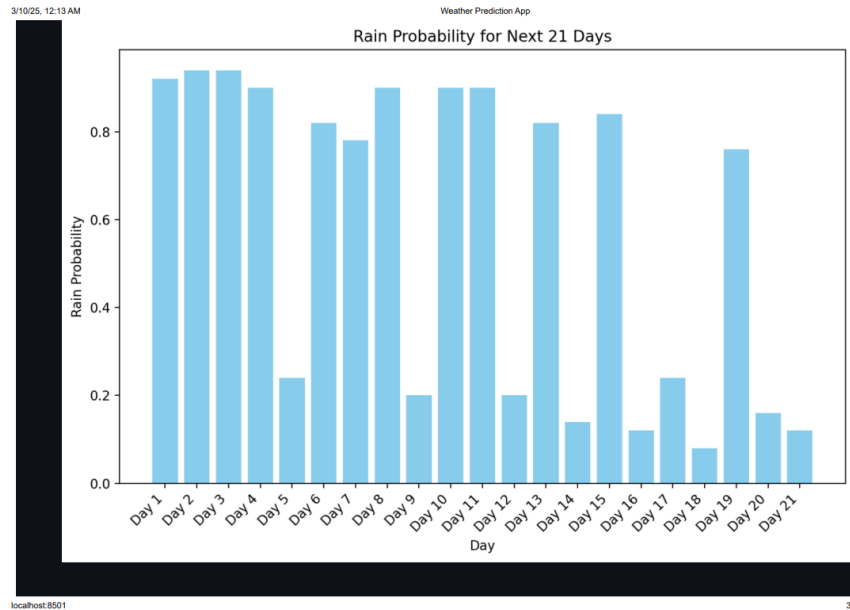


Figure 3: Dashboard View 3

7 Handling Sensor Malfunctions

The system handles sensor failures by:

- Validating data for out-of-range values.
- Using fallback values if data is missing.
- Alerting operators for continuous failures.

8 Conclusion

This system provides real-time weather predictions with daily data aggregation and robust handling of sensor malfunctions. The use of **Streamlit** and **Random Forest** ensures accurate and interactive predictions for the next 21 days.