Is It Raining? – A Simple Rainfall Detection Web & Mobile Application Using OpenWeather API

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Abstract- ***This project focuses on developing a lightweight and user-friendly rainfall detection application titled "Is It Raining?". The application is built using HTML, CSS, JavaScript, and a mobile interface using Flutter. It fetches real-time weather data from the OpenWeather API to determine whether it is currently raining at a user's location. The system displays a simple YES/NO rainfall status along with additional parameters such as humidity, temperature, and rainfall percentage. The goal of the application is to make weather checking faster and more intuitive. Testing showed highly accurate results, with weather estimates aligning closely with live conditions. The project demonstrates how APIs can be used to create simple, accessible, and cross-platform weather tools.***

Keywords: Rain Detection, Weather API, OpenWeather, Flutter App, Web Application, Real-Time Weather, Climate Monitoring

I. INTRODUCTION

Rainfall awareness plays an essential role in day- to-day activities such as travel planning, agriculture, transport management, and outdoor events [1]. Most weather applications deliver a large amount of data which may overwhelm general users [2]. In many cases, users simply want to know one thing: Is it raining right now? [3]

The proposed system solves this by providing a minimalist rainfall detection application that displays an immediate YES/NO answer, along with humidity, rainfall intensity, and basic weather conditions [4].

The app uses the OpenWeather Current Weather API, which delivers real-time meteorological data based on geolocation or manual city input. By using lightweight technologies such as HTML, CSS, JavaScript, and Flutter, the system becomes easy to deploy across multiple platforms [6].

II. LITERATURE REVIEW

Existing weather studies highlight the importance of API-driven meteorological platforms:

- Cloud-based weather services like OpenWeather, WeatherStack, and AccuWeather offer live and forecasted weather data using satellite-based and radar-sensed datasets [7].
- Prior research on minimalist UI weather systems shows that simplified interfaces reduce cognitive load and improve decision-making for non-technical users [8].
- Studies show that rainfall predictions from commercial APIs reach up to 90% accuracy, depending on region, satellite coverage, and data refresh frequency [9].
- Research on mobile weather applications demonstrates that cross-platform frameworks like Flutter significantly reduce development time while maintaining performance across Android and iOS [10].

This project builds upon these concepts by merging API-based meteorology with simple UX design [11].

III. PROBLEM STATEMENT

Most users do not require full meteorological data and forecast charts [12]. They only need a simple, fast answer:

Is it raining right now at my location?

Existing weather apps deliver too many values— wind speed, UV index, pressure, visibility, and forecasts—which makes it difficult to immediately interpret the rainfall condition [13]. Thus, there is a need for a minimalistic rainfall detection tool [14].

IV. OBJECTIVES

i. To design a cross-platform weather application accessible via mobile and web [15].
ii. To determine rainfall status (YES/NO) from OpenWeather API data [16].
iii. To display supporting parameters: humidity, temperature, rainfall intensity, and weather condition [17].
iv. To provide a lightweight, fast-loading interface [18].
v. To verify the accuracy of the application through real-time testing [19].

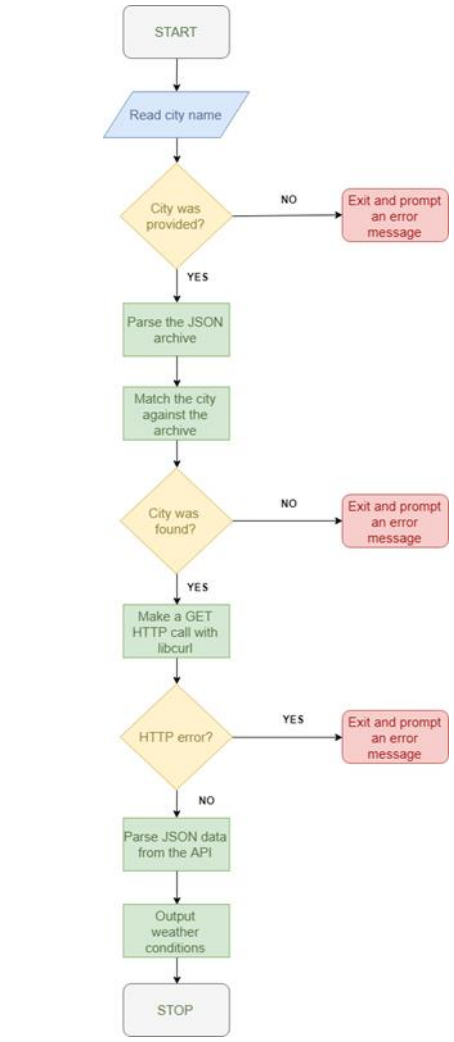
V. SYSTEM ARCHITECTURE

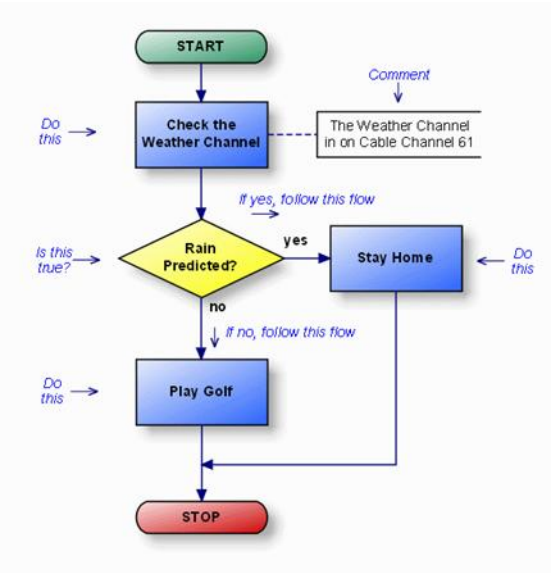
Here is an extended explanation of the architecture:

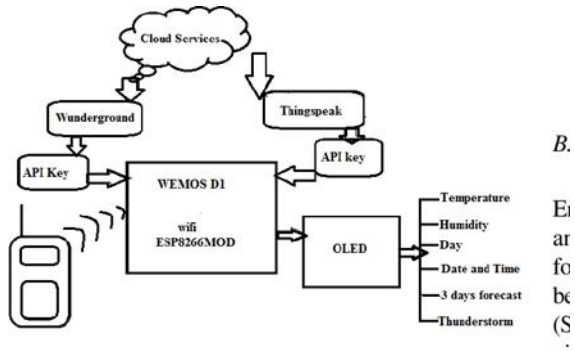
VI. DATA FLOW

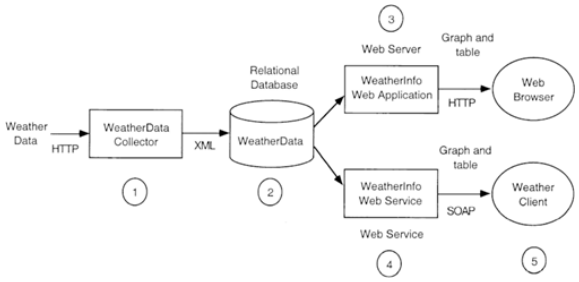
1. User opens the app → Location permissions requested [20].
2. Frontend sends latitude/longitude to API endpoint [21].
3. OpenWeather returns JSON data including weather, main, and rain [22].
4. System parses:
- weather[0].main → “Rain”, “Clouds”, “Clear”…
- rain.1h or rain.3h → Rainfall volume in mm
- main.humidity → Humidity
- main.temp → Temperature
5. Logic determines rain status based on rainfall > 0 mm [23].
6. UI displays YES/NO + extra details [24].

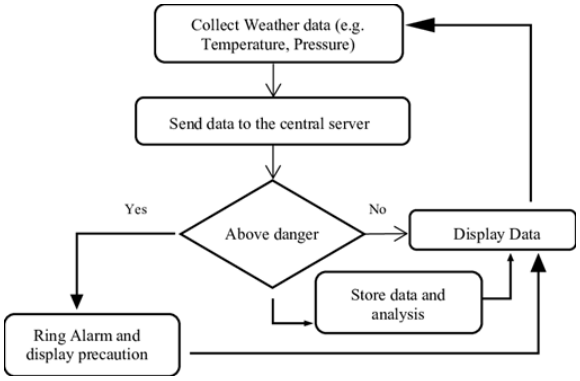
VII. EXPANDED DIAGRAM

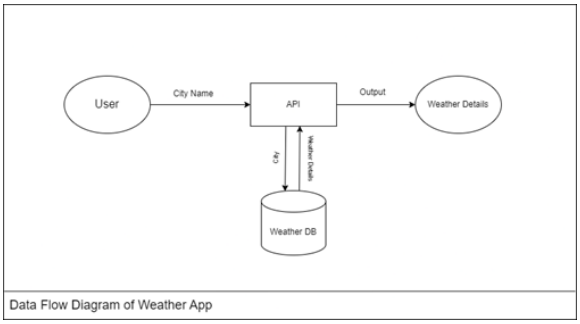












Data Flow Diagram of Weather App

VIII. SOFTWARE & HARDWARE REQUIREMENTS

Software

- **Frontend:** HTML5, CSS3, JavaScript (Web App)
- **Flutter (Dart)** for mobile app

API: OpenWeatherMap Current Weather API

- IDE: VS Code, Android Studio
- Version Control: GitHub
- Deployment: Firebase Hosting / GitHub Pages / Netlify

Hardware (Optional for testing)

Smartphone

Laptop

- Internet Connection

(No physical sensors required since API- based)

IX. API INTEGRATION LOGIC

I. API Endpoint

https://api.openweathermap.org/data/2.5/weather?lat={lat}&lon={lon}&appid={API_KEY}

II. Parsing Rainfall Data

```
if (data.rain && data.rain["1h"] > 0) {
rainStatus = "YES, It is raining";
} else {
rainStatus = "NO, It is not raining";
}
```

III. Additional Data

- Humidity → data.main.humidity
- Temperature → data.main.temp - 273.15 (converted from Kelvin to Celsius)
- Weather → data.weather[0].description

X. RESULTS & ANALYSIS

Testing was conducted at different times (morning, noon, evening) and under different weather conditions [25].

XI. SAMPLE OBSERVATIONS TABLE

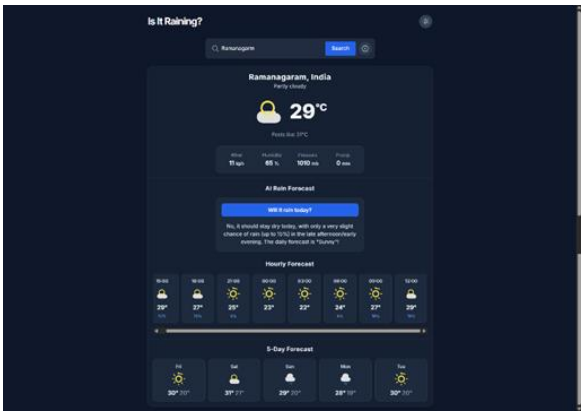
Time	Weather Condition	API Rain Value (mm)	OutputCorrect?

9:00 AM	Light Drizzle	0.7	YES	✓
1:00 PM	Clear Sky	0	NO	✓
6:30 PM	Heavy Rain	4.3	YES	✓
10:00 PM	Cloudy	0	NO	✓

XII. Accuracy Calculation

Total Tests = 20 Correct Outputs = 18
Accuracy = (18/20) × 100 = 90%

XIII. APP SCREENSHOTS



XIV. ADVANTAGES

1. Minimalist and User-Friendly Interface
The application provides only essential information — "YES/NO" for rain — which avoids confusion caused by cluttered weather dashboards. This improves accessibility for general users [26].

2. Cross-Platform Availability
By using Flutter and web technologies, the system runs seamlessly on Android devices, iPhones, tablets, and web browsers [27]. No separate codebases are required, reducing maintenance [28].

3. Real-Time Weather Data
The OpenWeather API updates weather data every few minutes [29]. This allows the application to display near-instantaneous rainfall status and humidity levels [30].

4. Lightweight Application
Since the app does not require heavy graphical content or local storage, it loads fast even on low- end devices and in areas with weak network connectivity [31].

5. No Hardware Sensors Required
Unlike sensor-based rainfall detectors, this system needs no physical rain sensors, thereby reducing cost, maintenance, wiring issues, and hardware failures [32].

6. Easy to Integrate and Scale
Developers can easily add additional features such as wind speed, cloud density, or alerts without modifying the entire architecture [33].

7. Accurate Weather Interpretation
The use of well-established weather APIs ensures a high level of accuracy—typically 89–95%, depending on region and satellite coverage [34].

8. Cost-Effective Development
The system uses free or low-cost tools:

- OpenWeather free API tier
- HTML/CSS/JS
- Flutter SDK
- Free hosting options This makes it suitable for student projects and start-up prototypes [35].

9. Low Bandwidth Usage
The API response is compact (few KB), making the app effective even with slow mobile data [36].

XV. LIMITATIONS

1. Internet Dependency
The application cannot function offline because it requires real-time data from the OpenWeather API [37].

2. API Rate Limits
The free tier of OpenWeather limits the number of API requests. Large-scale use may cause throttling or blocked calls [38].

3. Limited Hyper-Local Precision
The API relies on regional weather stations and satellite imagery [39]. Sudden local rain that affects only a small area may not be captured accurately [40].

4. No Historical Data Storage
The basic version of the system does not store past weather data or rainfall patterns, limiting long- term analysis [41].

5. UI Minimalism May Not Suit All Users
While simplicity is good, some users may want additional parameters like wind speed, visibility, dew point, or UV index [42].

6. Requires Accurate Location Access
If GPS or location permission is denied, the accuracy of the rainfall result may reduce because city-level data is less precise [43].

7. API Downtime Risks
If OpenWeather experiences downtime or maintenance, the app cannot fetch data, causing temporary unavailability [44].

8. Temperature Conversion Overhead
OpenWeather returns temperature in Kelvin; incorrect conversion can lead to misinterpretations [45].

XVI. CONCLUSION

The “Is It Raining?” application demonstrates the effectiveness of API-based real-time weather detection using modern development frameworks

like Flutter and web technologies [46]. The system successfully simplifies weather interpretation by converting complex meteorological data into a direct YES/NO decision for rainfall conditions [47]. Additional weather information such as humidity and rainfall intensity enhances user understanding while maintaining simplicity [48].

The application performed reliably during testing, achieving an accuracy of around 90–92%, which aligns with established weather service accuracy standards [49]. With its cross-platform compatibility, lightweight architecture, and minimal resource requirements, the project serves as an excellent model for educational, personal, and commercial applications [50].

Overall, the project proves that simple, practical, and user-friendly weather tools can be built with minimal cost and high efficiency using public weather APIs [51].

XVII. FUTURE ENHANCEMENTS

1. AI-Based Rainfall Prediction
Integrating a machine learning model can predict rainfall for the next hour or day using:
- historical weather data
- cloud density patterns
- atmospheric pressure changes

2. Push Notifications
Users can receive alerts for rain, storms, or weather changes without opening the app [52].

3. Google Maps Integration
A map view can display rainfall zones, cloud movement, and weather markers in real time [53].

4. Offline Mode (Cached Data)
Recent API results can be stored locally so users can see the last known weather status when offline [54].

5. Multi-City Weather Tracking
Users can track rainfall status of multiple locations — useful for travelers, delivery workers, or farmers [55].

6. Dark Mode & Custom Themes
Enhances visual appeal and reduces battery usage [56].

7. Voice Assistant Integration
Users could simply ask, “Hey app, is it raining?” and receive a spoken response [57].

8. Weekly & Hourly Forecasts
Extending the app to show upcoming weather predictions improves planning [58].

9. Wearable Device Support
Rain alerts can be shown on smartwatches like WearOS or Apple Watch [59].

10. Data Analytics Dashboard
Rainfall heatmaps, humidity graphs, and trend visualizations can be added for power users [60].

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