**SkyPulse – Global Weather Prediction & Recommendation Platform**

**1. Vision**

**SkyPulse empowers individuals, organizations, and governments to make climate-smart decisions by combining high-accuracy weather prediction with actionable, location-specific recommendations. Our goal is to turn weather data into trusted insights that help communities respond proactively to extreme events, plan activities, and optimize operations.**

**2. Problem**

**Traditional weather apps often provide generic forecasts without context, leading to:**

* **Missed opportunities in agriculture, events, or disaster preparedness.**
* **Uncertainty when planning for extreme or localized weather.**
* **Overreliance on manual interpretation of raw data.**

**SkyPulse solves this by automating the interpretation of predicted weather and validating all user inputs to ensure reliable, actionable guidance.**

**3. Solution**

**SkyPulse integrates geolocation, predictive models, and recommendations into a single workflow:**

1. **Input Validation & Parsing**
   * **Users provide country, region, city, date, and optionally predictedWeather.**
   * **System validates against country-state-city hierarchy, corrects missing or invalid inputs, and produces a structured inputsReport.**
2. **Prediction & Recommendation Engine**
   * **If predictedWeather is known: generates location-specific recommendations.**
   * **If unknown: system predicts weather using historical and current data, then recommends actions.**
   * **Recommendations are tailored to user location and risk profile.**
3. **Database Integration**
   * **Validated inputs generate optimized SQL queries with ±2 range for predictedWeather, ensuring relevant results.**
   * **Query results are returned with an inputsReport, explaining any corrections or fallback logic.**

**4. Key Technical Highlights**

* **High-Precision Geolocation: geoip-lite fallback for missing user data.**
* **Hierarchical Validation: Ensures country → region → city consistency.**
* **Resilient Input Handling: Handles empty fields, invalid dates, extreme weather values, and regions without cities.**
* **Optimized Queries: SQL queries dynamically include ranges for weather, allowing flexible and fast searches.**
* **Structured Reporting: Every request returns a clear inputsReport, making outputs auditable and trustworthy.**
* **Scalable Architecture: Modular, extensible code ready for concurrent multi-region predictions.**

**5. Impact & Innovation**

* **Global Reach: Works across any country, automatically correcting missing or inconsistent location data.**
* **Proactive Recommendations: Beyond forecasts, SkyPulse advises actions, reducing human error and reactive decision-making.**
* **Edge Case Coverage: Predicts and handles extreme weather, empty inputs, and invalid city-region combinations.**
* **Hackathon Differentiator: Combines real-time geolocation, ML-based prediction, and actionable recommendations in one platform.**

**6. Use Cases**

| **Scenario** | **Input** | **Output** |
| --- | --- | --- |
| **Planning an event in Cairo** | **{country: "Egypt", region: "Cairo", city: "Cairo", date: "2025-10-10", predictedWeather: 30}** | **inputsReport: all valid, recommendations: “Ideal day for outdoor events.”** |
| **Missing date** | **{country: "Egypt", region: "Cairo", city: "Cairo", date: "", predictedWeather: 30}** | **inputsReport: defaulted to today, recommendations generated automatically.** |
| **Unknown city** | **{country: "Egypt", region: "Cairo", city: "UnknownCity", date: "2025-10-10", predictedWeather: 30}** | **inputsReport: city corrected to Cairo, recommendations adapted.** |

**7. Edge Case Handling**

* **Empty Input: Defaults to geolocated user position.**
* **Extreme Weather Values: Flags unrealistic weather predictions.**
* **Region Without Cities: Automatically selects a top-level city or informs the user.**
* **Null Dates: Defaults to the current date.**

**8. Why SkyPulse Stands Out**

* **Technical Depth: Real-time geolocation, hierarchical validation, predictive modeling, SQL range queries, and structured reports.**
* **User Trust: InputsReport ensures transparency for all recommendations.**
* **Global Impact: Supports communities, agriculture, events, and disaster preparedness.**
* **Innovation: Combines multiple systems into a single seamless workflow, enabling actionable insights at scale.**