**1. Project Title**

Real-Time Weather Monitoring and Alert System

**2. Contributors**

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**3. Research Focus**

This project focuses on developing a real-time monitoring and alert system to track weather conditions, specifically focusing on temperature and humidity. The aim is to create a cloud-based solution that can automatically trigger alerts when weather conditions exceed specific thresholds, allowing users to take preventive action based on real-time data insights.

Key questions include:

* How can cloud services be used to automate data collection and monitoring?
* What trends can be identified in real-time weather data?
* How can alert thresholds help in proactive decision-making?

**4. Dataset Overview**

The dataset consists of real-time weather data collected from public sources or simulated data with attributes such as temperature, humidity, wind speed, and timestamp. This data will be stored in AWS S3, processed via AWS Lambda, and visualized on Amazon QuickSight.

Example fields include:

* timestamp
* temperature
* humidity
* wind\_speed

**5. Data Processing and Analysis Techniques**

**5.1 Data Collection and Storage**

* Use **AWS S3** to store real-time weather data in CSV format.
* Data files are uploaded periodically to simulate real-time data ingestion.

**5.2 Data Processing**

* An **AWS Lambda** function will be triggered upon data upload to S3.
* Lambda will process the data, checking for any predefined conditions (e.g., temperature above a certain threshold) and triggering alerts if conditions are met.

**5.3 Data Visualization**

* Use **Amazon QuickSight** to create dashboards displaying temperature, humidity, and other weather patterns over time.
* Visualizations will highlight instances where threshold limits were breached, supporting proactive decision-making.

**6. Project Development and Guidelines**

* **Data Preparation**: Develop scripts to clean and structure the data in S3 for optimal storage and processing.
* **Threshold Alert Setup**: Configure Lambda to monitor thresholds and trigger alerts if weather conditions exceed predefined values.
* **Dashboard Development**: Design interactive dashboards in QuickSight to visualize weather trends and alert history.

**7. Tools and Services**

**AWS Services**:

* **Amazon S3**: Storage for real-time data.
* **AWS Lambda**: Automated processing and alert triggers.
* **Amazon QuickSight**: Visualization and dashboard creation.

**Other Tools**:

* **AWS SNS** (optional): For sending notifications via SMS or email.
* **Amazon Athena** (optional): For querying data in S3 before loading it into QuickSight.

**8. Scalability Considerations**

This system can scale by increasing the frequency of data collection, expanding to include additional weather parameters, or integrating data from multiple locations. The use of cloud services allows easy scaling of storage, processing, and visualization resources.

**9. Project Deliverables**

* **Automated data collection system** for weather data using S3 and Lambda.
* **Threshold-based alert system** that triggers alerts in real-time.
* **Visual dashboards** in QuickSight for monitoring trends and threshold breaches.
* **Documentation** detailing the setup, process, and operation of the system.

**10. Challenges and Considerations**

* Ensuring the reliability of data sources for real-time updates.
* Managing Lambda execution time if data volume increases.
* Creating user-friendly and informative QuickSight dashboards for non-technical stakeholders.