**Title:ClimateLens-Unveiling Weather Patterns Through Data**

## **1. Problem Statement**

Weather forecasting plays a crucial role in various sectors, including agriculture, transportation, and disaster management. However, analyzing weather trends across multiple cities can be challenging without a structured data pipeline. This project aims to build a **weather data analysis system** that:

* Collects and processes weather data for multiple Indian cities over a month.
* Stores the data in an SQL database.
* Provides insights through SQL queries.
* Visualizes the results using a Streamlit dashboard with filters.

## **2. Dataset Explanation**

* **Dataset Name:** Indian Cities Weather Dataset
* **Dataset Description:** Contains daily weather data for 30 cities in India over a 30-day period.
* **Features Included:**
  + Date
  + City
  + Temperature (°C)
  + Humidity (%)
  + Wind Speed (km/h)
  + Precipitation (mm)
  + Pressure (hPa)
  + Cloud Cover (%)
  + Visibility (km)
  + Weather Condition
* **Dataset Link:** [india\_weather\_data](https://docs.google.com/spreadsheets/d/1ssBZZlfrgKt9vkna9zfbAr1QDEmGsDCY6ACeLtygtYg/edit?usp=sharing)

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## **3. Approach**

### **Step-by-Step Execution**

1. **Read the dataset using Pandas.**
2. **Handle missing values** using multiple techniques (mean, mode, bfill, ffill, etc.).
3. **Fill missing temperature values for Mumbai** with its mean temperature.
4. **Rename columns** using different Pandas methods.
5. **Establish SQL connections** using multiple libraries (SQLite, MySQL, PostgreSQL, etc.).
6. **Create an SQL database** and **store the dataset** in a table.
7. **Insert data using different approaches** (to\_list, to\_tuple, iterrows, executemany, etc.).
8. **Run SQL queries** to extract key insights.
9. **Develop a Streamlit app** for interactive data visualization and querying.

## **4. Skills Takeaways**

* **Python:** Pandas, Streamlit, SQLAlchemy
* **Data Handling:** Null value treatment, column renaming
* **SQL:** Querying, database creation, data insertion
* **Web Development:** Streamlit-based dashboard
* **Data Visualization:** Displaying SQL query results in an interactive interface

## **5. Results**

The project successfully:

* Processed and cleaned weather data.
* Stored the dataset in an SQL database.
* Provided analytical insights through SQL queries.
* Created an interactive dashboard for visualization and filtering.

## **6. 10 SQL Questions and Queries**

1. **What is the average temperature in each city?**
2. **What was the hottest and coldest day?**
3. **Which days had the highest precipitation?**
4. **Which cities have an average humidity above 80%?**
5. **What is the monthly average wind speed for each city?**
6. **Which city experienced the highest temperature fluctuation?**
7. **Which city had the most rainy days?**
8. **Find the city with the lowest average visibility.**
9. **How does temperature correlate with humidity?**
10. **Find the city with the highest pressure variation over the month.**

## **7. Project Deliverables**

* **Cleaned Weather Dataset** (CSV/Excel)
* **SQL Database with Stored Data**
* **Python Scripts for Data Processing and SQL Operations**
* **Streamlit Dashboard for Data Visualization**
* **Documentation with Queries and Insights**

## **8. Project Guidelines**

* Use Pandas to handle missing values efficiently.
* Ensure SQL compatibility across multiple database engines.
* Optimize queries for better performance.
* Make the Streamlit dashboard user-friendly and interactive.
* Follow best coding practices and documentation standards.

## **9. Business Use Cases**

* **Agriculture:** Helps farmers plan irrigation based on weather conditions.
* **Transportation:** Assists airlines and logistics companies in route optimization.
* **Disaster Management:** Identifies extreme weather patterns for early warning systems.
* **Energy Sector:** Aids power companies in demand forecasting based on temperature fluctuations.
* **Tourism:** Helps travelers plan trips based on historical weather trends.

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## **10. Technical Tags**

Python, Pandas, SQL, Streamlit, WeatherAnalysis

## **11. Reference.**

| Recoding in English | [Project Excellence Series: Guided Learning & Problem Solving [Python & SQL](English)](https://docs.google.com/document/d/1hj9s5C9mylUEQR7E9kcfuKyICr3sQ9T7YDuE3LnRZYQ/edit?usp=sharing) |
| --- | --- |
| Recording in Tamil | [Project Excellence Series: Guided Learning & Problem Solving [Python & SQL](English)](https://docs.google.com/document/d/1hj9s5C9mylUEQR7E9kcfuKyICr3sQ9T7YDuE3LnRZYQ/edit?usp=sharing) |
| Streamlit recording Tamil | <https://us06web.zoom.us/rec/share/JTr7DywhE1-SarjyIHBSCn4qnl7_uvJH6IGk06qAlkE0Ny1o_rqcq5FRFKuo93dm.iyM2o6l0h9aTUkNE> |
| Streamlit recording English | [Special session for STREAMLIT(11/08/2024)](https://docs.google.com/document/d/1aR3pUZFlCi8gicpF6aPHPESeFdOtGMlfob5PckresZk/edit?usp=sharing) |
| Streamlit doc | <https://30days.streamlit.app/>  [Install Streamlit](https://docs.streamlit.io/get-started/installation) |
| Reference coding file Tamil | <https://colab.research.google.com/drive/1rk2g12qKNAsey61xjxaTc5MSxaZjMd0X> |
| Reference coding file English | [weather.ipynb](https://drive.google.com/file/d/1QXPW7AUlg7NxHE8Jf2Guar5u3d-B5Bca/view?usp=sharing) |
| Dataset | [india\_weather\_data](https://docs.google.com/spreadsheets/d/1ssBZZlfrgKt9vkna9zfbAr1QDEmGsDCY6ACeLtygtYg/edit?usp=sharing) |