Algorithms and Software Concepts final Project: Comprehensive Weather Analysis

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Project Overview

In this collaborative project, pairs of students will analyze datasets containing weather information for multiple cities, specifically in Paris. The datasets include maximum and minimum temperatures, precipitation, wind speed, humidity, and cloud cover. Additionally, the Paris dataset incorporates climate change-related factors, including CO2 levels and rising sea levels. The overarching goal is to gain insights into the impact of weather patterns and climate change and leverage this knowledge in creating a startup.

Each pair of students will perform data analysis and create visualizations. Moreover, they will collaboratively develop a startup concept to raise awareness about climate change. The project encourages creativity, collaboration, and applying technical skills to address real-world challenges.

Project Tasks

Task 1: Data Loading and Inspection

1. Load the provided dataset for Paris and multiple cities.

Task 2: City-wise Analysis

1. For each city, calculate and display the following statistics:

   - Average temperatures.
   - Total precipitation.
   - Maximum and minimum wind speed.

Task 3: Visualization

1. Make a plot showing the temperature over time for each city.

2. Create a bar chart to compare the average temperatures for different cities.

Task 4: Conditional Statements

1. Implement a function that categorizes a day as 'Cold,' 'Moderate,' or 'Warm' based on the average temperature for a selected city. Apply this function to every city and display the results.

2. Implement a Python function that identifies a selected city's hottest and coldest days based on maximum and minimum temperatures.

3. Apply this function to every city in the dataset and display the dates and temperature details for the hottest and coldest days.

4. Discuss potential factors contributing to extreme temperatures in each city.

5. Calculate the overall hottest day considering the maximum temperatures across all ten cities and Identify the date and temperature details of this hottest day.

6. Do the same for the coldest day

Task 5: Climate Change Impact Analysis

1. Load the provided dataset for the city of Paris.

2. Use Matplotlib to create visualizations to illustrate the relationship between temperature, precipitation, and climate change factors.

3. Explore the correlation between weather variables (temperature, precipitation) and climate change factors (CO_2 levels, sea level rise).

Task 6: User Interaction

1. Implement a user interface that allows the user to input a city name and view the weather statistics for that city.

2. Implement error handling to handle cases where the user inputs an invalid city name.

Deliverables

- A well-documented Python code for each task.

- Clearly labeled visualizations with appropriate titles and axis labels.

- A user-friendly interface for inputting a city name and viewing weather statistics.