Project Report: Weather Data Analysis

# Overview

This project involves analyzing weather data using various pandas operations to derive insights and statistics. The dataset consists of weather-related columns such as Wind Speed, Visibility, Pressure, Relative Humidity, and Weather Condition.

**Analysis Results:**

1. **Unique 'Wind Speed' Values**  
   The data contains a variety of unique wind speeds. These wind speeds represent the different velocities at which the wind was recorded during the period covered by the dataset.
2. **Occurrences of Clear Weather**  
   The dataset records the number of instances where the weather was exactly clear. This allows us to understand how frequently clear weather conditions occurred.
3. **Occurrences of 4 km/h Wind Speed**  
   The number of times when the wind speed was exactly 4 km/h is recorded. This can be useful for identifying how often specific wind speeds were measured.
4. **Null Values in the Data**  
   The dataset was checked for any missing values (null values). This is a critical step in data preprocessing to ensure the quality of the data used for analysis.
5. **Column Renaming**  
   The column name 'Weather' was renamed to 'Weather Condition' to provide better clarity and consistency in the dataset.
6. **Mean Visibility**  
   The mean value of visibility was calculated, giving an average measure of how far one could see during the recorded weather conditions.
7. **Standard Deviation of Pressure**  
   The standard deviation of the pressure data was determined, showing the amount of variation in atmospheric pressure readings throughout the dataset.
8. **Variance of Relative Humidity**  
   The variance of relative humidity was computed, which quantifies the variability of humidity levels in the data.
9. **Instances of Snow**  
   All instances where snow was recorded were identified. This helps to track snow-related weather conditions in the dataset.
10. **Wind Speed Above 24 and Visibility at 25**  
    All records where the wind speed was above 24 km/h and the visibility was exactly 25 were extracted. This is useful for identifying harsh weather conditions where visibility was still relatively good.
11. **Mean Values per Weather Condition**  
    For each weather condition, the mean value of each numerical column was computed. This provides insights into how different weather conditions correlate with factors like wind speed, visibility, pressure, and humidity.
12. **Minimum & Maximum Values per Weather Condition**  
    The minimum and maximum values of each column were calculated against each weather condition. This reveals the extreme measurements for each weather scenario.
13. **Records Where Weather Condition is Fog**  
    All records where the weather condition was fog were filtered. Fog is an important weather condition for visibility-related insights.
14. **Weather is Clear or Visibility Above 40**  
    Instances where either the weather was clear or the visibility was above 40 were identified. This captures favorable conditions for visibility, either due to clear skies or high visibility levels.
15. **Conditions for Clear Weather and High Humidity or High Visibility**  
    All instances were found where the weather was clear and the relative humidity was greater than 50, or the visibility was above 40. This is helpful to understand when clear weather coincides with either high humidity or excellent visibility conditions.