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Exp 8: Designing Interactive Dashboards and Storytelling using D3.js on Environment/Forest Cover Dataset

Aim:

To design interactive dashboards and create visual storytelling using D3.js on a dataset related to Environment/Forest cover, covering basic and advanced charts.

Objectives:

1. To understand how to use D3.js for data visualization.
2. To implement basic charts like Bar chart, Pie chart, Histogram, Timeline chart, Scatter plot, and Bubble plot.
3. To implement advanced charts like Word chart, Box and whisker plot, Violin plot, Regression plot (linear and nonlinear), 3D chart, and Jitter.
4. To draw observations and insights from each chart.
5. To create an interactive storytelling dashboard using the above visualizations.

Dataset Description

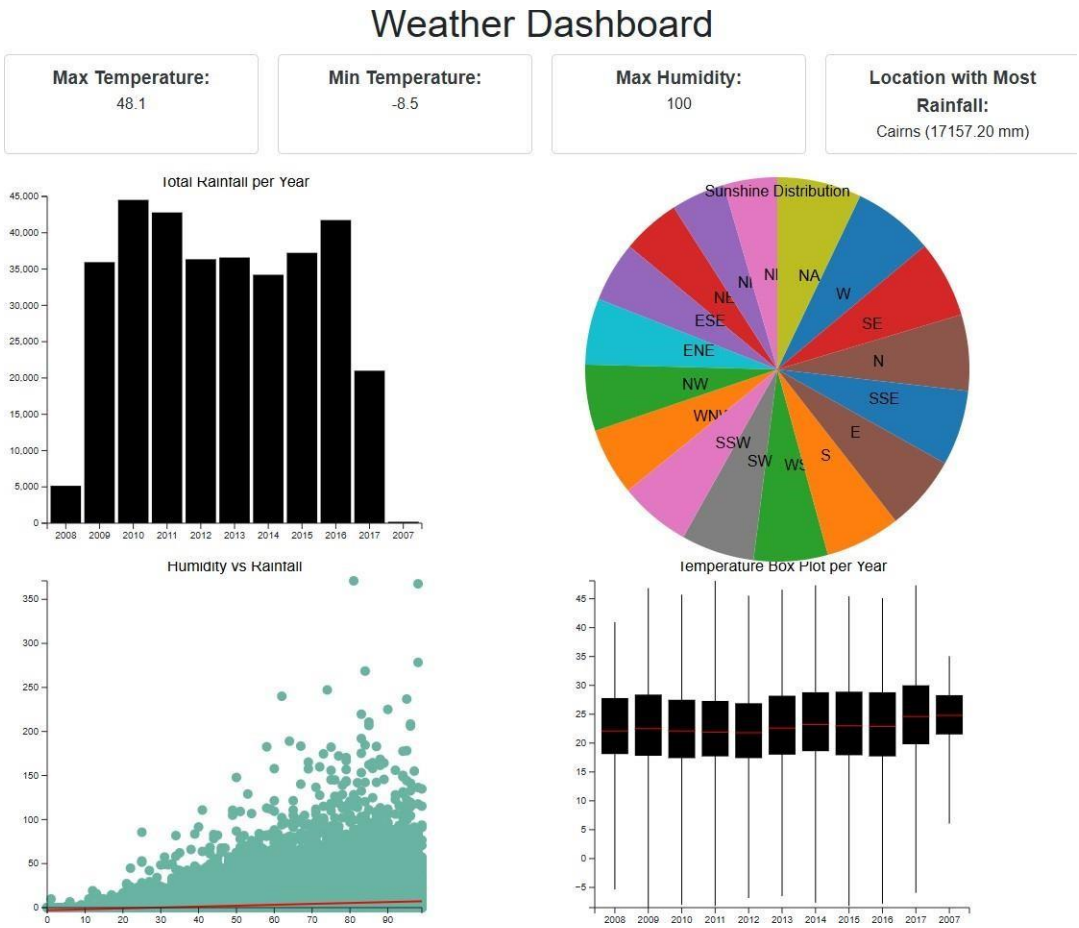
Variables/Columns

1. Date
   - Type: Date
   - Description: The date of the recorded weather data in `YYYY-MM-DD` format. This field is used to analyze trends over time.
2. Location
   - Type: Categorical
   - Description: The geographical location (city, region) where the weather data was collected. This allows for geographical comparisons.
3. MinTemp
   - Type: Numeric (Float)
   - Description: The minimum temperature recorded for the day, measured in degrees Celsius. This parameter is useful for analyzing cold spells and temperature trends.
4. MaxTemp

- Type: Numeric (Float)
- Description: The maximum temperature recorded for the day, measured in degrees Celsius. Important for assessing heatwaves and daily temperature fluctuations.

5. Rainfall
   - Type: Numeric (Float)
   - Description: The total amount of rainfall measured in millimeters (mm) over the day. This data helps in understanding precipitation patterns and potential flooding events.
6. Humidity3pm
   - Type: Numeric (Float)
   - Description: The relative humidity percentage recorded at 3 PM local time. This variable is crucial for studying the effects of humidity on comfort levels and weather forecasting.
7. WindGustSpeed
   - Type: Numeric (Float)
   - Description: The maximum wind gust speed recorded for the day, measured in kilometers per hour (km/h). This data is important for analyzing wind patterns and potential storm conditions.
8. WindGustDir
   - Type: Categorical
   - Description: The direction of the maximum wind gust, represented as compass directions (e.g., N, NE, E, SE, S, SW, W, NW). This helps in understanding wind patterns and their impact on weather conditions.

Output:



Questions Addressed by the Visualizations:

1. **What is the trend in total rainfall per year?**
    - The bar chart allows viewers to see how total rainfall varies from year to year, identifying years with significant rainfall and potential drought years.
2. **What is the relationship between humidity and rainfall?**
    - The scatter plot provides insights into how humidity levels correlate with rainfall amounts, revealing patterns or trends in weather behavior.
3. **What are the maximum and minimum temperatures recorded?**
    - The KPI box highlights the extremes of temperature for the dataset, offering a quick reference for understanding temperature variability.
4. **Where is the location with the most rainfall recorded?**
    - The KPI box indicates the location with the highest recorded rainfall, which can help in understanding geographical rainfall distribution.
5. **What is the distribution of sunshine across different wind gust directions?**
    - The pie chart illustrates the proportion of different wind gust directions, indicating which directions are more common, potentially influencing weather patterns.
6. **How does the temperature vary throughout the years?**
    - The box plot provides a summary of the distribution of temperatures over the years, showcasing the median, quartiles, and outliers, helping to identify any significant variations or trends in temperature.

Additional Questions:

7. **Are there any outliers in rainfall or temperature data?**
    - By examining the box plots and scatter plots, one can identify potential outliers that may indicate unusual weather events.
8. **How does maximum humidity correlate with rainfall?**
    - While not directly visualized in the current charts, further analysis could explore how humidity levels impact rainfall amounts.
9. **Is there a seasonal pattern in humidity and rainfall?**
    - If the data were broken down by month or season, additional questions about seasonal trends could be explored.
10. **How consistent are the temperature readings across the years?**
    - The box plot provides insight into the consistency of temperature readings, helping to identify if there are fluctuations that could indicate climate changes.

Conclusion:

The weather dashboard provides a comprehensive overview of various meteorological parameters, allowing for a thorough analysis of historical weather patterns. By visualizing the data through various charts, such as bar charts, scatter plots, pie charts, and box plots, we gain valuable insights into the relationships and trends among temperature, humidity, and rainfall.