**Classification Report**

#### **1. Introduction**

* **Dataset Description**: Describe the weather\_classification\_data.csv dataset, including features like Temperature, Humidity, Wind Speed, and the target variable Weather Type.
* **Objective**: State the objective of the analysis, which is to classify weather types based on the provided features using various classification algorithms.

#### **2. Data Cleaning and Preparation**

* **Loading the Data**: Load the dataset using pandas and display the first few rows to understand its structure.
* **Handling Missing Values**:
  + Identify and print the missing values for each column.
  + For numerical columns, fill missing values with the mean of that column.
  + For categorical columns, fill missing values with the mode (most frequent value).
* **Encoding Categorical Variables**: Convert categorical features into numerical values using Label Encoding.
* **Scaling Numerical Features**: Standardise numerical features using StandardScaler to normalise the data.

#### **3. Data Analysis and Visualization**

* **Summary Statistics**: Generate and display summary statistics (mean, median, standard deviation, etc.) of the dataset.
* **Histograms**: Create histograms to visualise the distribution of numerical features.
* **Scatter Plots**: Generate scatter plots to explore relationships between pairs of features.
* **Box Plots**: Use box plots to visualise the distribution of features and identify outliers.
* **Correlation Heatmaps**: Create a heatmap to show the correlation between numerical features.

#### **4. Model Building**

* **Splitting Data**: Split the data into training and testing sets.
* **Applying Classification Models**:
  + **Logistic Regression**: Train and evaluate a Logistic Regression model.
  + **Decision Tree**: Train and evaluate a Decision Tree Classifier.
  + **Random Forest**: Train and evaluate a Random Forest Classifier.

#### **5. Model Evaluation**

* **Classification Reports**: Generate classification reports for each model to evaluate performance metrics like accuracy, precision, recall, and F1-score.
* **Performance Comparison**:
  + Create a DataFrame to compare the performance of different models.
  + Plot a bar chart to visualise the comparison of model performance.

#### **6. Conclusion**

* **Summary of Findings**: Summarise the findings from the classification models, including the strengths and weaknesses of each model.
* **Future Work**: Suggest possible improvements, such as tuning hyperparameters, exploring additional features, or trying other classification algorithms.

I am also adding the graphs made from the visualisation codes:





