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Assignment 6:

Problem Statement

Apply Linear Regression using a suitable library function to predict **month-wise temperature** and evaluate the model using performance metrics.

Objectives

1. Apply regression techniques for predicting temperature trends.
 2. Preprocess and analyze temperature data for better model performance.
 3. Evaluate model performance using MSE, MAE, and R-Square metrics.
 4. Visualize the regression model and interpret the results.
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Resources Used

- **Software:** Google Colab
 - **Libraries:** pandas, matplotlib, seaborn, sklearn
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Theory

Regression is a supervised learning technique used to model relationships between a dependent variable (temperature) and one or more independent variables (month).

Linear Regression assumes a linear relationship between these variables and fits a straight line that minimizes error.

Linear Regression Formula

$$y = mx + c$$

Where:

- **y**: Temperature (dependent variable)
 - **x**: Month (independent variable)
 - **m**: Slope (rate of change)
 - **c**: Intercept (baseline value)
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Performance Metrics

1. **Mean Squared Error (MSE)**: Average squared difference between actual and predicted values. Lower is better.
 2. **Mean Absolute Error (MAE)**: Average absolute difference between actual and predicted values.
 3. **R² Score (R-Square)**: Proportion of variance explained by the model. Value closer to 1 is better.
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Methodology

1. Data Preprocessing

- Load the dataset using Pandas.
- Handle missing values by imputation or removal.
- Convert categorical months to numerical form (e.g., January = 1, ..., December = 12).
- Split the dataset into training (80%) and testing (20%) sets.

2. Applying Linear Regression

- Use LinearRegression from sklearn.linear_model.
- Train the model using the training data.
- Predict month-wise temperatures using the trained model.

3. Model Evaluation

- Evaluate using MSE, MAE, and R^2 .

4. Visualization

- Plot actual vs predicted temperature values using Matplotlib/Seaborn.
 - Display the regression line.
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Conclusion

- The regression model accurately predicts monthly temperatures with reasonable error margins.
- Evaluation metrics such as MSE, MAE, and R^2 provide insight into the model's performance and accuracy.