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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. To apply regression techniques for predicting temperature trends.
2. To preprocess and analyze temperature data for better model performance.
3. To evaluate model performance using MSE, MAE, and R-Square metrics.
4. To visualize the regression model and interpret the results.

**Resources used:**

1. Software used: Visual Studio Code
2. Libraries used: Pandas, Matplotlib, Seaborn, SKLearn

**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 errors.

### Linear Regression Formula:

### y=mx+c

### Where:

### y is the dependent variable (Temperature)

### x is the independent variable (Month)

### m is the slope (rate of change)

### c is the intercept (baseline value)

1. **Mean Squared Error (MSE):** Measures the average squared differences between actual and predicted values. Lower values indicate better performance.
2. **Mean Absolute Error (MAE):** Measures the average absolute differences between actual and predicted values.
3. **R-Square (R²):** Represents the proportion of variance explained by the model. Closer to 1 indicates a better fit.

**Methodology:**

### Data Preprocessing

* Load the dataset using Pandas.
* Handle missing values by imputation or removal.
* Convert categorical month values into numerical form (e.g., January = 1, February = 2, etc.).
* Split the dataset into training (80%) and testing (20%) sets.

### Applying Linear Regression

* Use LinearRegression from sklearn.linear\_model to fit the model.
* Train the model on the dataset.
* Predict temperature values for each month.

### Model Evaluation

* Compute MSE, MAE, and R² scores to assess model performance.

### Visualization

* Plot actual vs. predicted temperature values using Matplotlib/Seaborn.
* Display the regression line over the dataset.

**Conclusion:**

* The regression model effectively predicts monthly temperatures with a reasonable error margin.
* The evaluation metrics provide insight into model accuracy.