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Mata Kuliah   : Metode Numerik

Tugas Aplikasi Regresi

Regresi Linear dan Eksponensial

Source Code

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from scipy.optimize import curve_fit

# Import data diambil dari kaggle, Jumlah latihan soal (NL) dan Nilai ujian
siswa (NT)
NL = np.array([1, 2, 2, 2, 5, 6, 6, 6])
NT = np.array([91, 65, 45, 36, 66, 61, 63, 42])

# Exponential Regression
X = NL.reshape(-1, 1)
y = NT
log_y = np.log(y)
exponential_model = LinearRegression()
exponential_model.fit(X, log_y)
log_y_pred = exponential_model.predict(X)
y_pred_exponential = np.exp(log_y_pred)
rms_error_exponential = np.sqrt(np.mean((y - y_pred_exponential) ** 2))
print("Galat RMS (Exponential Regression):", rms_error_exponential)

def test_regression_exponential():
    assert isinstance(rms_error_exponential, float), "Invalid linear RMS
error"
    assert len(y_pred_exponential) == len(NL), "Linear prediction does not
match the number of data points"
    print("All Exponential Regression tests passed.")

test_regression_exponential()

# Linear Regression
def linear_regression(x, m, c):
    return m * x + c

popt, pcov = curve_fit(linear_regression, NL, NT)

m, c = popt

y_pred_linear = linear_regression(NL, m, c)
rms_error_linear = np.sqrt(np.mean((NT - y_pred_linear) ** 2))
print("Galat RMS (Linear Regression):", rms_error_linear)
```

```
def test_regression_liner():
    assert isinstance(rms_error_linear, float), "Invalid linear RMS error"
    assert len(y_pred_linear) == len(NL), "Linear prediction does not match
the number of data points"
    print("All Regerssion Linear tests passed.")

test_regression_liner()

# Plotting the graph
plt.scatter(NL, NT, label='Original Data')

# Plot Exponential Regression
plt.plot(NL,   y_pred_exponential,   color='green',   label='Exponential
Regression')

# Plot Linear Regression
plt.plot(NL, y_pred_linear, color='red', label='Linear Regression')

plt.xlabel('Number of Exercises (NL)')
plt.ylabel('Test Scores (NT)')
plt.legend()
plt.title('Relationship between Number of Exercises and Test Scores\n')
plt.show()
```
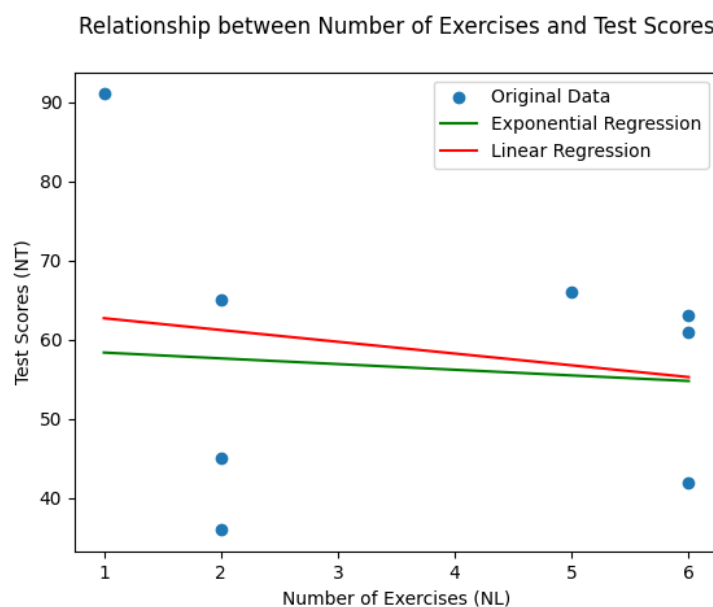
Output


```
PS C:\Users\Lenovo> & C:/Users/Lenovo/AppData/Local/Mic
Galat RMS (Exponential Regression): 16.303813962290363
All Exponential Regression tests passed.
Galat RMS (Linear Regression): 16.077906180973287
All Regerssion Linear tests passed.
```

Graph

Analisis Hasil

Grafik yang dihasilkan menunjukkan hubungan antara jumlah latihan soal (NL) dan nilai ujian siswa (NT) dengan dua model regresi, yaitu regresi eksponensial dan regresi linear. Titik-titik biru pada grafik mewakili data asli, jumlah latihan soal dan nilai ujian siswa, yang diambil dari kaggle. Garis hijau mewakili model regresi eksponensial dan garis merah mewakili model regresi linear.

Berdasarkan grafik yang dihasilkan, kedua model regresi menggambarkan penurunan pada nilai ujian seiring bertambahnya jumlah latihan soal. Jika melihat dari nilai Galat RMS dari kedua model, model regresi linear lebih akurat dibandingkan regresi eksponensial.