

colab.research.google.com/drive/1SdqBf8cPKJS7sJgrzuUM-Os1HcENosz?authuser=1#scrollTo=olp9svLobhTd

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```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
np.random.seed(0)
X = 2 * np.random.rand(100, 1)
y = 4 + 3 * X + np.random.randn(100, 1)
print("Data generated successfully!")
mean_x = np.mean(X)
mean_y = np.mean(y)
n = len(X)
m = np.sum((X - mean_x) * (y - mean_y)) / np.sum((X - mean_x) ** 2)
c = mean_y - m * mean_x
print("\n--- Manual Calculation ---")
print(f"Slope (m): {m:.4f}")
print(f"Intercept (c): {c:.4f}")
y_pred = m * X + c
plt.figure(figsize=(8, 6))
plt.scatter(X, y, color='blue', label='Data Points')
plt.plot(X, y_pred, color='red', label='Best Fit Line', linewidth=2)
plt.title("Linear Regression (Least Squares Method)")
plt.xlabel("X")
plt.ylabel("Y")
plt.legend()
plt.grid(True)
plt.show()
model = LinearRegression()
model.fit(X, y)
print("\n--- Verification with Scikit-learn ---")
print(f"Slope (m): {model.coef_[0][0]:.4f}")
print(f"Intercept (c): {model.intercept_[0]:.4f}")
print("Both values are nearly identical to the manual calculation.")
```

Variables Terminal

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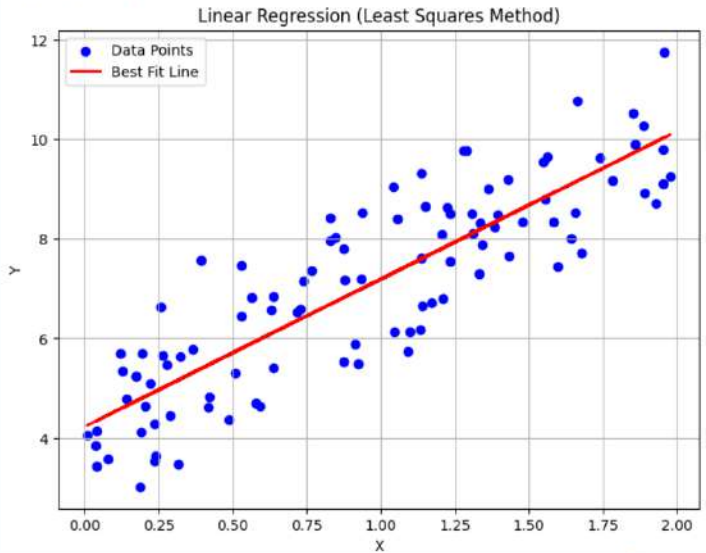
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...
--- Manual Calculation ---
slope (m): 2.9685
Intercept (c): 4.2222

Linear Regression (Least Squares Method)



The figure is a scatter plot titled "Linear Regression (Least Squares Method)". The x-axis is labeled "X" and ranges from 0.00 to 2.00 with major ticks every 0.25. The y-axis is labeled "Y" and ranges from 4 to 12 with major ticks every 2 units. The plot contains numerous blue circular data points that show a positive linear correlation. A solid red line, representing the "Best Fit Line", is drawn through the data points. The line starts at an intercept of approximately 4.22 on the y-axis and has a positive slope, ending at approximately 10.2 on the y-axis when x is 2.00. A legend in the top-left corner of the plot area identifies the blue dots as "Data Points" and the red line as "Best Fit Line".

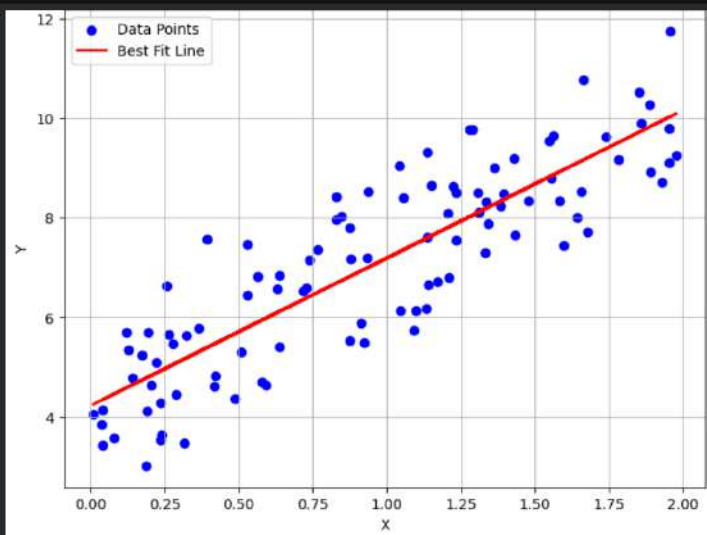
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```
--- Verification with Scikit-Learn ---
Slope (m): 2.9685
Intercept (c): 4.2222
✅ Both values are nearly identical to the manual calculation.
```