```
# Import necessary libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
```

```
# Load the dataset
data = pd.read_csv("customer_churn_dataset-testing-master[1].csv")

# Display first few rows
print("First 5 rows of dataset:")
print(data.head())

# Check for missing values and data types
print("\nDataset Info:")
print(data.info())

# Summary statistics
print("\nSummary Statistics:")
print(data.describe())
```

```
First 5 rows of dataset:
   CustomerID  Age  Gender  Tenure  Usage Frequency  Support Calls  \
0           1   22  Female      25               14              4
1           2   41  Female      28               28              7
2           3   47    Male      27               10              2
3           4   35    Male       9               12              5
4           5   53  Female      58               24              9

   Payment Delay Subscription Type Contract Length  Total Spend  \
0             27             Basic         Monthly          598
1             13          Standard         Monthly          584
2             29           Premium          Annual          757
3             17           Premium       Quarterly          232
4              2          Standard          Annual          533

   Last Interaction  Churn
0                 9      1
1                20      0
2                21      0
3                18      0
4                18      0

Dataset Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 64374 entries, 0 to 64373
Data columns (total 12 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   CustomerID         64374 non-null  int64
 1   Age                64374 non-null  int64
 2   Gender             64374 non-null  object
 3   Tenure             64374 non-null  int64
 4   Usage Frequency    64374 non-null  int64
 5   Support Calls      64374 non-null  int64
 6   Payment Delay      64374 non-null  int64
 7   Subscription Type  64374 non-null  object
 8   Contract Length    64374 non-null  object
 9   Total Spend        64374 non-null  int64
 10  Last Interaction   64374 non-null  int64
 11  Churn              64374 non-null  int64
dtypes: int64(9), object(3)
memory usage: 5.9+ MB
None

Summary Statistics:
         CustomerID           Age        Tenure  Usage Frequency  \
count  64374.000000  64374.000000  64374.000000     64374.000000
```

```
mean   32187.500000     41.970982     31.994827        15.080234
std    18583.317451     13.924911     17.098234         8.816470
min        1.000000     18.000000      1.000000         1.000000
25%    16094.250000     30.000000     18.000000         7.000000
50%    32187.500000     42.000000     33.000000        15.000000
75%    48280.750000     54.000000     47.000000        23.000000
max    64374.000000     65.000000     60.000000        30.000000

       Support Calls  Payment Delay   Total Spend  Last Interaction  \
count   64374.000000   64374.000000  64374.000000      64374.000000
```

```
X = data[['Tenure']]   # independent variable
y = data['Total Spend']   # dependent variable
```

```
# Split data into 80% training and 20% testing
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

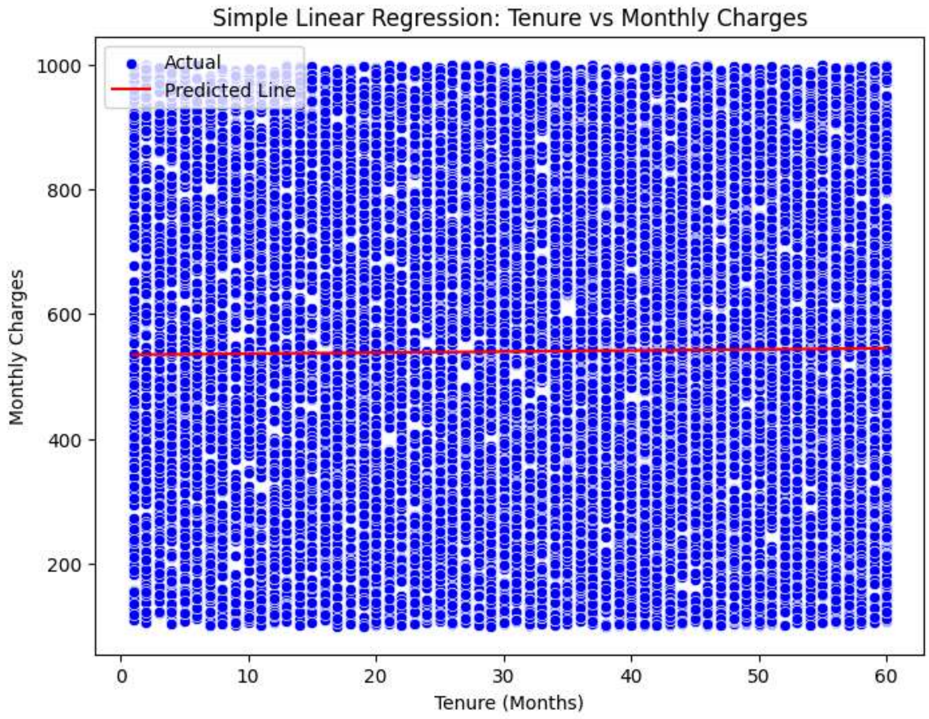
```
# Create and train the model
model = LinearRegression()
model.fit(X_train, y_train)

# Get coefficients
print("Intercept (b0):", model.intercept_)
print("Slope (b1):", model.coef_[0])
```

```
Intercept (b0): 534.883464580102
Slope (b1): 0.175090532919694
```

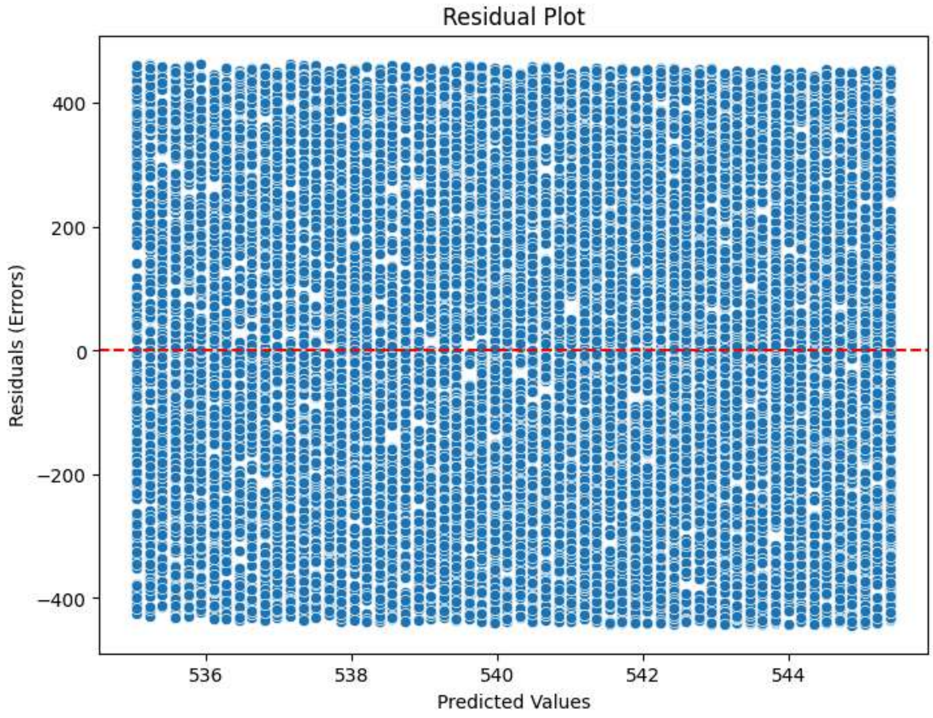
```
# Predict on test data
y_pred = model.predict(X_test)

# Compare actual vs predicted
comparison = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
print(comparison.head())
```

```
       Actual   Predicted
15476     635  538.385275
34666     631  539.610909
50474     314  545.388897
7984      527  543.112720
20227     236  544.688534
```

```
# Scatter plot with regression line
plt.figure(figsize=(8,6))
sns.scatterplot(x=X_test.squeeze(), y=y_test, color='blue', label='Actual')
sns.lineplot(x=X_test.squeeze(), y=y_pred, color='red', label='Predicted Line')
plt.title("Simple Linear Regression: Tenure vs Monthly Charges")
plt.xlabel("Tenure (Months)")
plt.ylabel("Monthly Charges")
plt.legend()
plt.show()
```



```
# Plot residuals
residuals = y_test - y_pred
plt.figure(figsize=(8,6))
sns.scatterplot(x=y_pred, y=residuals)
plt.axhline(0, color='red', linestyle='--')
plt.title("Residual Plot")
plt.xlabel("Predicted Values")
plt.ylabel("Residuals (Errors)")
plt.show()
```



```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
# Evaluate model performance
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print("Mean Squared Error:", mse)
print("R-squared Score:", r2)
```

```
Mean Squared Error: 68233.63038286162
R-squared Score: -0.00020630155329692812
```