**2311100**

**Startup 50**

**Interpretations Simple Linear Regression Analysis**

**Model Overview**: Simple Linear Regression model performed to evaluate the relationship between Marketing Spend (independent variable) and Profit (dependent variable). The dataset was split into training and testing sets, with 80% of data used for training the model and 20% reserved for testing.

**Model Parameters:**

**a) Intercept (𝛽0) = 48923.31**, which indicates that if Marketing Spend is 0, the predicted Profit would be 48923.31 units. This represents the baseline profit when no marketing investment is made.

**b) R-Squared = -0.11**, which indicates that the model does not explain the variance in Profit effectively. In fact, the negative value suggests that the model performs worse than a simple mean-based prediction for the dependent variable. This may indicate that Marketing Spend alone is not a significant predictor of Profit in this dataset.

------------------------------------------------------------------------------------------------------------------------

**Multiple Linear Regression Analysis**

**Model Overview**: Multiple Linear Regression is used to predict Profit based on R&D Spend, Administration, Marketing Spend, and State. The dataset was processed, with categorical variables (State) encoded into numerical form to ensure compatibility with the regression model.

**Model Parameters**

**a) Intercept (𝛽0) = 54080.72**, indicating that if all independent variables (R&D Spend, Administration, Marketing Spend, and the encoded State variables) are zero, the model predicts a baseline profit of approximately 54080.72 units.

**b) R-Squared value = 0.9001**, which means that the independent variables collectively explain 90.01% of the variability in Profit. This indicates a strong relationship between the predictors and the target variable.

**c) Mean Squared Error = 80929465.4910**, which represents the average squared difference between the actual and predicted profits. While this number provides insight into the model's error magnitude, its interpretation depends on the scale of the target variable.