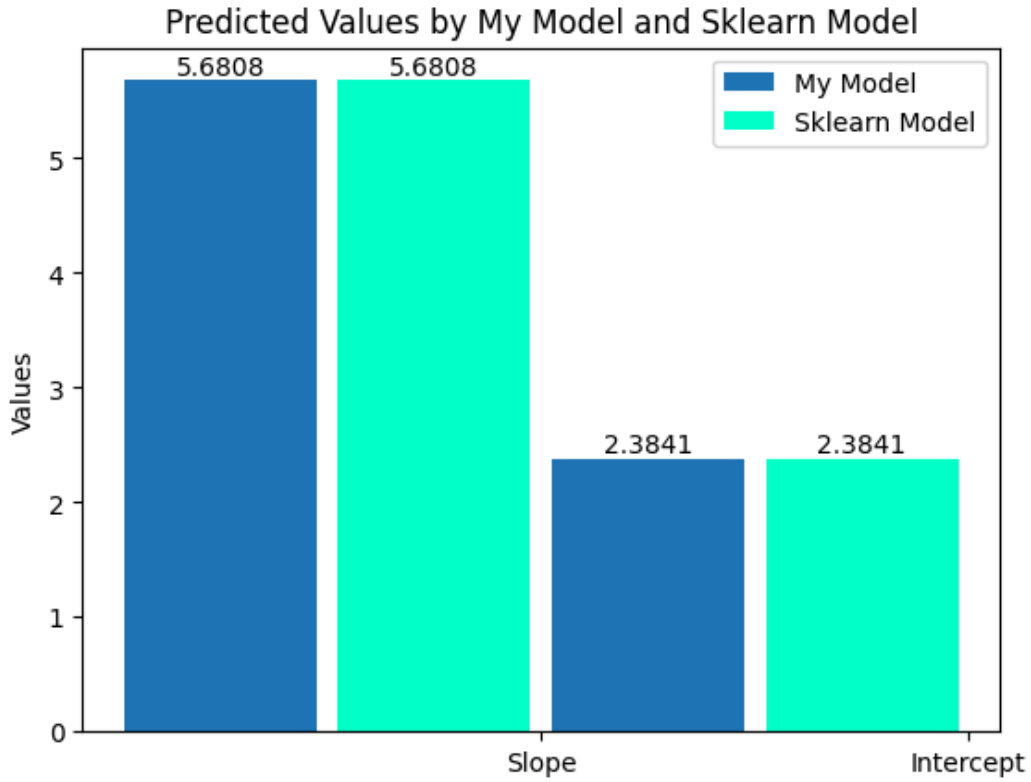
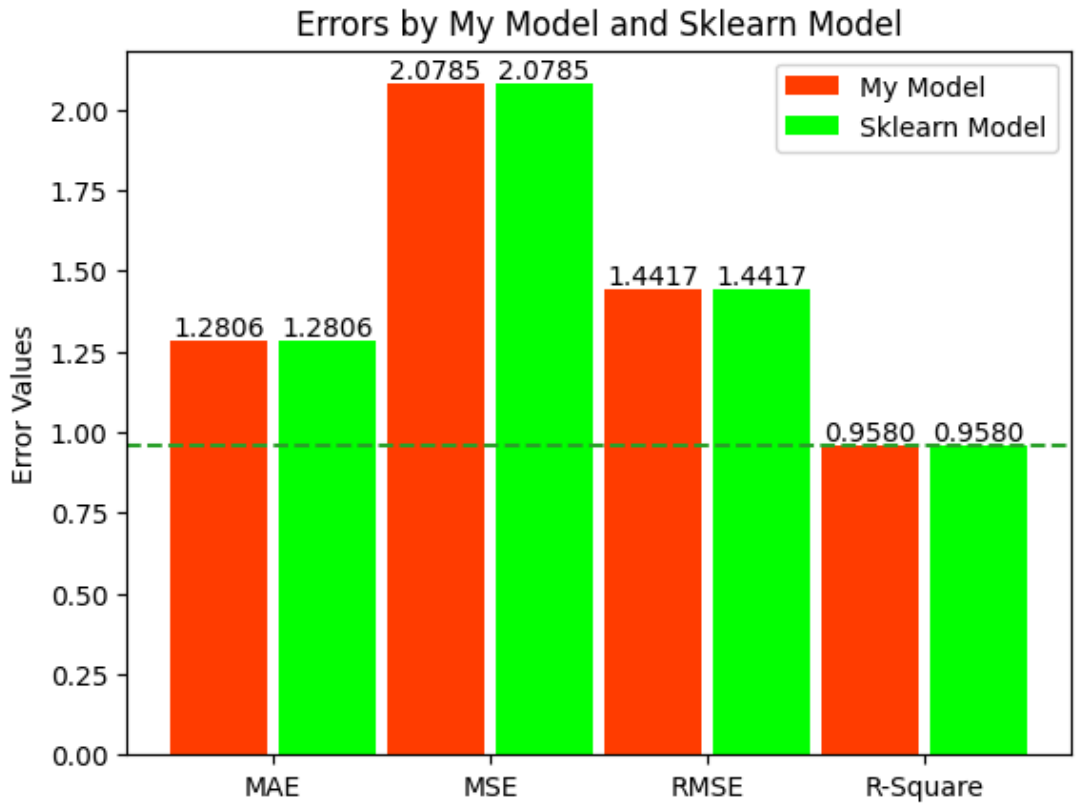
Report

DATASET1:-

	Slope	Intercept
Predicted value(by Model)	2.3840600660571827	5.680787126761217
Predicted value(by Scikit Learn)	2.38406007	5.68078713



ERROR	Error by Model	Error by Scikit Learn
MAE	1.2805559784291467	1.280555978429147
MSE	2.0785254017773265	2.078525401777328
RMSE	1.4417091945941547	1.4417091945941551
R_Square	0.9579571905586358	0.9579571905586357



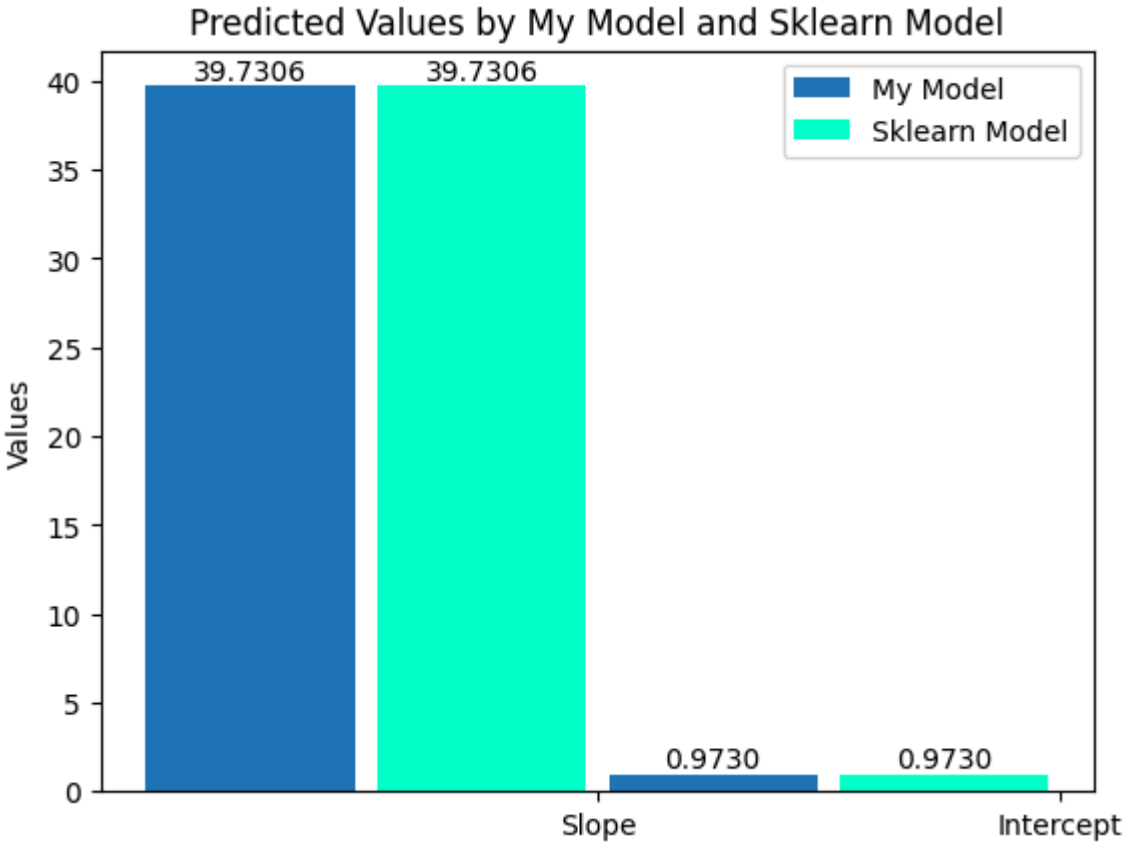
CONCLUSION

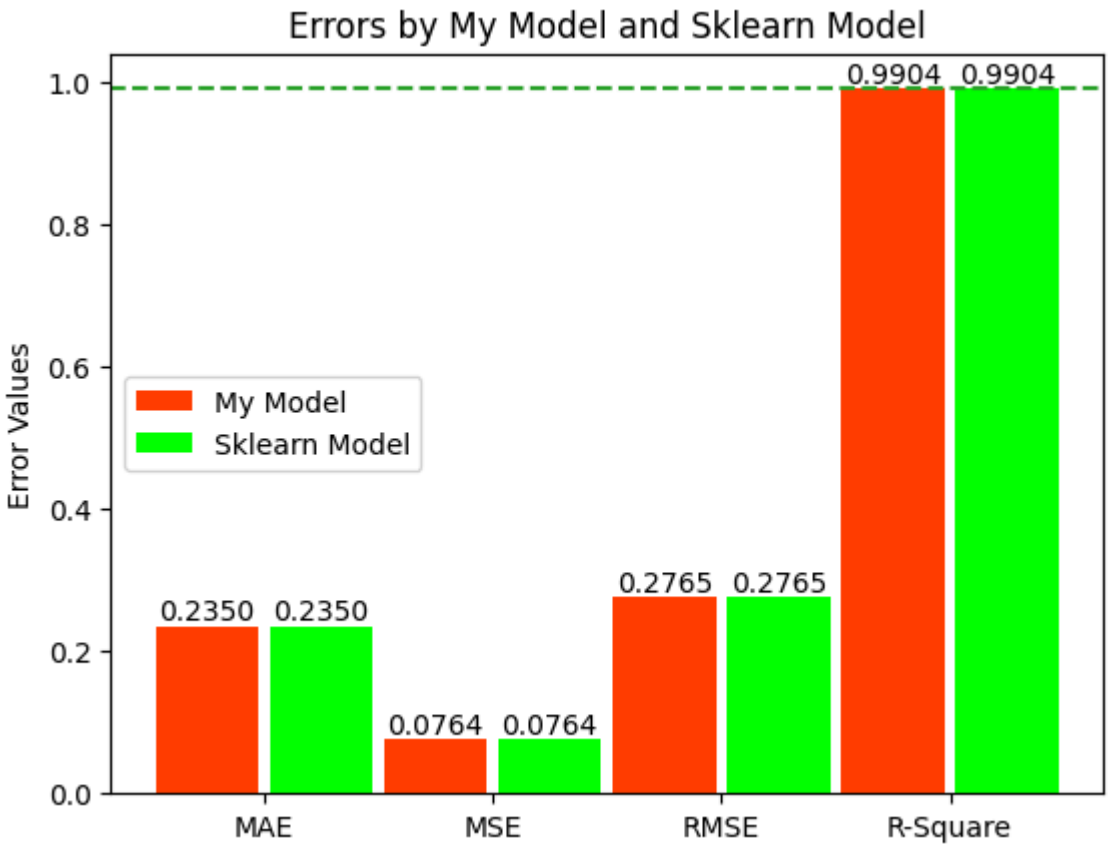
I used Simple Linear Regression on the data, and my model gave results very similar to what Scikit-Learn Library predicted. The numbers my model guessed ([5.680787126761226, 2.384060066057183]) were almost the same as Scikit-Learn's ([5.68078713, 2.38406007]). Also, when I checked how well the models did with numbers like Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared, there wasn't much difference. Especially, the R-squared value was 0.96, close to 1, which means my model is good at catching the patterns in the data using Simple Linear Regression. So, we can trust that my model is reliable and does a good job at making accurate predictions and analyzing data.

Best Fit Hyperplane: y = 5.681 + 2.384x

DATASET2:-

	Slope	Intercept
Predicted value(by Model)	`0.9729974518460569`	`39.730639517767955`
Predicted value(by Scikit Learn)	`0.97299745`	`39.73063952`


Predicted Values by My Model and Sklearn Model
My Model
Sklearn Model
Values
0
5
10
15
20
25
30
35
40
39.7306
39.7306
0.9730
0.9730
Slope
Intercept



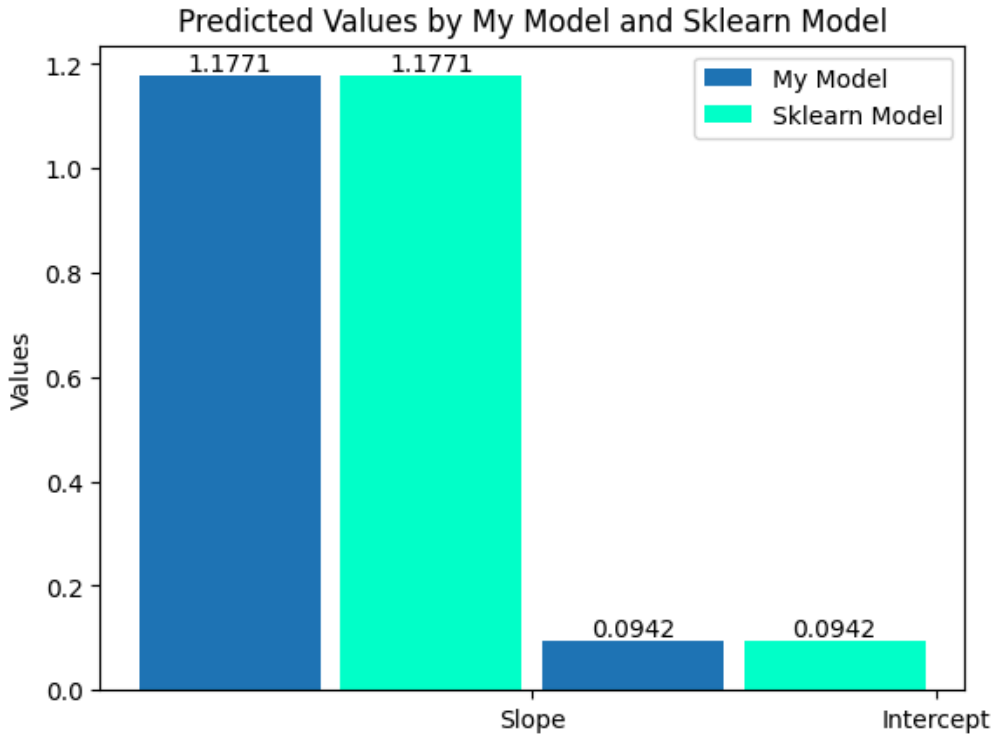
CONCLUSION

In this dataset, I used Simple Linear Regression after applying a Nonlinear transformation, and the results matched exactly with what the Scikit-Learn Library predicted. The numbers I got for Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared were nearly identical to the ones from the Scikit-Learn model. Particularly, the R-squared value of 0.99, close to 1, indicates that my model works really well with Simple Linear Regression. So, we can confidently say that my model is effective in capturing patterns in the data and making accurate predictions.

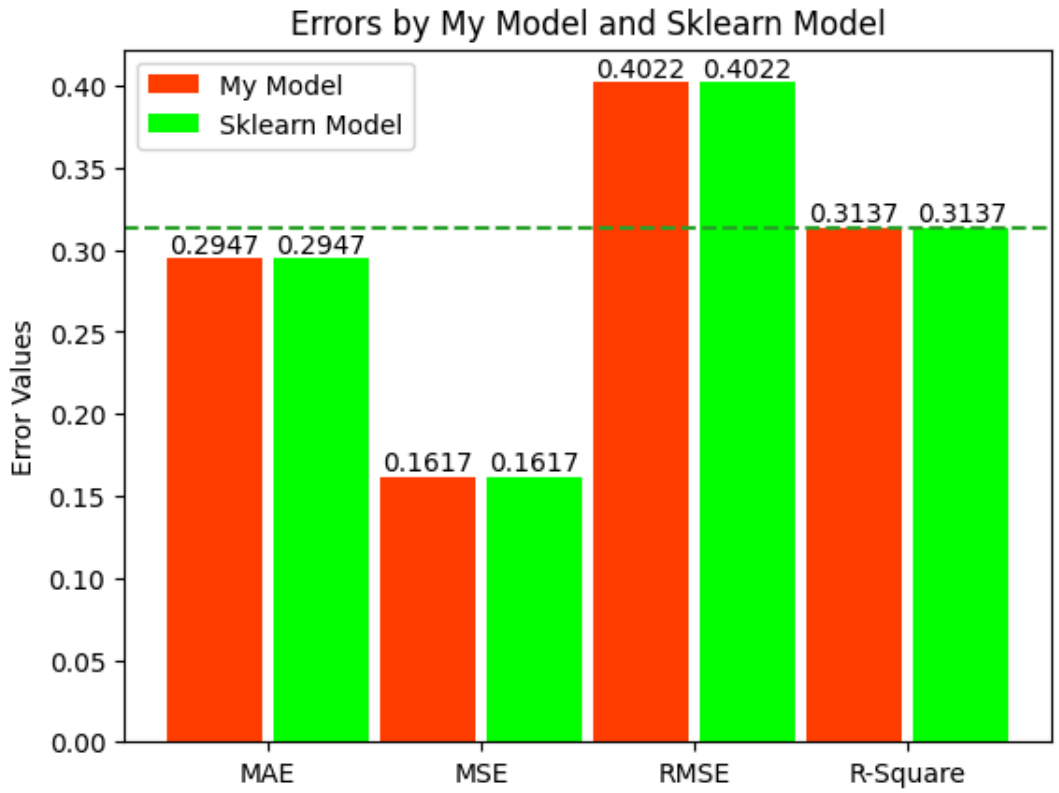
Best Fit Hyperplane; y = log(39.73) + 0.97x

DATASET3:-

	Slope	Intercept
Predicted value(by Model)	`0.09419021414817919`	`1.1770620783119954`
Predicted value(by Scikit Learn)	`0.09419021`	`3.24482714`



ERROR	Error by Model	Error by Scikit Learn
MAE	0.29467793301310385	0.29467793301310374
MSE	0.16173044143088552,	0.16173044143088552
RMSE	0.4021572347116057	0.4021572347116057
R_Square	0.3136973226728079	0.3136973226728079

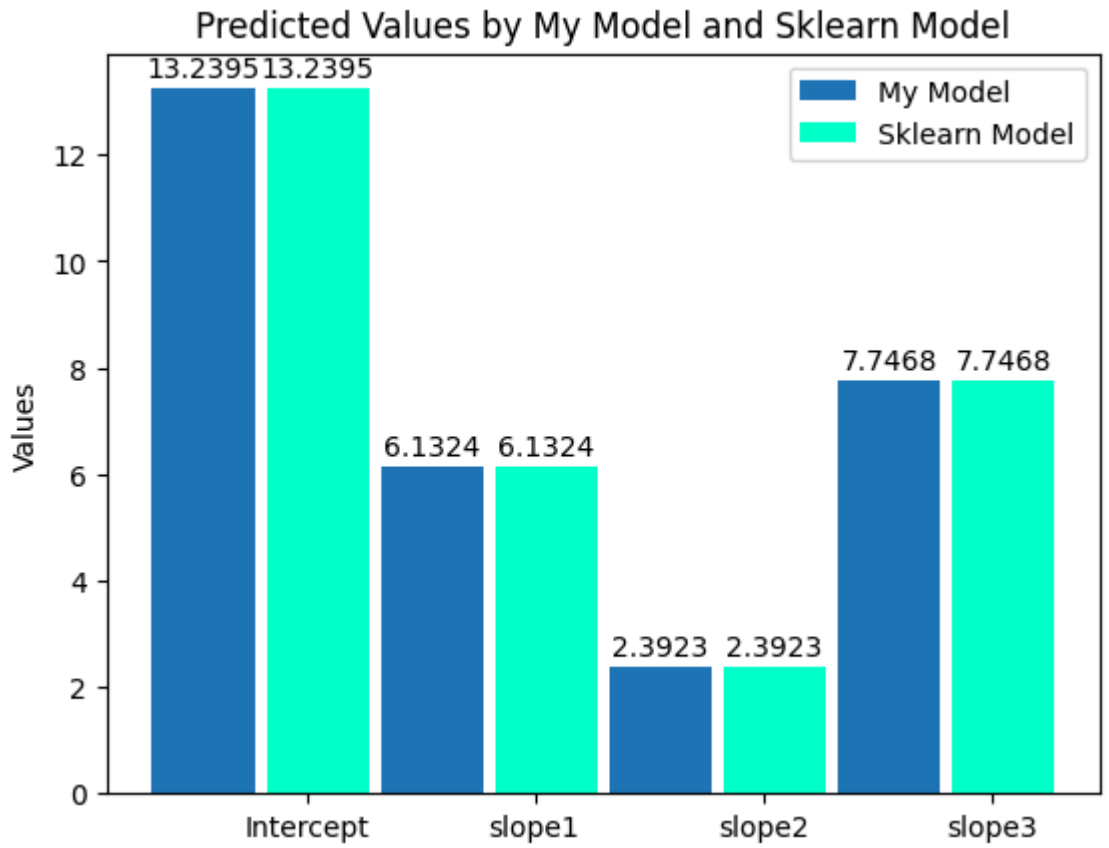


CONCLUSION

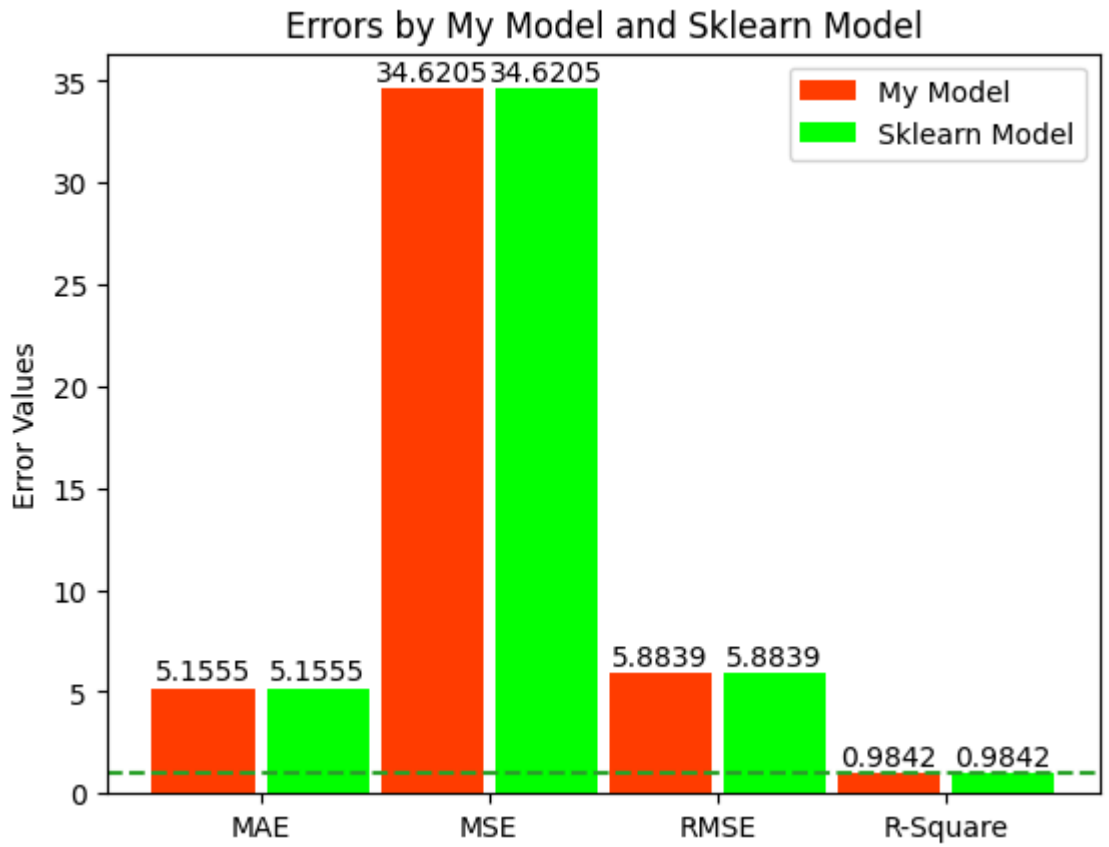
In this dataset, I used Simple Linear Regression and obtained results that matched the predictions made by the Scikit-Learn Library. The values for Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE) were quite similar, and they were also relatively low. However, the R-squared value was 0.31, which is close to 0. This indicates that linear regression doesn't fit well with this dataset, as the R-squared value is low. In such cases, it suggests that the linear relationship between the variables may not adequately capture the underlying patterns in the data.

DATASET4:-

	INTERCEPT	SLOPE1	SLOPE2	SLOPE3
Predicted value(by Model)	13.239477824153255	6.132437632345 5	2.392265542522523	7.746810379973795
Predicted value(by Scikit Learn)	13.239477824154704	6.13243763	2.39226554	7.74681038



ERROR	Error by Model	Error by Scikit Learn
AME	5.155505639902197	5.15550562646378
ASE	34.62048082924356	34.62048082924356
RASE	5.883917133104745	5.883917133104745
R_Square	0.9841749058943147	0.9841749058943147



In this dataset, I applied multiple Simple Linear Regression models and obtained results that closely matched the predictions made by the Scikit-Learn Library. The values for Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE) were nearly identical, and they were also low. Additionally, the R-squared value was 0.98, which is close to 1. This high R-squared value indicates that multiple linear regression fits well with this dataset. It suggests that the linear relationship involving multiple variables adequately captures the underlying patterns in the data, making the model reliable and effective for prediction and analysis.

Best Fit Hyperplane: 13.24 + 6.13*x1+ 2.39*x2+7.75*x3

Comparison of Gradient Descent(GD) and Scikit learn(SL) error result

Data1:-

	AME	MSE	RMSE	R_Square
GD	1.2805559784291471	2.078525401777327	1.441709194594155	0.9579571905586357
SL	1.280555978429147	2.078525401777328	1.4417091945941551	0.9579571905586357

COMMENT

The performance metrics (MAE, MSE, RMSE, R-Square) for Gradient Descent (GD) and Simple Linear Regression (SL) are very similar, indicating that both methods perform equally well in predicting and analyzing the data.

Data3:-

	AME	MSE	RMSE	R_Square
GD	0.2946779330131053	0.161730441430885 6	0.4021572347116058	0.3136973226728076
SL	0.2946779330131037 4	0.161730441430885 52	0.4021572347116057	0.3136973226728079

COMMENT

Even though the errors like MAE, MSE, and RMSE are similar for both Gradient Descent and Simple Linear Regression, the very low R-squared value close to zero indicates that neither method is doing a good job explaining or predicting the data patterns. This suggests that the chosen models might not be the best fit.

Data4:-

	AME	MSE	RMSE	R_Square
GD	5.155022267931194	34.62081600700139	5.883945615571356	0.9841747526838615
SL	5.155505630416842	34.62048082941043	5.883917133118925	0.9841749058942384

COMMENT

The error metrics (MAE, MSE, RMSE, R-Square) for both Gradient Descent (GD) and Simple Linear Regression (SL) are very close, indicating a similar performance in predicting and analyzing the data. The high R-squared values close to 1 suggest that both methods effectively capture the variation in the data and provide accurate predictions.