Advanced Regression Subjective Questions

Question-1:

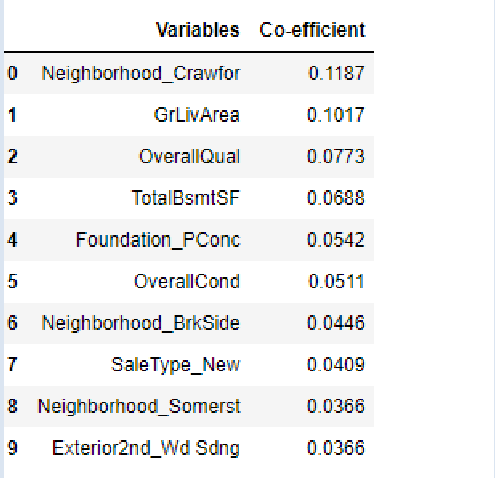
What is the optimal value of alpha for ridge and lasso regression? What will be the changes in the model if you choose to double the value of alpha for both ridge and lasso? What will be the most important predictor variables after the change is implemented?

Answer:

Ridge Regression Analysis:

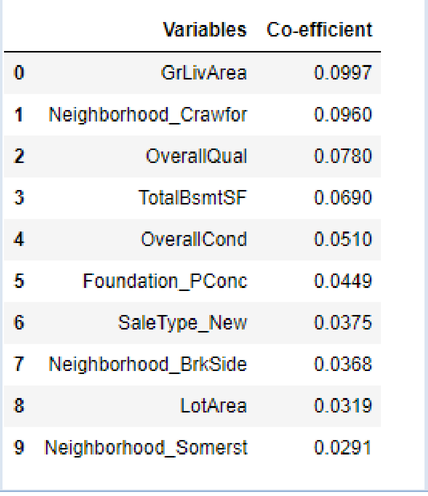
Alpha = 7.0				
	Mean Absolute Error	Mean Squared Error	Root Mean Square Error	R2 Score
Train Data	0.0705	0.0104	0.1019	0.9187
Test Data	0.0812	0.0139	0.1181	0.8882
Alpha=14.0				
	Mean Absolute Error	Mean Squared Error	Root Mean Square Error	R2 Score
Train Data	0.07139	0.0106	0.1032	0.9167
Test Data	0.0822	0.01411	0.1188	0.8868

Alpha=7.0



	Variables	Co-efficient
0	Neighborhood_Crawfor	0.1187
1	GrLivArea	0.1017
2	OverallQual	0.0773
3	TotalBsmtSF	0.0688
4	Foundation_PConc	0.0542
5	OverallCond	0.0511
6	Neighborhood_BrkSide	0.0446
7	SaleType_New	0.0409
8	Neighborhood_Somerst	0.0366
9	Exterior2nd_Wd Sdng	0.0366

Alpha=14.0

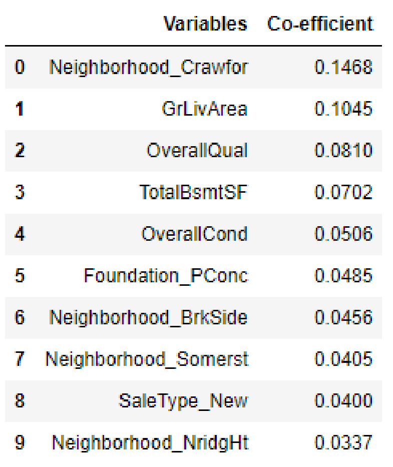
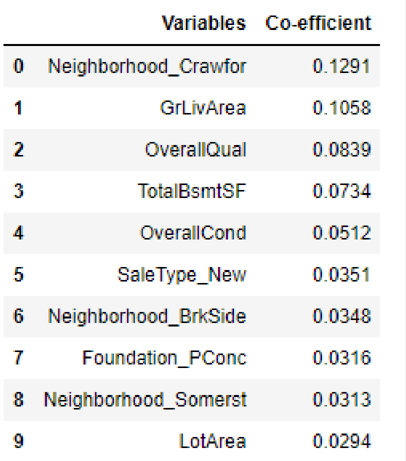


	Variables	Co-efficient
0	GrLivArea	0.0997
1	Neighborhood_Crawfor	0.0960
2	OverallQual	0.0780
3	TotalBsmtSF	0.0690
4	OverallCond	0.0510
5	Foundation_PConc	0.0449
6	SaleType_New	0.0375
7	Neighborhood_BrkSide	0.0368
8	LotArea	0.0319
9	Neighborhood_Somerst	0.0291

- Ridge Regression's ideal alpha value is 7.0. So, if, we doubled the alpha then it will become 14.
- There is slight decrease in R2 score in Test for alpha=14.
- There is change in the position of co-efficient for Alpha=14.

Lasso Regression Analysis:

Alpha = 0.0004				
	Mean Absolute Error	Mean Squared Error	Root Mean Square Error	R2 Score
Train Data	0.0717	0.0106	0.1030	0.9171
Test Data	0.0824	0.0142	0.1192	0.8860
Alpha=0.0008				
	Mean Absolute Error	Mean Squared Error	Root Mean Square Error	R2 Score
Train Data	0.0732	0.0110	0.1053	0.9133
Test Data	0.0835	0.0144	0.1201	0.8842

Alpha= 0.0004	Alpha=0.0008
	

	Variables	Co-efficient
0	Neighborhood_Crawfor	0.1468
1	GrLivArea	0.1045
2	OverallQual	0.0810
3	TotalBsmtSF	0.0702
4	OverallCond	0.0506
5	Foundation_PConc	0.0485
6	Neighborhood_BrkSide	0.0456
7	Neighborhood_Somerst	0.0405
8	SaleType_New	0.0400
9	Neighborhood_NridgHt	0.0337

	Variables	Co-efficient
0	Neighborhood_Crawfor	0.1291
1	GrLivArea	0.1058
2	OverallQual	0.0839
3	TotalBsmtSF	0.0734
4	OverallCond	0.0512
5	SaleType_New	0.0351
6	Neighborhood_BrkSide	0.0348
7	Foundation_PConc	0.0316
8	Neighborhood_Somerst	0.0313
9	LotArea	0.0294

- lasso Regression's ideal alpha value is 0.0004. So, if, we doubled the alpha then it will become 0.0008.
- There is slight decrease in R2 score in Test for alpha=0.0008.
- There is change in the position of co-efficient for Alpha=0.0008.

Question-2:

You have determined the optimal value of lambda for ridge and lasso regression during the assignment. Now, which one will you choose to apply and why?

Answer:

Ridge regression does not perform as well as Lasso regression, so we will apply it instead. It also eliminates other features by bringing the coefficients to zero, making it less complex than the Ridge model.

Lasso helps with feature reduction by setting redundant variable coefficients to 0. Lasso indirectly selects variables by reducing the coefficients of redundant variables to 0. - Additionally, it is more tolerant of outliers.

On the other hand, ridge regression reduces the coefficients to arbitrarily low values, but not to zero.
When there is high multi-collinearity, or high correlation, between various features, Lasso Regression perform better.

Question-3:

After building the model, you realized that the five most important predictor variables in the lasso model are not available in the incoming data. You will now have to create another model excluding the five most important predictor variables. Which are the five most important predictor variables now?

Answer:

Below are the five predictors that will have influence on the sales-

Variables	Co-efficient
MSZoning_RL	0.2965
MSZoning_RH	0.2959
MSZoning_RM	0.2694
MSZoning_FV	0.2615
1stFlrSF	0.1225

Note: We have not removed variables based on VIF like we do it in actual prediction.

Question-4:

How can you make sure that a model is robust and generalizable? What are the implications of the same for the accuracy of the model and why?

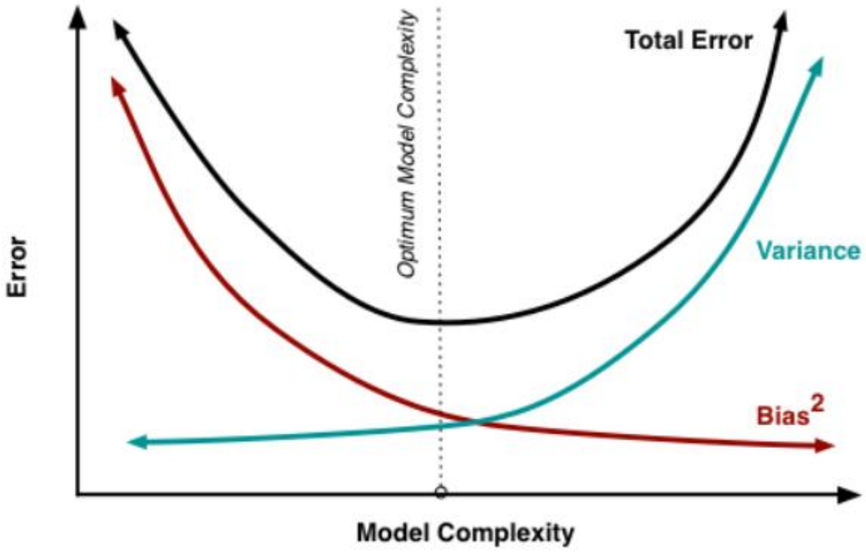
Answer:

When data variance has little to no impact on a model's performance, the model is robust. A generalizable model can react effectively to unexpectedly added data that originates from the same distribution as the model's original data.
To make sure a model is resilient and generalizable, we must be careful not to overfit it.
An overfitting model has a very high variance and is exceedingly sensitive to even little changes in the data. A model of this type will be able to identify every pattern in training

data, but it won't pick up on unnoticed patterns in test data.

Keep the model simple—but not overly simple, as it would be pointless.
To create a simpler model, regularization might be used. Making a model simple also results in the Bias-Variance Trade-off. Thus, we must make balance between bias and variance.

Thus, by maintaining the balance between bias and variance, which reduces the overall error as illustrated in the graph below, the accuracy of the model may be maintained.


Optimum Model Complexity
Total Error
Variance
Error
Bias^2
Model Complexity