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 double the value of alpha for both ridge and lasso? What will be the most important predictor variables after the change is implemented?

Answer:

Optimal Value of Alpha for ridge is coming as 10.0

Optimal Value of Alpha for ridge is coming as 0.001

Below are the statistics with above value:

	Metric	Ridge Regression	Lasso Regression
0	R2 Score (Train)	0.93	0.91
1	R2 Score (Test)	0.86	0.85
2	RSS (Train)	1.41	1.72
3	RSS (Test)	1.39	1.51
4	MSE (Train)	0.06	0.07
5	MSE (Test)	0.09	0.10

When we double the alpha for both ridge and lasso

	Metric	Ridge Regression	Lasso Regression
0	R2 Score (Train)	0.92	0.90
1	R2 Score (Test)	0.85	0.83
2	RSS (Train)	1.64	2.11
3	RSS (Test)	1.44	1.65
4	MSE (Train)	0.07	0.07
5	MSE (Test)	0.09	0.10

So, we see that for Ridge below are the changes:

- **R2 Score for Training Set got reduced by 0.01**
- **RSS for training set got increased by 0.23**
- **MSE for training set got increased by .01**

Below are the changes for Lasso

- **R2 Score for Training Set got reduced by 0.01**
- **RSS got for Training Set increased by 0.39**
- **MSE for Training Set increased by 0.01**

Top Five Predictor variable after change for Ridge

```
GrLivArea          1.04
OverallQual_8      1.04
Functional_Typ     1.03
Condition1_Norm    1.03
TotalBsmtSF        1.03
Name: Ridge, dtype: float64
```

Top Five Predictor variable after change for Lasso

```
GrLivArea         1.09
Functional_Typ    1.04
OverallQual_8     1.03
TotalBsmtSF       1.03
BsmtFinSF1        1.02
Name: Lasso, dtype: float64
```

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:

Based on the Optimal value, I would be selecting Lasso over Ridge as based on below values Lasso it produces simpler model with only significant features, where as Ridge has all the features in the model. So, whenever we would like to do feature selection, so we use Lasso.

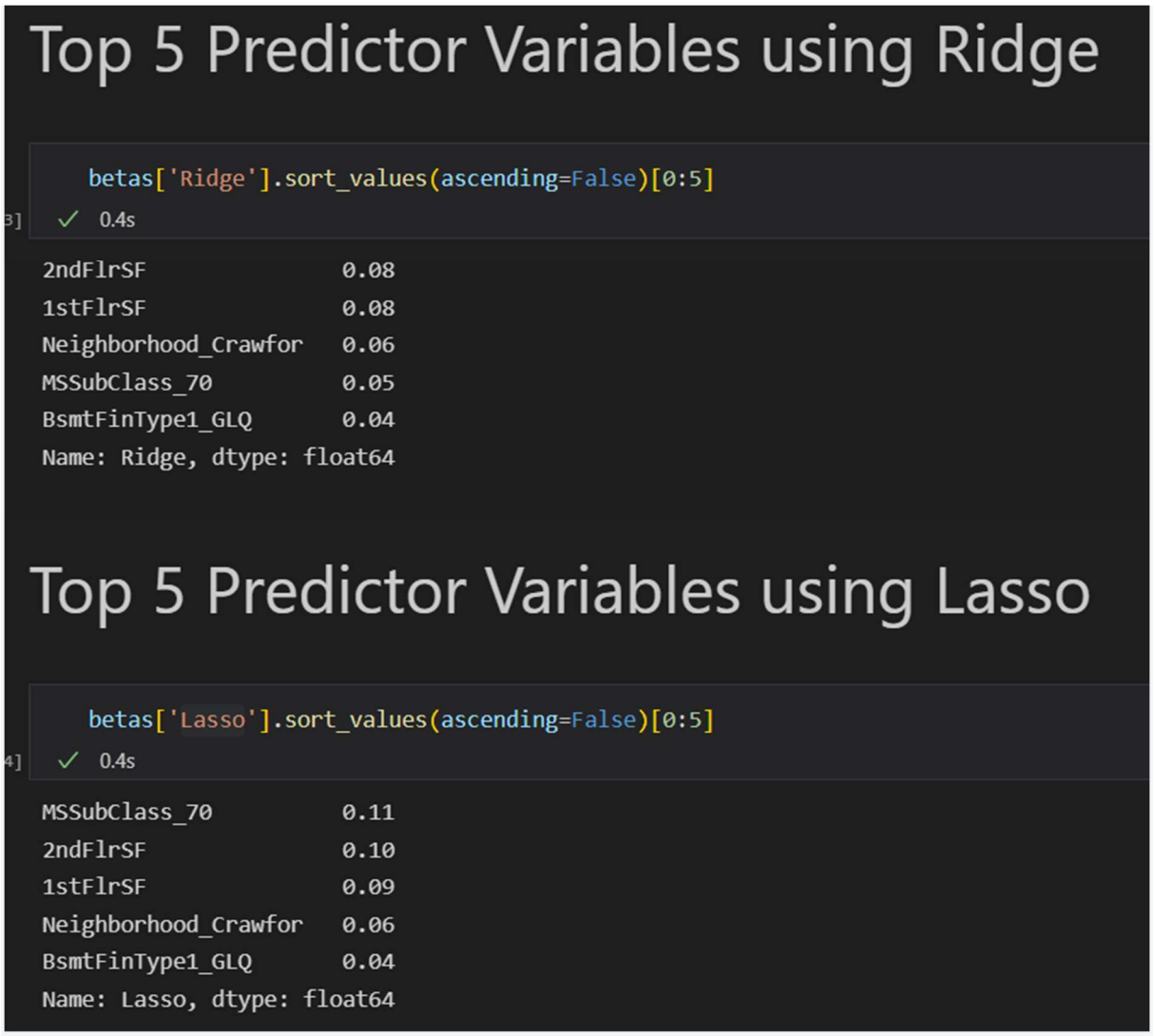
But whenever we don’t want to get very large coefficients and we just like to reduce them, then we can use Ridge.
But here as we want to have important features selected, I would like to go with Lasso.

	Metric	Ridge Regression	Lasso Regression
0	R2 Score (Train)	0.93	0.91
1	R2 Score (Test)	0.86	0.85
2	RSS (Train)	1.41	1.72
3	RSS (Test)	1.39	1.51
4	MSE (Train)	0.06	0.07
5	MSE (Test)	0.09	0.10

Question 3

After building the model, you realised 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: We will drop these values from data and rebuild model.
Below are the top 5 Predictors



Question 4

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

Answer:

The model can be made sure to be robust and generalizable by excluding so of the extreme predictors which impacts only some of the data or simply model is not overfitting.

The idea is to keep the model simple and shall be having generic attributes. We can also understand this by using tradeoff between Bias and Variance.

A simpler model will have more Bias and less variance, as we add features, it will decrease bias and increase variance.

Accuracy of simple, robust and generalizable model will not have much difference in Training and Testing Data.

Whereas Accuracy of Complex model will be very high on Training Data and performs significantly Low on Testing Data because the model memorizes up the training data also called as overfitting.

So, we need to have a balance between complexity and accuracy.