

## 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?

The optimal alpha value in case of Ridge and Lasso is as below:

Ridge - 5

Lasso - 0.0004

The Mean Squared error in case of Ridge and Lasso were:

Ridge - 0.013633610832326818

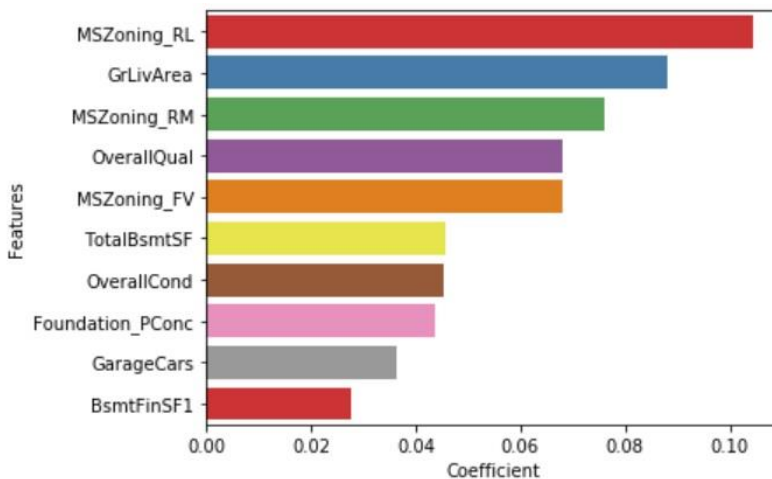
Lasso - 0.013468208254564643

Once we choose double the value of alpha for both ridge and lasso, the new Mean Squared error in case of Ridge and Lasso becomes:

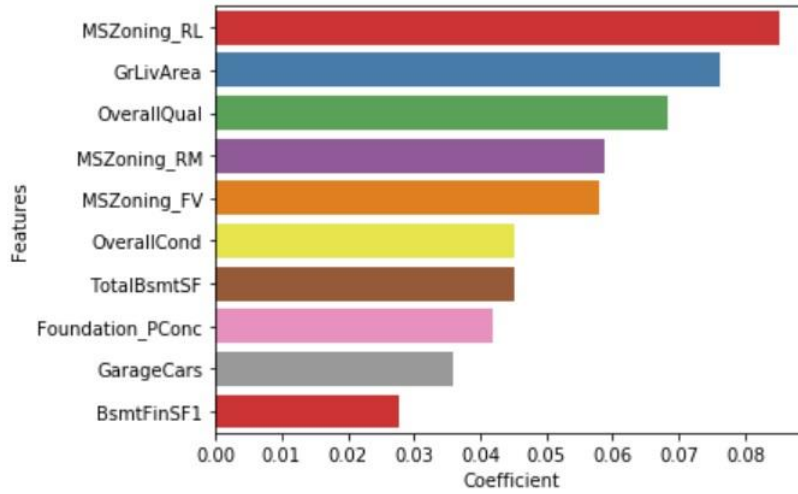
Ridge - 0.013592887428853742

Lasso - 0.013268113701371981

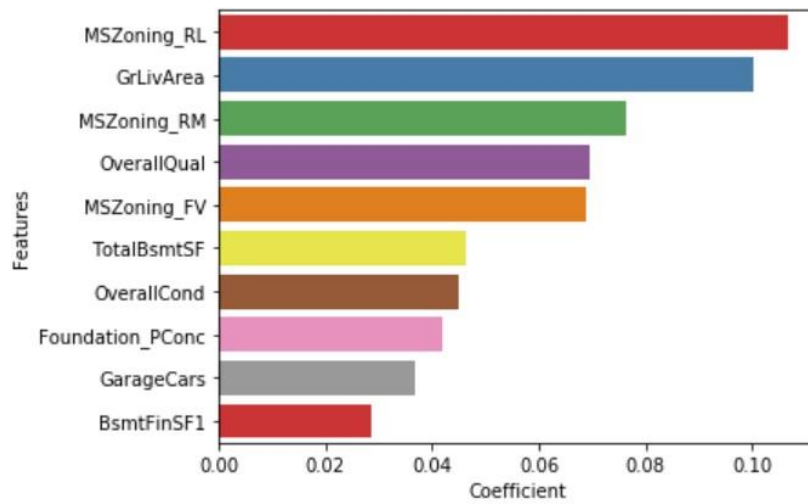
The ten most important predictor variables after the change is implemented remains same, but some variables changed their place in plot graph:



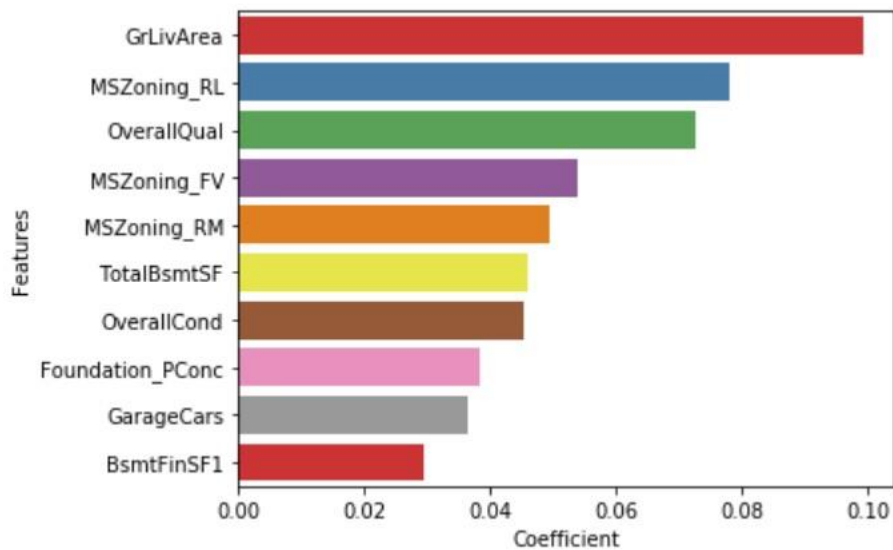
Ridge (before the change is implemented)



Ridge (after the change is implemented)



Lasso (before the change is implemented)



Lasso (after the change is implemented)

## 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?

The optimal lambda value in case of Ridge and Lasso is as below:

Ridge - 10

Lasso - 0.0004

The Mean Squared error in case of Ridge and Lasso are:

Ridge - 0.013743

Lasso - 0.013556

The Mean Squared Error of Lasso is slightly lower than that of Ridge.

Also, since Lasso helps in feature reduction (as the coefficient value of one of the feature became 0), Lasso has a better edge over Ridge.

Hence based on Lasso, the factors that generally affect the price are –

1. MSZoning\_RL
2. GrLivArea
3. MSZoning\_RM

4. OverallQual
5. MSZoning\_FV
6. OverallQual
7. TotalBsmtSF
8. OverallCond
9. Foundation\_PConc
10. GarageCars
11. BsmtFinSF1

Therefore, the variables predicted by Lasso are significant variables for predicting the price of a house.

### 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?

The five most important predictor variables now are:

12. MSZoning\_RL
13. GrLivArea
14. MSZoning\_RM
15. OverallQual
16. MSZoning\_FV

#### 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?

According to Occam's Razor— if two models that show similar 'performance' in the finite training or test data, we should pick the one that makes fewer on the test data because:

1. Simpler models are usually more 'generic' and are more widely applicable
2. Simpler models require fewer training samples for effective training than the more complex ones and hence are easier to train.
3. Simpler models are more robust.
4. Complex models tend to change wildly with changes in the training data set
5. Simple models have low variance, high bias and complex models have low bias, high variance
6. Simpler models make more errors in the training set. Complex models lead to overfitting — they work very well for the training samples, fail miserably when applied to other test samples

Regularization can be used to make the model simpler. Regularization helps to strike the delicate balance between keeping the model simple and not making it too naive to be of any use. For regression, regularization involves adding a regularization term to the cost that adds up the absolute values or the squares of the parameters of the model.

Also, Making a model simple leads to Bias-Variance Trade-off:

1. A complex model will need to change for every little change in the dataset and hence is very unstable and extremely sensitive to any changes in the training data.
2. A simpler model that abstracts out some pattern followed by the data points given is unlikely to change wildly even if more points are added or removed.

Bias quantifies how accurate is the model likely to be on test data. A complex model can do an accurate job prediction provided there is enough training data.

Variance refers to the degree of changes in the model itself with respect to changes in the training data.

Thus accuracy of the model can be maintained by keeping the balance between Bias and Variance as it minimizes the total error:

### Bias-Variance Tradeoff

