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:

The optimal value of alpha for ridge regression is 20.0 .
The optimal value of alpha for lasso regression is 0.01 .

When we double the value of alpha, the changes observed are:

<u>In Lasso Regression Model:</u>

FOR DOUBLE THE VALUE OF ALPHA

In [47]:
```
lasso = Lasso(alpha=0.02)
lasso.fit(X_train,Y_train)

y_train_pred = lasso.predict(X_train)
y_test_pred = lasso.predict(X_test)

print(r2_score(y_true=Y_train,y_pred=y_train_pred))
print(r2_score(y_true=Y_test,y_pred=y_test_pred))
```

Out[47]:
```
Lasso(alpha=0.02, copy_X=True, fit_intercept=True, max_iter=1000,
      normalize=False, positive=False, precompute=False, random_state=None,
      selection='cyclic', tol=0.0001, warm_start=False)

0.8687932859585151
0.8683516446021355
```

The Predictor variables will be:

Out[48]:

	Features	Coefficients
0	MSSubClass	0.520254
32	BsmtUnfSF	0.300602
8	Condition1	0.222476
22	ExterQual	0.107185
45	HalfBath	0.085177
3	LotShape	0.069189
15	YearRemodAdd	0.064532
26	BsmtCond	0.058645
10	BldgType	0.053656
9	Condition2	0.043732

In Ridge Regression Model:

FOR DOUBLE THE VALUE OF ALPHA

In [57]:
```
ridge = Ridge(alpha=40.0)
ridge.fit(X_train,Y_train)

y_train_pred = lasso.predict(X_train)
y_test_pred = lasso.predict(X_test)

print(r2_score(y_true=Y_train,y_pred=y_train_pred))
print(r2_score(y_true=Y_test,y_pred=y_test_pred))
```

Out[57]:
```
Ridge(alpha=40.0, copy_X=True, fit_intercept=True, max_iter=None,
      normalize=False, random_state=None, solver='auto', tol=0.001)

0.8687932859585151
0.8683516446021355
```

The Predictor variables will be:

Out[58]:

	Features	Coefficients
0	MSSubClass	0.441921
8	Condition1	0.175248
32	BsmtUnfSF	0.150144
30	BsmtFinType2	0.113585
22	ExterQual	0.091515
26	BsmtCond	0.090964
15	YearRemodAdd	0.086457
9	Condition2	0.079234
45	HalfBath	0.078208
3	LotShape	0.073926

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:

As Lasso Regression will help to penalize more and help in feature selection.Lasso Regression model would be a considerably better option.

```
In [59]: lasso = Lasso(alpha=0.01)
         lasso.fit(X_train,Y_train)

         y_train_pred = lasso.predict(X_train)
         y_test_pred = lasso.predict(X_test)

         print(r2_score(y_true=Y_train,y_pred=y_train_pred))
         print(r2_score(y_true=Y_test,y_pred=y_test_pred))

Out[59]: Lasso(alpha=0.01, copy_X=True, fit_intercept=True, max_iter=1000,
               normalize=False, positive=False, precompute=False, random_state=None,
               selection='cyclic', tol=0.0001, warm_start=False)

         0.8752887263905512
         0.8729043367495957
```

From the Models and Optimal value of alpha

We find that,some of the significant variables in predicting the price of a house (on comparison) are:

1)*MSSubClass*
2)*BsmtUnfSF*
3)*Condition1*
4)*ExterQual*
5)*Condition2*
6)*HalfBath*
7)*LotShape*

Question-3:

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:

To make sure a model is robust and generalisable,it must be consistently accurate (even if one or more of the input vairables undergo drastic change) for the datasets apart from the ones used during the training dataset.The model must not be affected by outliers in the data.Outlier Analysis must be performed and only the relevant outliers must be included in the data to maintain higher accuracy.Rest of the outliers must be removed..This will help for the model to be useful in predictive analysis

The performance of the model (algorithm) must not deteriorate too much when training and testing with slightly different data.It implies algorithmic stability.It also implies predictions that are more concrete,having less variance and minimial bias.

DONE BY:
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