In [932]:
```
import matplotlib.pyplot as plt
import numpy as np
import scipy as sci
import pandas as pd
import seaborn as sns
import matplotlib
```

In [933]:
```
train = pd.read_csv("house-prices-advanced-regression-techniques/train.csv")
test = pd.read_csv("house-prices-advanced-regression-techniques/test.csv")
```

In [934]:
```
data = pd.concat((train.loc[:,'MSSubClass':'SaleCondition'], test.loc[:,'MSSub
Class':'SaleCondition']))
```

In [935]:
```
train["SalePrice"] = np.log1p(train["SalePrice"])

#log transform skewed numeric features:
indeces = data.dtypes[data.dtypes != "object"].index

skewed_feats = train[indeces].apply(lambda x: sci.stats.skew(x.dropna())) #com
pute skewness
skewed_feats = skewed_feats[skewed_feats > 0.75]
skewed_feats = skewed_feats.index

data[skewed_feats] = np.log1p(data[skewed_feats])
```

In [936]:
```
data = pd.get_dummies(data)
```

In [937]:
```
#filling NA's with the mean of the column:
data = data.fillna(data.mean())
```

In [938]:
```
#creating matrices for sklearn:
X_train = data[:train.shape[0]]
X_test = data[train.shape[0]:]
Y_train = train.SalePrice
```

In [939]:
```
from sklearn.linear_model import Ridge, Lasso
from sklearn.model_selection import cross_val_score
```

In [940]:
```
model_ridge = Ridge(alpha=.1)
model_ridge.fit(X_train, Y_train)
```

Out[940]:
```
Ridge(alpha=0.1)
```

In [941]:
```
preds = model_ridge.predict(X_test)
preds = np.expm1(preds)
```

In [942]:
```
prediction = pd.DataFrame({"id":test.Id, "SalePrice":preds})
prediction.to_csv("ridge_sol.csv", index = False)
```

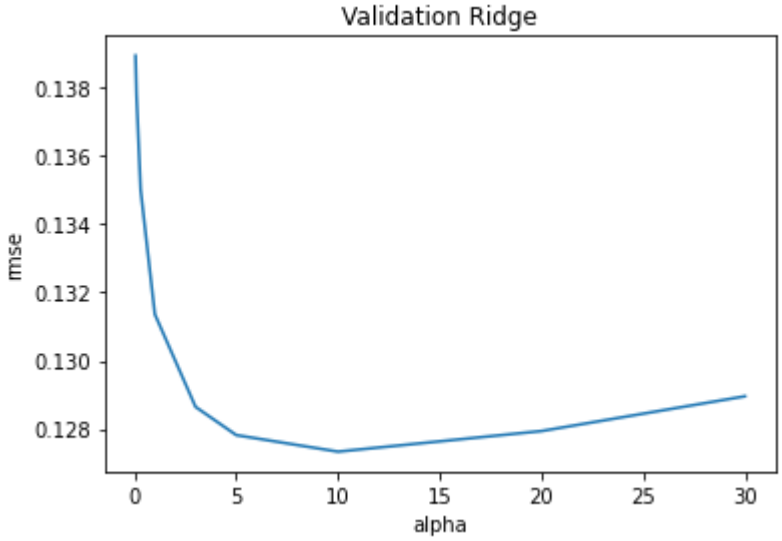
In [943]:
```
#After submitting to Kaggle, we get a RMSE of .1377
```

In [944]:
```
def rmse_cv(model):
    rmse= np.sqrt(-cross_val_score(model, X_train, Y_train, scoring="neg_mean_
squared_error", cv = 5))
    return(rmse)
```

In [945]:
```
alphas = [0.05, 0.1, 0.3, 1, 3, 5, 10, 20, 30]
cv_ridge = [rmse_cv(Ridge(alpha = alpha)).mean()
            for alpha in alphas]
```

In [946]:
```
cv_ridge = pd.Series(cv_ridge, index = alphas)
cv_ridge.plot(title = "Validation Ridge")
plt.xlabel("alpha")
plt.ylabel("rmse")
```

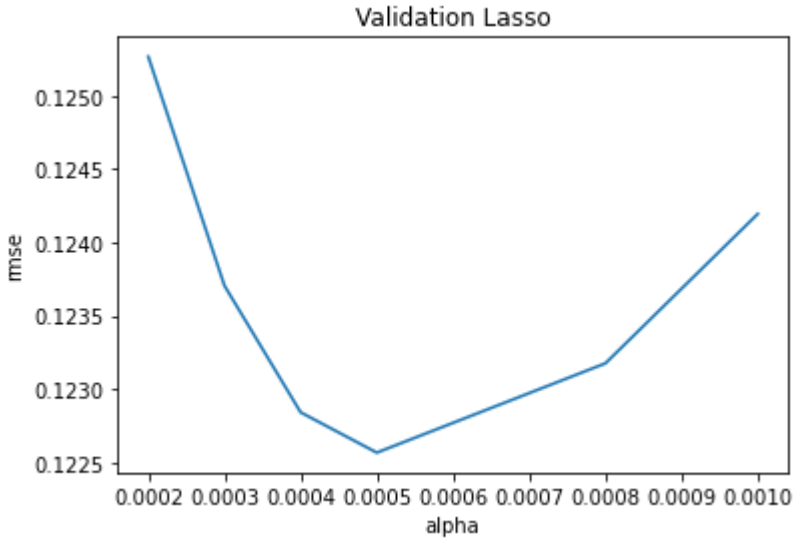
Out[946]:
```
Text(0, 0.5, 'rmse')
```



In [947]:
```
alphasl = [.001, .0008, .0005, .0004, .0003, .0002]
cv_lasso = [rmse_cv(Lasso(alpha = alpha)).mean()
            for alpha in alphasl]
```

In [948]:
```
cv_lasso = pd.Series(cv_lasso, index = alphasl)
cv_lasso.plot(title = "Validation Lasso")
plt.xlabel("alpha")
plt.ylabel("rmse")
```

Out[948]: Text(0, 0.5, 'rmse')



In [949]:
```
# For a single LASSO Model, we can get to a RMSE of ~.138
# For a single Ridge Model, we can get to a RMSE of ~.141
```

In [950]:
```
models_lasso = [Lasso(alpha = alpha).fit(X_train, Y_train) for alpha in alphas
l]
```

In [951]:
```
coefs = [pd.Series(models_lasso[i].coef_, index = X_train.columns) for i in ra
nge(0, len(alphasl))]
```

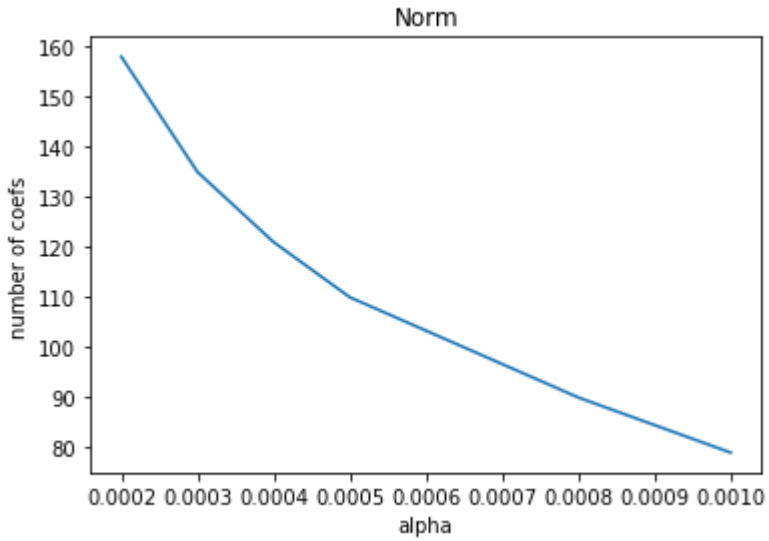
In [952]:
```
l0 = np.zeros_like(alphasl)
for i in range(0, len(alphasl)):
    l0[i] = sum(coefs[i] != 0)
```

In [953]:
```
print(l0)
```

```
[ 79.  90. 110. 121. 135. 158.]
```

In [954]:
```
l0 = pd.Series(l0, index = alphasl)
l0.plot(title = "Norm")
plt.xlabel("alpha")
plt.ylabel("number of coefs")
```

Out[954]: Text(0, 0.5, 'number of coefs')



In [955]:
```
predictions_lasso = [models_lasso[i].predict(X_train) for i in range(0, len(al
phasl))]
```

In [956]:
```
X_train.loc[:]["lasso1"] = predictions_lasso[0]
X_train.loc[:]["lasso2"] = predictions_lasso[1]
X_train.loc[:]["lasso3"] = predictions_lasso[2]
X_train.loc[:]["lasso4"] = predictions_lasso[3]
X_train.loc[:]["lasso5"] = predictions_lasso[4]
X_train.loc[:]["lasso6"] = predictions_lasso[5]
```

In [957]:
```
model_ridge_es = Ridge(alpha=10)
model_ridge_es.fit(X_train, Y_train)
```

Out[957]: Ridge(alpha=10)

In [958]:
```
preds = model_ridge_es.predict(X_test)
preds = np.expm1(preds)
```

In [959]:
```
prediction = pd.DataFrame({"id":test.Id, "SalePrice":preds})
prediction.to_csv("ridge_es_sol.csv", index = False)
```

In [960]:
```
def rmse_cv(model):
    rmse= np.sqrt(-cross_val_score(model, X_train, Y_train, scoring="neg_mean_
squared_error", cv = 5))
    return(rmse)
```

In [961]:
```
cv_ridge_es = rmse_cv(model_ridge_es).mean()
print(cv_ridge_es)
```

```
0.1273373466867077
```

In [962]:
```
# We can get down to a RMSE score of .134 which is better than both the LASSO
 and the Ridge Models
```

In [963]:
```
from xgboost import XGBRegressor
```

In [964]:
```
data_dmatrix = xgb.DMatrix(data=X_train,label=Y_train)
```

In [965]:
```
model = XGBRegressor(learning_rate=1, n_estimators=1000, max_depth=6,
                     min_child_weight=.8, gamma=0, subsample=0.8,
                     colsample_bytree=.8, nthread=4, objective='reg:squarederro
r'
                      )
model.fit(X_train, Y_train)
```

Out[965]:
```
XGBRegressor(base_score=0.5, booster='gbtree', colsample_bylevel=1,
             colsample_bynode=1, colsample_bytree=0.8, gamma=0, gpu_id=-1,
             importance_type='gain', interaction_constraints='',
             learning_rate=1, max_delta_step=0, max_depth=6,
             min_child_weight=0.8, missing=nan, monotone_constraints='()',
             n_estimators=1000, n_jobs=4, nthread=4, num_parallel_tree=1,
             random_state=0, reg_alpha=0, reg_lambda=1, scale_pos_weight=1,
             subsample=0.8, tree_method='exact', validate_parameters=1,
             verbosity=None)
```

In [966]:
```
# make predictions for test data
y_pred = model.predict(X_test)
predictions = np.expm1(y_pred)
```

In [967]:
```
params = {"objective":"reg:squarederror",'colsample_bytree': .8,'learning_rat
e': .1,
                'max_depth': 6, 'alpha': 0}

cv_results = xgb.cv(dtrain=data_dmatrix, params=params, nfold=100,
                    num_boost_round=5000,early_stopping_rounds=10,metrics="rms
e", as_pandas=True, seed=123)
```

In [968]:
```
cv_results.head(1000)
```

Out[968]:

	train-rmse-mean	train-rmse-std	test-rmse-mean	test-rmse-std
0	10.380132	0.000874	10.379370	0.096206
1	9.344456	0.000787	9.343646	0.096331
2	8.412309	0.000718	8.411510	0.092148
3	7.573347	0.000648	7.572970	0.088340
4	6.818244	0.000580	6.817646	0.085559
...	...	...	...	...
216	0.021461	0.000843	0.119023	0.045331
217	0.021341	0.000825	0.119003	0.045352
218	0.021213	0.000821	0.119005	0.045363
219	0.021083	0.000809	0.118982	0.045401
220	0.020969	0.000806	0.118971	0.045372

221 rows × 4 columns

In [969]:
```
print((cv_results["test-rmse-mean"]).tail(1))
```

```
220    0.118971
Name: test-rmse-mean, dtype: float64
```

In [970]:
```
prediction = pd.DataFrame({"id":test.Id, "SalePrice":predictions})
prediction.to_csv("xgb_sol.csv", index = False)
```

In [ ]:
```

```