Problem 5: Source Code

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# Importing Libraries


import numpy as np

import pandas as pd

from scipy import stats

from sklearn.model_selection import train_test_split,RepeatedKFold

from sklearn.model_selection import cross_val_score,KFold

from sklearn.linear_model import ElasticNet,Ridge,Lasso

from sklearn.metrics import mean_squared_error


# Reading Data from the Xlsx File into a pandas dataframe


df = pd.read_excel('ENB2012_data.xlsx')


# #Checking for null values

# print(df.isnull().values.any)


# #Looking for outliers

# z = np.abs(stats.zscore(df))

# #print(z)

# threshold = 3

# #print(np.where(z > 3))


#Splitting the data into input and output features

X = df[["X1","X2","X3","X4","X5","X6","X7","X8"]]

y = df["Y2"]


#Using all the models to train the data
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model_Lasso = Lasso(alpha=1.0)


model_Ridge = Ridge(alpha=1.0)


model_ElasticNet = ElasticNet(alpha=1.0, l1_ratio=0.5)


#Using Kfolds = 5 to cross validate the results

kf = KFold(n_splits=5)

kf.get_n_splits(X)


scores_Lasso = []

scores_Ridge = []

scores_ElasticNet= []


mse_Lasso = []

mse_Ridge = []

mse_ElasticNet= []


#Train and test the all three models, calculate their scores and MSE


for train_index, test_index in kf.split(X):

        X_train, X_test = X.iloc[train_index], X.iloc[test_index]

        y_train, y_test = y.iloc[train_index], y.iloc[test_index]


        model_Lasso.fit(X_train, y_train)

        model_Ridge.fit(X_train, y_train)

        model_ElasticNet.fit(X_train, y_train)


        scores_Lasso.append(model_Lasso.score(X_test,y_test))

        scores_Ridge.append(model_Ridge.score(X_test,y_test))

        scores_ElasticNet.append(model_ElasticNet.score(X_test,y_test))
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        temp = model_Lasso.predict(X_test)
        mse_Lasso.append(mean_squared_error(temp,y_test))
        temp = model_Ridge.predict(X_test)
        mse_Ridge.append(mean_squared_error(temp,y_test))
        temp = model_ElasticNet.predict(X_test)
        mse_ElasticNet.append(mean_squared_error(temp,y_test))


#scores and MSE of
print("Mean of scores of Lasso:",sum(scores_Lasso)/len(scores_Lasso))
print("Mean of scores of Ridge:",sum(scores_Ridge)/len(scores_Ridge))
print("Mean of scores of ElasticNet:",sum(scores_ElasticNet)/len(scores_ElasticNet))
print("MSE of \nLasso , Ridge , ElasticNet")
print(sum(mse_Lasso)/len(mse_Lasso),sum(mse_Ridge)/len(mse_Ridge),sum(mse_ElasticNet)/len(mse_ElasticNet))
```

Output(Evaluation Result):

Mean of scores of Lasso: 0.7380103307895334

Mean of scores of Ridge: 0.8668525182699964

Mean of scores of ElasticNet: 0.7418988862088958

MSE of :

Lasso , Ridge , ElasticNet

22.5004863291658 11.54632478836805 22.125773471265415