ADS Assignment-3

```
# This is formatted as code
```

VISHNU VARDHAN REDDY

20BEC1279

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
import seaborn as sns
from sklearn.preprocessing import StandardScaler
```

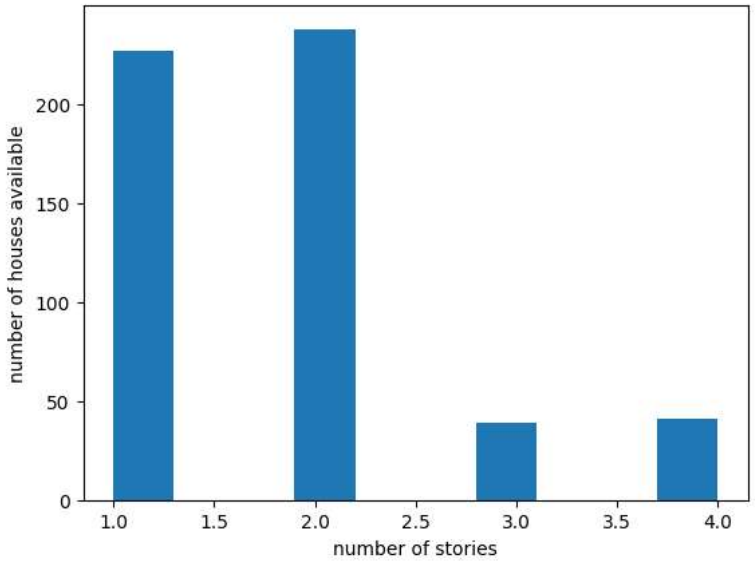
```
data=pd.read_csv('/Housing.csv')
data
```

	price	area	bedrooms	bathrooms	stories	mainroad	guestroom	basement	hot
0	13300000	7420	4	2	3	yes	no	no	
1	12250000	8960	4	4	4	yes	no	no	
2	12250000	9960	3	2	2	yes	no	yes	
3	12215000	7500	4	2	2	yes	no	yes	
4	11410000	7420	4	1	2	yes	yes	yes	
...	...	...	...	...	...	...	...	...	
540	1820000	3000	2	1	1	yes	no	yes	
541	1767150	2400	3	1	1	no	no	no	
542	1750000	3620	2	1	1	yes	no	no	
543	1750000	2910	3	1	1	no	no	no	
544	1750000	3850	3	1	2	yes	no	no	

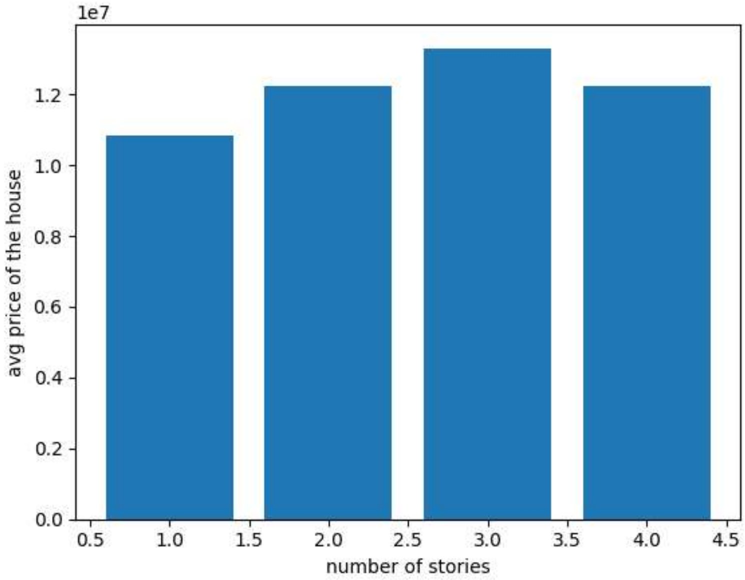
545 rows × 12 columns

Uni varient

```
plt.hist(data['stories'])
plt.xlabel('number of stories')
plt.ylabel('number of houses available')
plt.show()
```

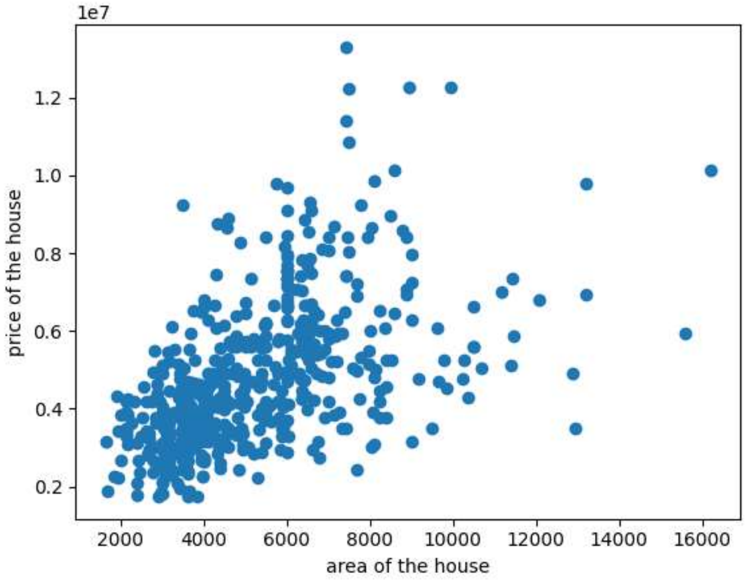


```
plt.bar(data['stories'],data['price'])
plt.xlabel('number of stories')
plt.ylabel('avg price of the house')
plt.show()
```

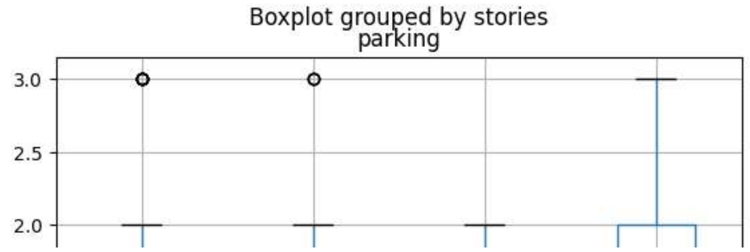


Bi varient

```
plt.scatter(data['area'],data['price'])
plt.xlabel('area of the house')
plt.ylabel('price of the house')
plt.show()
```



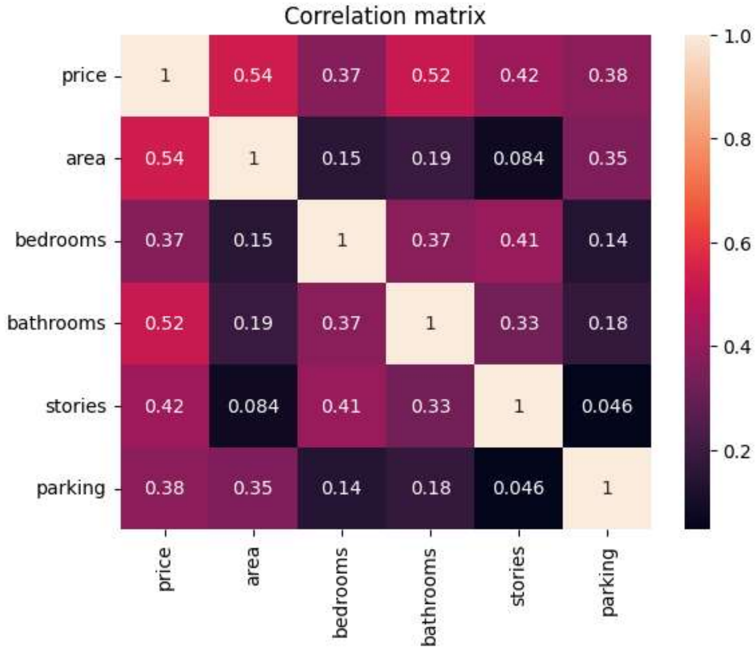
```
data.boxplot('parking','stories')
plt.show()
```



Multi varient

```
sns.heatmap(data.corr(),annot=True)
plt.title('Correlation matrix')
plt.show()
```

```
    <ipython-input-7-d901d6faafdc>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is
      sns.heatmap(data.corr(),annot=True)
```



Descriptive Statistics

```
data.describe()
```

	price	area	bedrooms	bathrooms	stories	parking
count	5.450000e+02	545.000000	545.000000	545.000000	545.000000	545.000000
mean	4.766729e+06	5150.541284	2.965138	1.286239	1.805505	0.693578
std	1.870440e+06	2170.141023	0.738064	0.502470	0.867492	0.861586
min	1.750000e+06	1650.000000	1.000000	1.000000	1.000000	0.000000
25%	3.430000e+06	3600.000000	2.000000	1.000000	1.000000	0.000000
50%	4.340000e+06	4600.000000	3.000000	1.000000	2.000000	0.000000
75%	5.740000e+06	6360.000000	3.000000	2.000000	2.000000	1.000000
max	1.330000e+07	16200.000000	6.000000	4.000000	4.000000	3.000000

Cheching and dealing with missing values

```
missing=data.isnull().sum()
missing
```

```
    price              0
    area               0
    bedrooms           0
    bathrooms          0
```

```
stories             0
mainroad            0
guestroom           0
basement            0
hotwaterheating     0
airconditioning     0
parking             0
furnishingstatus    0
dtype: int64
```

```
#there are no missing data incase missing data are present we can replace them with mean of that column of the data
#data1=data.fillna(data.mean())
#data1
```

Detecting and dealing with Outliers

```
numeric_columns = data.select_dtypes(include='number').columns
data_no_outliers = data.copy()

for column in numeric_columns:
    z_scores = (data[column] - data[column].mean()) / data[column].std()

    outliers = (z_scores > 3) | (z_scores < -3)
column_name=['price','area','bedrooms','bathrooms','stories','parking']
data_no_outliers.loc[np.abs(z_scores) > 3, column_name] = data[column].mean()

data_no_outliers
```

	price	area	bedrooms	bathrooms	stories	mainroad	guestroom	basement	hotwaterheating	a
0	13300000.0	7420.0	4.0	2.0	3.0	yes	no	no	no	
1	12250000.0	8960.0	4.0	4.0	4.0	yes	no	no	no	
2	12250000.0	9960.0	3.0	2.0	2.0	yes	no	yes	no	
3	12215000.0	7500.0	4.0	2.0	2.0	yes	no	yes	no	
4	11410000.0	7420.0	4.0	1.0	2.0	yes	yes	yes	no	
...	...	...	...	...	...	...	...	...	...	
540	1820000.0	3000.0	2.0	1.0	1.0	yes	no	yes	no	
541	1767150.0	2400.0	3.0	1.0	1.0	no	no	no	no	
542	1750000.0	3620.0	2.0	1.0	1.0	yes	no	no	no	
543	1750000.0	2910.0	3.0	1.0	1.0	no	no	no	no	
544	1750000.0	3850.0	3.0	1.0	2.0	yes	no	no	no	

545 rows × 12 columns

Checking Categorical columns and encoding

```
categorical_columns=data.select_dtypes('object','category').columns
encoded_data=pd.get_dummies(data,categorical_columns)

encoded_data
```

	price	area	bedrooms	bathrooms	stories	parking	mainroad_no	mainroad_yes	guestroom_no	gu
0	13300000	7420	4	2	3	2	0	1	1	
1	12250000	8960	4	4	4	3	0	1	1	
2	12250000	9960	3	2	2	2	0	1	1	
4	11410000	7420	4	1	2	2	0	1	0	

Splitting into dependent and independent data

```
dependent_data=data_no_outliers['price']
dependent_data
```

```
    0      13300000.0
    1      12250000.0
    2      12250000.0
    3      12215000.0
    4      11410000.0
              ...
    540     1820000.0
    541     1767150.0
    542     1750000.0
    543     1750000.0
    544     1750000.0
    Name: price, Length: 545, dtype: float64
```

```
independent_data=data_no_outliers.drop('price',axis=1)
independent_data
```

	area	bedrooms	bathrooms	stories	mainroad	guestroom	basement	hotwaterheating	airconditioni
0	7420.0	4.0	2.0	3.0	yes	no	no	no	y
1	8960.0	4.0	4.0	4.0	yes	no	no	no	y
2	9960.0	3.0	2.0	2.0	yes	no	yes	no	
3	7500.0	4.0	2.0	2.0	yes	no	yes	no	y
4	7420.0	4.0	1.0	2.0	yes	yes	yes	no	y
...	...	...	...	...	...	...	...	...	
540	3000.0	2.0	1.0	1.0	yes	no	yes	no	
541	2400.0	3.0	1.0	1.0	no	no	no	no	
542	3620.0	2.0	1.0	1.0	yes	no	no	no	
543	2910.0	3.0	1.0	1.0	no	no	no	no	
544	3850.0	3.0	1.0	2.0	yes	no	no	no	

545 rows × 11 columns

Scaling the independent data

```
independent_var=independent_data.select_dtypes('number')
independent_var
```

	area	bedrooms	bathrooms	stories	parking
0	7420.0	4.0	2.0	3.0	2.0
1	8960.0	4.0	4.0	4.0	3.0
2	9960.0	3.0	2.0	2.0	2.0
3	7500.0	4.0	2.0	2.0	3.0
4	7420.0	4.0	1.0	2.0	2.0
...	...	...	...	...	...
540	3000.0	2.0	1.0	1.0	2.0
541	2400.0	3.0	1.0	1.0	0.0
542	3620.0	2.0	1.0	1.0	0.0
543	2910.0	3.0	1.0	1.0	0.0
544	3850.0	3.0	1.0	2.0	0.0

545 rows × 5 columns

```
sclr=StandardScaler()
scaled=sclr.fit_transform(independent_var)
scaled
```

```
array([[ 1.04672629,  1.40341936,  1.42181174,  1.37821692,  1.51769249],
       [ 1.75700953,  1.40341936,  5.40580863,  2.53202371,  2.67940935],
       [ 2.21823241,  0.04727831,  1.42181174,  0.22441013,  1.51769249],
       ...,
       [-0.70592066, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [-1.03338891,  0.04727831, -0.57018671, -0.92939666, -0.80574124],
       [-0.5998394 ,  0.04727831, -0.57018671,  0.22441013, -0.80574124]])
```

Splitting the data into Training and Testing data

```
x_train,x_test,y_train,y_test=train_test_split(scaled,dependent_data,test_size=0.2,random_state=10)
```

```
x_train
```

```
array([[-0.38306464,  0.04727831, -0.57018671, -0.92939666,  0.35597563],
       [ 0.11505607,  0.04727831, -0.57018671, -0.92939666,  2.67940935],
       [-1.07628264,  1.40341936,  1.42181174,  0.22441013,  0.35597563],
       ...,
       [-1.52874228, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [ 4.81952946,  0.04727831, -0.57018671, -0.92939666,  1.51769249],
       [-1.04722559,  0.04727831, -0.57018671,  0.22441013, -0.80574124]])
```

```
x_test
```

```
array([[-0.92269542,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [-0.51220705, -1.30886273, -0.57018671,  0.22441013,  0.35597563],
       [-0.30004453,  1.40341936,  1.42181174,  0.22441013,  1.51769249],
       [ 0.11505607,  1.40341936, -0.57018671,  0.22441013, -0.80574124],
       [ 0.3917898 ,  1.40341936,  1.42181174,  2.53202371,  1.51769249],
       [ 0.71925804,  0.04727831,  1.42181174,  0.22441013,  0.35597563],
       [ 1.1758687 , -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [-0.71514512,  0.04727831, -0.57018671,  0.22441013,  0.35597563],
       [-1.08412342,  0.04727831,  1.42181174,  0.22441013,  0.35597563],
       [-0.65979837, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [ 0.3917898 ,  0.04727831, -0.57018671, -0.92939666,  0.35597563],
       [-0.69900232, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [-1.44618339,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [-0.41996247,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [ 0.78936392,  0.04727831, -0.57018671,  0.22441013,  1.51769249],
       [-1.15791909, -1.30886273, -0.57018671, -0.92939666,  0.35597563],
       [ 1.68321386,  0.04727831,  1.42181174,  0.22441013,  1.51769249],
       [ 0.43791208,  0.04727831, -0.57018671,  1.37821692, -0.80574124],
       [-0.2954323 ,  1.40341936,  1.42181174,  0.22441013, -0.80574124],
       [ 0.59934009,  1.40341936, -0.57018671,  0.22441013, -0.80574124],
       [-0.70130843, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [-1.03338891, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [ 2.55953734,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [ 0.59472786, -1.30886273, -0.57018671, -0.92939666,  2.67940935],
       [ 0.11505607,  2.7595604 , -0.57018671,  0.22441013, -0.80574124],
       [ 0.77229867,  0.04727831, -0.57018671, -0.92939666, -0.80574124],
       [-0.64134946,  0.04727831, -0.57018671, -0.92939666,  1.51769249],
       [ 0.55783003, -1.30886273, -0.57018671,  0.22441013, -0.80574124],
       [-0.53065597, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [-0.54449265,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [-1.38622441,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [-0.99187885,  0.04727831,  1.42181174,  0.22441013, -0.80574124],
       [ 1.42954128,  0.04727831, -0.57018671, -0.92939666,  2.67940935],
       [ 0.58550341,  0.04727831, -0.57018671,  1.37821692, -0.80574124],
       [ 1.7201117 ,  0.04727831,  1.42181174,  0.22441013,  0.35597563],
       [ 0.7607681 , -1.30886273, -0.57018671, -0.92939666,  1.51769249],
       [ 0.25342293,  0.04727831, -0.57018671, -0.92939666,  1.51769249],
       [-1.13024571, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [ 0.66852353,  0.04727831, -0.57018671, -0.92939666, -0.80574124],
       [-0.25392224, -1.30886273,  1.42181174, -0.92939666,  1.51769249],
       [-0.05098417,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [ 0.31245946,  1.40341936, -0.57018671,  2.53202371, -0.80574124],
       [-1.26861258,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [ 0.66852353,  0.04727831,  1.42181174, -0.92939666, -0.80574124],
       [ 0.80689039,  0.04727831,  1.42181174, -0.92939666, -0.80574124],
       [ 0.66852353,  0.04727831, -0.57018671,  2.53202371,  2.67940935],
       [ 5.09626319,  2.7595604 ,  3.41381019,  0.22441013, -0.80574124],
       [-0.34616681,  1.40341936, -0.57018671,  0.22441013,  1.51769249],
       [-0.75573273, -1.30886273, -0.57018671, -0.92939666,  0.35597563],
       [-0.69208397,  0.04727831,  1.42181174,  0.22441013,  1.51769249],
       [-0.99187885,  0.04727831, -0.57018671,  0.22441013, -0.80574124],
       [ 0.53984234,  0.04727831, -0.57018671,  0.22441013,  0.35597563],
       [-0.087882  ,  1.40341936, -0.57018671,  1.37821692, -0.80574124],
       [-0.91716074,  0.04727831, -0.57018671,  0.22441013,  0.35597563],
       [-0.18473881, -1.30886273, -0.57018671, -0.92939666, -0.80574124],
       [ 1.35113339,  0.04727831, -0.57018671, -0.92939666,  1.51769249],
       [-0.71514512,  0.04727831, -0.57018671, -0.92939666, -0.80574124],
       [ 0.40101425,  0.04727831, -0.57018671, -0.92939666, -0.80574124]
```

```
y_train
```

```
443    3220000.0
323    4025000.0
157    5495000.0
231    4690000.0
351    3780000.0
         ...
369    3675000.0
320    4060000.0
527    2275000.0
125    5943000.0
265    4403000.0
Name: price, Length: 436, dtype: float64
```

```
y_test
```

```
482    2940000.0
314    4095000.0
383    3570000.0
487    2870000.0
43     7700000.0
         ...
98     6293000.0
307    4165000.0
399    3500000.0
214    4865000.0
173    5250000.0
Name: price, Length: 109, dtype: float64
```

Creating the model

```
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVR
```

```
model1=LinearRegression()
model2=LogisticRegression()
model3=RandomForestRegressor(random_state=42)
model4=DecisionTreeClassifier(criterion='entropy',random_state=0)
model5=SVR()
```

Training the models

```
model1.fit(x_train,y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
model2.fit(x_train,y_train)
```

```
▾ LogisticRegression
LogisticRegression()
```

```
model3.fit(x_train,y_train)
```

```
▾        RandomForestRegressor
RandomForestRegressor(random_state=42)
```

```
model4.fit(x_train,y_train)
```

```
▾                 DecisionTreeClassifier
DecisionTreeClassifier(criterion='entropy', random_state=0)
```

```
model5.fit(x_train,y_train)
```

```
▾ SVR
SVR()
```

Testing the models

```
y_pred1=model1.predict(x_test)
```

```
y_pred2=model2.predict(x_test)
```

```
y_pred3=model3.predict(x_test)
```

```
y_pred4=model4.predict(x_test)
```

```
y_pred5=model5.predict(x_test)
```

```
y_pred1
```

```
array([ 3651111.51615361,  4079537.61885261,  6176820.61585599,
        4675112.2385528 ,  7788114.89515948,  6381314.4368112 ,
        4484747.38197334,  4154633.27794423,  5002050.94330468,
        3080791.19165212,  4460157.49495376,  3050807.20266285,
        3250737.07494392,  4035612.08083958,  5650095.94606231,
        3044601.15163584,  7463350.80968896,  5232814.84141006,
        5490782.15086578,  5045502.69077322,  3049043.43860466,
        2795061.41422494,  6314395.24402428,  5074627.82896872,
        4905419.13476537,  4406395.56800222,  4014774.19343682,
        4553141.14530063,  3179561.9789109 ,  3940368.82169718,
        3296594.94045692,  4727818.50907908,  5943417.31424697,
        5345695.74113438,  7146788.03806675,  4856835.84460529,
        4699114.6480155 ,  2720983.32378085,  4327026.18538356,
        5210399.57367183,  4317814.33015038,  5908255.50377982,
        3386546.90742474,  5456646.1000548 ,  5562471.94354635,
        6984622.76781207, 10974389.32980363,  5011925.42002089,
        3352201.60338461,  5646673.8297507 ,  3598198.59440784,
        5114473.67841259,  5060983.53235473,  4000127.54644657,
        3444126.58763977,  5538666.33971513,  3268767.75046807,
        4122429.55463323,  3461764.2282217 ,  4674905.58733331,
        3967898.75927627,  3467055.52039628,  4428865.71216983,
        3936841.2935808 ,  4873400.00848101,  4931931.50369691,
        3197199.61949283,  2986565.50115727,  2890304.67336733,
        7036648.59657437,  4139860.54399566,  7948554.48913368,
        5424543.39984283,  4012058.61437776,  3355938.38473015,
        3661694.10050277,  4422687.32701178,  5158608.06199798,
        9827837.06385804,  4404198.07921444,  6192629.77036232,
        6325891.55559659,  3610897.69562683,  3121982.29869587,
        4953580.30852772,  3025368.3104375 ,  6564890.02241819,
       11436286.04350521,  4839198.20402336,  2858556.92031987,
        6003412.95809447,  4112302.94054761,  6140734.41726409,
        5392924.33576335,  4372425.26230767,  3091373.77600128,
        3665446.10011959,  5302321.95591734,  5480880.0082806 ,
        5120261.22298129,  4229850.59874119,  3581634.43053211,
        5477000.35132506,  4409857.34247193,  6538811.16190055,
        4668737.62408401,  4706066.89445316,  3303025.46298437,
        5228374.34113732])
```

```
y_pred2
```

```
array([4200000., 3780000., 4200000., 3500000., 8400000., 4200000.,
       4900000., 4200000., 4200000., 3150000., 3500000., 3150000.,
       4200000., 4900000., 4900000., 3150000., 6300000., 5600000.,
       4200000., 5600000., 3150000., 2660000., 5600000., 4760000.,
       3500000., 4900000., 4200000., 3780000., 3150000., 4200000.,
       4200000., 4200000., 4480000., 5600000., 5250000., 3150000.,
       3500000., 2660000., 4900000., 3150000., 4900000., 5600000.,
       4200000., 5250000., 5250000., 7962500., 6790000., 4340000.,
       3150000., 4200000., 4200000., 4900000., 5600000., 4200000.,
       3150000., 4900000., 3290000., 4900000., 3150000., 4200000.,
       3150000., 3150000., 4200000., 4200000., 4900000., 3500000.,
       3150000., 3290000., 2660000., 7350000., 2660000., 5250000.,
       4900000., 3150000., 3150000., 4200000., 4200000., 4900000.,
       7210000., 3500000., 4900000., 5950000., 4200000., 3430000.,
       4200000., 3290000., 5250000., 9681000., 3150000., 2660000.,
       5250000., 4200000., 8400000., 5810000., 4200000., 3150000.,
       3150000., 3500000., 4200000., 4200000., 3150000., 3150000.,
       5250000., 3500000., 6650000., 4200000., 3150000., 3150000.,
       5250000.])
```

```
y_pred3
```

```
array([ 3532340.        ,  4290300.        ,  5715780.        ,
        4641560.        ,  7440664.44444444,  6792170.46666667,
        3034850.        ,  4062991.33333333,  3670800.        ,
        3005566.66666667,  5873342.33333333,  3623433.33333333,
        3189526.66666667,  4647136.66666667,  6706840.        ,
        3030440.        ,  7562450.        ,  5792523.33333333,
        5080483.33333333,  5976518.33333333,  3457445.83333333,
        2611700.        ,  5303480.        ,  4330900.        ,
        4650030.        ,  5281640.        ,  4369890.        ,
        4523925.        ,  3079069.58333333,  3919055.        ,
        3397706.66666667,  4789190.        ,  4359250.        ,
        5914300.        ,  6998740.        ,  4321520.        ,
        4054855.        ,  3179610.        ,  5393780.        ,
        6321000.        ,  4896360.        ,  4557367.5       ,
        3685111.5       ,  5780926.66666667,  6244939.4       ,
        6463975.        ,  6848975.        ,  5092896.66666667,
        3526886.66666667,  4743620.        ,  4112925.41666667,
        5738353.83333333,  4348155.        ,  3490375.        ,
        3336573.33333333,  6426000.        ,  3779537.5       ,
        4820900.        ,  3455946.66666667,  4326945.        ,
        3963386.66666667,  3399526.66666667,  4472990.66666667,
        3873817.5       ,  5103945.        ,  5480790.        ,
        3653889.5       ,  3643780.        ,  2671923.33333333,
        7360775.5       ,  4200904.16666667,  6829865.        ,
        5566423.33333333,  3169530.        ,  3424621.66666667,
        3215625.        ,  3750390.        ,  7247100.        ,
        7790370.        ,  4580472.5       ,  5423600.        ,
        7700006.66666667,  4017287.91666667,  2468095.        ,
        3793230.        ,  2654680.        ,  5365080.        ,
        7899080.        ,  4329920.        ,  2949730.        ,
        7030590.        ,  4140425.33333333, 10062990.        ,
        5449500.        ,  3717513.33333333,  3334275.        ,
        3505250.        ,  5404000.        ,  4802840.        ,
        4785620.        ,  4254945.83333333,  3100370.        ,
        5161870.        ,  4344200.        ,  6286291.66666667,
        5129425.        ,  4030530.        ,  3253912.66666667,
        5140905.        ])
```

```
y_pred4
```

```
array([ 3570000.,  3325000.,  4970000.,  4900000.,  9100000.,  8043000.,
        4970000.,  3500000.,  2800000.,  4095000.,  6629000.,  3675000.,
        3430000.,  5250000.,  8400000.,  3220000.,  3150000.,  5110000.,
        3990000.,  5250000.,  3675000.,  3010000.,  6615000.,  8855000.,
        4900000.,  2730000.,  3535000.,  7875000.,  2695000.,  4410000.,
        3332000.,  2485000.,  3773000.,  6650000.,  3150000.,  5803000.,
        3675000.,  3220000.,  5950000.,  3010000.,  4620000.,  2940000.,
        4200000.,  5383000.,  5523000.,  6090000.,  9800000.,  2485000.,
        2450000.,  3500000.,  2485000.,  4900000.,  4382000.,  3570000.,
        3010000.,  6020000.,  3710000.,  2870000.,  3010000.,  3780000.,
        7455000.,  3010000.,  5145000.,  4410000.,  4235000.,  6300000.,
        3990000.,  4235000.,  2520000.,  5873000.,  2450000.,  6615000.,
        8043000.,  5950000.,  3255000.,  3570000.,  3332000.,  8645000.,
        7980000.,  5740000.,  3150000.,  9800000.,  3465000.,  1890000.,
        4550000.,  2520000.,  4900000.,  7980000.,  5803000.,  2870000.,
        4480000.,  4473000., 11410000.,  5600000.,  2450000.,  3360000.,
        2590000.,  5320000.,  3570000.,  4550000.,  6629000.,  3430000.,
        5250000.,  5866000.,  6685000.,  4165000.,  3500000.,  2835000.,
        2233000.])
```

```
y_pred5
```

```
array([4339963.74904185, 4339968.7780853 , 4340034.83982371,
       4340003.46479983, 4340037.49667552, 4340038.49256881,
       4339985.26300725, 4339979.74940705, 4340010.23557542,
       4339942.01690805, 4339991.61307292, 4339941.8067364 ,
       4339963.0647234 , 4339970.67264414, 4340023.87213431,
       4339953.46015226, 4340039.25439691, 4340014.4792232 ,
       4340023.70870434, 4340011.72633734, 4339941.79579233,
       4339941.87384838, 4340023.04363024, 4340010.53571791,
       4340011.51051057, 4339988.72451209, 4339995.06509423,
       4339980.25796605, 4339943.0280757 , 4339968.44028752,
       4339962.80041089, 4340002.81012523, 4340022.8948581 ,
       4340016.71020428, 4340041.31645419, 4340001.78184421,
       4340008.11879349, 4339942.50664956, 4339985.77510085,
       4340006.57053358, 4339978.82559088, 4340025.63190806,
       4339962.53283058, 4340016.47988929, 4340018.25822272,
       4340023.36041908, 4340013.76148337, 4340017.80778657,
       4339953.13120231, 4340022.9506046 , 4339963.26408602,
       4340007.3292085 , 4340014.26511728, 4339977.23669348,
       4339948.00814499, 4340024.04930569, 4339954.44324758,
       4339978.09683874, 4339948.44787941, 4340002.03270509,
       4339984.66886416, 4339948.58219706, 4340001.03552416,
       4339968.36361421, 4339997.79608323, 4340013.21463549,
       4339943.25931101, 4339952.83276972, 4339941.46052289,
       4340043.02377346, 4339985.64795011, 4340036.49449332,
       4340016.28426772, 4339966.87832464, 4339946.00126637,
       4339963.86041196, 4339999.18247421, 4340013.79595389,
       4340022.93713085, 4339997.42002322, 4340030.23790303,
       4340042.00231938, 4339963.36950717, 4339964.24530004,
       4340006.73542843, 4339952.83093247, 4340020.06832066,
       4340014.08970443, 4340001.39513166, 4339941.54755155,
       4340023.69093715, 4339978.97811543, 4340031.86415908,
       4340023.11695337, 4340000.29824374, 4339942.10193428,
       4339957.14198511, 4340020.46129542, 4340020.25715918,
       4340013.69135282, 4339973.12073139, 4339981.69219173,
       4340016.7276152 , 4340001.92258746, 4340039.84144945,
       4340004.80080469, 4339990.12233832, 4339944.9584116 ,
       4340020.21964677])
```

Measuring the performance using metrics

```
from sklearn.metrics import classification_report
from sklearn.metrics import r2_score, mean_squared_error,accuracy_score, precision_score, recall_score
```

```
mse1=mean_squared_error(y_test,y_pred1)
rmse1=np.sqrt(mse1)
r2=r2_score(y_test,y_pred1)
print("Linear Regression mse=",mse1)
print('Linear Regression rmse=',rmse1)
print("Linear Regression R2Score=",r2)
```

```
    Linear Regression mse= 1007650078767.6519
    Linear Regression rmse= 1003817.751769539
    Linear Regression R2Score= 0.6416199512557832
```

```
mse2=mean_squared_error(y_test,y_pred2)
rmse2=np.sqrt(mse2)
r2=r2_score(y_test,y_pred2)
print("Linear Regression mse=",mse2)
print('Linear Regression rmse=',rmse2)
print("Linear Regression R2Score=",r2)
```

```
    Linear Regression mse= 1770055995412.844
    Linear Regression rmse= 1330434.513763396
    Linear Regression R2Score= 0.3704632517948526
```

```
mse1=mean_squared_error(y_test,y_pred3)
rmse1=np.sqrt(mse1)
r2=r2_score(y_test,y_pred3)
print("Linear Regression mse=",mse1)
print('Linear Regression rmse=',rmse1)
print("Linear Regression R2Score=",r2)
```

```
    Linear Regression mse= 1628492595521.6956
    Linear Regression rmse= 1276124.051776196
    Linear Regression R2Score= 0.42081158126199614
```

```
mse1=mean_squared_error(y_test,y_pred4)
rmse1=np.sqrt(mse1)
r2=r2_score(y_test,y_pred4)
print("Linear Regression mse=",mse1)
print('Linear Regression rmse=',rmse1)
print("Linear Regression R2Score=",r2)
```

```
    Linear Regression mse= 3613073103211.0093
    Linear Regression rmse= 1900808.5393355663
    Linear Regression R2Score= -0.28502278928889213
```

```
mse1=mean_squared_error(y_test,y_pred5)
rmse1=np.sqrt(mse1)
r2=r2_score(y_test,y_pred5)
print("Linear Regression mse=",mse1)
print('Linear Regression rmse=',rmse1)
print("Linear Regression R2Score=",r2)
```

```
    Linear Regression mse= 2882158660430.241
    Linear Regression rmse= 1697692.157144587
    Linear Regression R2Score= -0.025066323099775856
```