HOUSE PRICE PREDICTION USING MACHINE LEARNING

Importing Libraries and dataset

In [14]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

In [15]:
```
df=pd.read_csv("C:\\Users\\Garima Ranjan\\Downloads\\Delhi.csv")
```

Data cleaning

In [16]:
```
#Since 0 and 1 tells us that the house comes with amenities or not and 9 in the dat
df.replace(9, np.nan, inplace=True)
df.dropna(inplace = True)
df.isna().sum()
```

Out[16]:
```
Price                0
Area                 0
Location             0
No. of Bedrooms      0
Resale               0
MaintenanceStaff     0
Gymnasium            0
SwimmingPool         0
LandscapedGardens    0
JoggingTrack         0
RainWaterHarvesting  0
IndoorGames          0
ShoppingMall         0
Intercom             0
SportsFacility       0
ATM                  0
ClubHouse            0
School               0
24X7Security         0
PowerBackup          0
CarParking           0
StaffQuarter         0
Cafeteria            0
MultipurposeRoom     0
Hospital             0
WashingMachine       0
Gasconnection        0
AC                   0
Wifi                 0
Children'splayarea   0
LiftAvailable        0
BED                  0
VaastuCompliant      0
Microwave            0
GolfCourse           0
TV                   0
DiningTable          0
Sofa                 0
Wardrobe             0
Refrigerator         0
dtype: int64
```

In [17]:
```
df.shape
```

Out[17]:
```
(2002, 40)
```

Data Processing

In [18]:
```
#finding number of objects,integers and floats
obj=(df.dtypes=='object')
object_cols=list(obj[obj].index)
print("Categorial variables:", len(object_cols))

int_=(df.dtypes=='int64')
int_cols=list(int_[int_].index)
print("Integer variables:",len(int_cols))

fl_=(df.dtypes=='float64')
fl_cols=list(fl_[fl_].index)
print("Float variables:",len(fl_cols))
```

```
Categorial variables: 1
Integer variables: 4
Float variables: 35
```

In [19]:
```
df.describe()
```

Out[19]:

	Price	Area	No. of Bedrooms	Resale	MaintenanceStaff	Gymnasium	Swim
count	2.002000e+03	2002.000000	2002.000000	2002.000000	2002.000000	2002.000000	20
mean	1.029472e+07	1200.141359	2.688811	0.700799	0.071928	0.193806	
std	9.119848e+06	614.340764	0.729588	0.458022	0.258433	0.395378	
min	2.000000e+06	200.000000	1.000000	0.000000	0.000000	0.000000	
25%	3.600000e+06	720.000000	2.000000	0.000000	0.000000	0.000000	
50%	7.000000e+06	1000.000000	3.000000	1.000000	0.000000	0.000000	
75%	1.550000e+07	1700.000000	3.000000	1.000000	0.000000	0.000000	
max	1.625000e+08	6400.000000	5.000000	1.000000	1.000000	1.000000	

8 rows × 39 columns

Encoding Categorical data

In [20]:
```
from sklearn.preprocessing import OneHotEncoder

s = (df.dtypes == 'object')
object_cols = list(s[s].index)
print("Categorical variables:")
print(object_cols)
print('No. of. categorical features: ',
      len(object_cols))
```

```
Categorical variables:
['Location']
No. of. categorical features:  1
```

In [21]:
```
OH_encoder = OneHotEncoder(sparse=False)
OH_cols = pd.DataFrame(OH_encoder.fit_transform(df[object_cols]))
OH_cols.index = df.index
OH_cols.columns = OH_encoder.get_feature_names_out()
df_final = df.drop(object_cols, axis=1)
df_final = pd.concat([df_final, OH_cols], axis=1)
```

In [22]:
```
df_final
```

Out[22]:

	Price	Area	No. of Bedrooms	Resale	MaintenanceStaff	Gymnasium	SwimmingPool	Landsca
0	10500000	1200	2	1	0.0	1.0	0.0	
1	6000000	1000	3	0	0.0	0.0	0.0	
2	15000000	1350	2	1	0.0	0.0	0.0	
3	2500000	435	2	0	0.0	0.0	0.0	
4	5800000	900	3	0	0.0	0.0	0.0	
...	...	...	...	...	...	...	...	
1997	9000000	1200	2	1	0.0	1.0	1.0	
1998	12000000	1350	3	1	0.0	0.0	0.0	
1999	16000000	1963	4	1	0.0	0.0	0.0	
2000	11600000	1050	2	1	0.0	1.0	0.0	
2001	13600000	1450	3	1	0.0	0.0	0.0	

2002 rows × 142 columns

Splitting Dataset into training and testing

In [23]:
```
from sklearn.metrics import mean_absolute_error
from sklearn.model_selection import train_test_split

X = np.array(df_final.drop(['Price'], axis=1))
Y = np.array(df_final['Price'])
Y = Y.reshape(len(Y),1)
# Split the training set into
# training and validation set
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, train_size=0.8, test_siz
```

Using Support Vector Regression(SVR) Model

In [24]:
```
from sklearn.metrics import mean_absolute_percentage_error

from sklearn.preprocessing import StandardScaler
sc_X = StandardScaler()
sc_y = StandardScaler()
X_train = sc_X.fit_transform(X_train)
Y_train = sc_y.fit_transform(Y_train)
```

In [25]:
```
from sklearn.svm import SVR
regressor = SVR(kernel = 'rbf')
regressor.fit(X_train, Y_train)
```

```
C:\Users\Garima Ranjan\anaconda3\lib\site-packages\sklearn\utils\validation.py:99
3: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[25]:
```
SVR()
```

In [26]:
```
#predicting the test set results
Y_pred= regressor.predict(X_test)
print(mean_absolute_percentage_error(Y_test, Y_pred))
```

```
0.9999999540899248
```

In [27]:
```
Y_pred = sc_y.inverse_transform(regressor.predict(sc_X.transform(X_test)).reshape(
np.set_printoptions(precision=2)
print(np.concatenate((Y_pred.reshape(len(Y_pred),1), Y_test.reshape(len(Y_test),1)
```

```
[[20879247.66 18000000.  ]
 [ 5735405.64  4700000.  ]
 [13547932.29 14500000.  ]
 [16442522.49 18000000.  ]
 [ 4010176.64  3800000.  ]
 [ 4129543.08  4000000.  ]
 [16516580.6  14900000.  ]
 [12730507.67 11000000.  ]
 [ 1772186.72  2000000.  ]
 [ 4552507.26  3600000.  ]
 [ 6280121.11  5500000.  ]
 [ 2048119.91  2500000.  ]
 [ 3386092.02  3211000.  ]
 [ 1924649.65  2599000.  ]
 [13887463.13 13100000.  ]
 [ 8527208.28  4500000.  ]
 [ 2672694.4   3600000.  ]
 [ 2200481.19  2900000.  ]
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 [ 4975072.95  4500000.  ]
 [19832277.77 25400000.  ]
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 [ 8152150.93  7500000.  ]
 [16972812.21 19000000.  ]
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 [14699639.78 13500000.  ]
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 [ 2681614.55  2600000.  ]
 [19497642.23 25500000.  ]
 [18588878.17 19000000.  ]
```

```
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[ 2431134.16  2800000.  ]
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```

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```

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```

```
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```

```
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[ 4676140.78  4400000.  ]
[ 4243558.58  4100000.  ]
[20639269.9  28500000.  ]
[ 5475343.11  4199000.  ]
[14551801.42 15000000.  ]
```

```
[ 8713457.63  9200000.  ]
[ 2251470.    3200000.  ]
[11116250.67  9000000.  ]
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[ 3507676.88  3600000.  ]
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[ 7296314.16  5700000.  ]
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[16580337.31 16500000.  ]
[ 2200481.19  3200000.  ]
[16728561.66 17500000.  ]
[14427641.63 11700000.  ]]
```
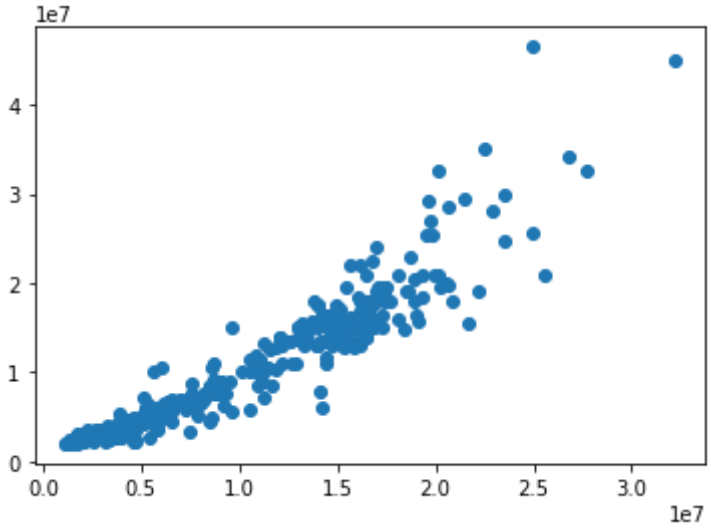

In [28]:
```
plt.scatter(Y_pred,Y_test)
```

Out[28]:
```
<matplotlib.collections.PathCollection at 0x25c7e29dfa0>
```



Using Random Forest Model

In [61]:
```
#resetting values of y_pred and x_pred
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, train_size=0.8, test_siz
```

In [62]:
```
from sklearn.metrics import mean_absolute_percentage_error
from sklearn.ensemble import RandomForestRegressor
regressor2 = RandomForestRegressor(n_estimators = 500, random_state = 0)
regressor2.fit(X_train, Y_train)
```

```
C:\Users\Garima Ranjan\AppData\Local\Temp\ipykernel_20444\1903883464.py:4: DataCon
versionWarning: A column-vector y was passed when a 1d array was expected. Please
change the shape of y to (n_samples,), for example using ravel().
  regressor2.fit(X_train, Y_train)
```

Out[62]:
```
RandomForestRegressor(n_estimators=500, random_state=0)
```

In [63]:
```
Y_pred= regressor2.predict(X_test)
print(mean_absolute_percentage_error(Y_test, Y_pred))
```

```
0.11664613066282309
```

In [64]:
```
np.set_printoptions(precision=2)
print(np.concatenate((Y_pred.reshape(len(Y_pred),1), Y_test.reshape(len(Y_test),1)
```

```
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```

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```

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```
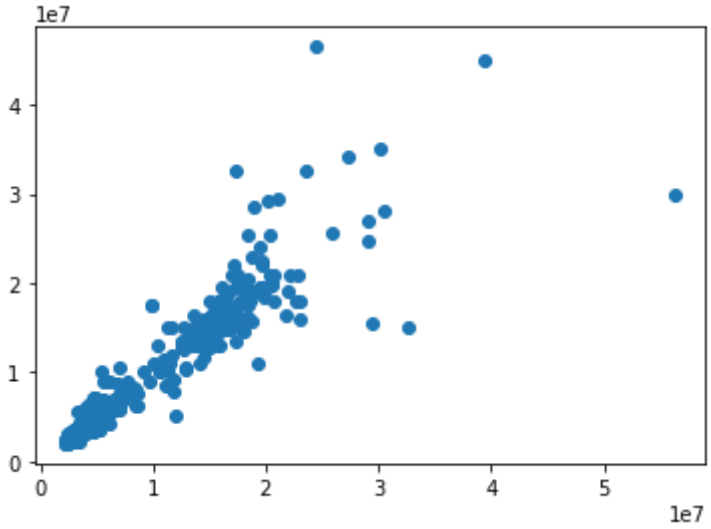

In [46]:
```
plt.scatter(Y_pred,Y_test)
```

Out[46]:
```
<matplotlib.collections.PathCollection at 0x25c0096a190>
```



Random forest model is best with error of just 0.115

Challenges faced

In [48]:
```
#Finding dataset
#Number of data in dataset
#Finding the right model
#increasing accuracy of Random Forest
```