Real Estate (99acres.com) Model Building

1. Import sklearn Libraries

In [1]:

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

import warnings
warnings.filterwarnings('ignore')
```

2. Import Dataset

In [3]:
```
mum_prop = pd.read_csv('Final_Project.csv')
mum_prop
```

Out[3]:

	Property_Name	Location	Region	Property_Age	Availability	Area_Tpye	Area_SqFt	R
0	Omkar Alta Monte	W E Highway Malad East Mumbai	Malad Mumbai	0 to 1 Year	Ready To Move	Super Built Up Area	2900.0	
1	T Bhimjyani Neelkanth Woods	Manpada Thane Mumbai	Manpada Thane	1 to 5 Year	Ready To Move	Super Built Up Area	1900.0	
2	Legend 1 Pramila Nagar	Dahisar West Mumbai	Dahisar Mumbai	10+ Year	Ready To Move	Super Built Up Area	595.0	
3	Unnamed Property	Vidyavihar West Vidyavihar West Central Mumbai...	Central Mumbai	5 to 10 Year	Ready To Move	Built Up Area	1450.0	
4	Unnamed Property	176 Cst Road Kalina Mumbai 400098 Santacruz Ea...	Santacruz Mumbai	5 to 10 Year	Ready To Move	Carpet Area	876.0	
...	...	...	...	...	...	...	...	
2526	Shagun White Woods	Sector 23 Ulwe Navi Mumbai Mumbai	Ulwe Navi-Mumbai	1 to 5 Year	Ready To Move	Built Up Area	1180.0	
2527	Guru Anant	Sector 2 Ulwe Navi Mumbai Mumbai	Ulwe Navi-Mumbai	0 to 1 Year	Ready To Move	Built Up Area	1090.0	
2528	Balaji Mayuresh Delta	Ulwe Navi Mumbai Mumbai	Ulwe Navi-Mumbai	1 to 5 Year	Ready To Move	Built Up Area	1295.0	
2529	Balaji Mayuresh Delta	Ulwe Navi Mumbai Mumbai	Ulwe Navi-Mumbai	1 to 5 Year	Ready To Move	Built Up Area	1850.0	
2530	Gurukrupa Tulsi Heights	Ulwe Navi Mumbai Mumbai	Ulwe Navi-Mumbai	0 to 1 Year	Ready To Move	Built Up Area	1100.0	

2531 rows × 12 columns

3. Data Understanding

In [4]:
```
mum_prop.shape
```

Out[4]:
```
(2531, 12)
```

In [5]:
```
mum_prop.isna().sum()
```

Out[5]:
```
Property_Name    0
Location         0
Region           0
Property_Age     0
Availability     0
Area_Tpye        0
Area_SqFt        0
Rate_SqFt        0
Floor_No         0
Bedroom          0
Bathroom         0
Price_Lakh       0
dtype: int64
```

In [6]:
```
mum_prop.describe().round()
```

Out[6]:

	Area_SqFt	Rate_SqFt	Floor_No	Bedroom	Bathroom	Price_Lakh
count	2531.0	2531.0	2531.0	2531.0	2531.0	2531.0
mean	949.0	16554.0	9.0	2.0	2.0	161.0
std	487.0	10204.0	8.0	1.0	1.0	162.0
min	185.0	1808.0	-1.0	1.0	1.0	13.0
25%	634.0	8751.0	3.0	1.0	2.0	66.0
50%	850.0	13636.0	6.0	2.0	2.0	110.0
75%	1150.0	22314.0	12.0	2.0	2.0	197.0
max	5000.0	55611.0	55.0	6.0	7.0	1900.0

4. Feature Engineering

4.1 Drop Unwanted Columns

In [7]:
```
mum_prop.drop(columns=['Property_Name', 'Location','Availability','Bathroom'],
print('Shape of data :', mum_prop.shape)
```

```
Shape of data : (2531, 8)
```

4.2 Label Encoding for Categorical Columns

In [8]:

```
le = LabelEncoder()
```

In [9]:

```
for column in mum_prop.describe(include='object').columns:
    mum_prop[column] = le.fit_transform(mum_prop[column])
```

In [10]:

```
mum_prop.describe().round(2).T
```

Out[10]:

	count	mean	std	min	25%	50%	75%	max
Region	2531.0	67.56	40.60	0.0	31.0	60.0	107.0	144.0
Property_Age	2531.0	1.30	1.09	0.0	0.0	1.0	2.0	4.0
Area_Tpye	2531.0	1.74	1.18	0.0	1.0	1.0	3.0	3.0
Area_SqFt	2531.0	948.77	486.83	185.0	634.5	850.0	1150.0	5000.0
Rate_SqFt	2531.0	16553.69	10204.27	1808.0	8751.0	13636.0	22314.0	55611.0
Floor_No	2531.0	8.78	7.98	-1.0	3.0	6.0	12.0	55.0
Bedroom	2531.0	1.95	0.83	1.0	1.0	2.0	2.0	6.0
Price_Lakh	2531.0	161.35	162.32	13.0	66.0	110.0	197.0	1900.0

In [11]:

```
mum_prop
```

Out[11]:

	Region	Property_Age	Area_Tpye	Area_SqFt	Rate_SqFt	Floor_No	Bedroom	Price_Lakh
0	69	0	3	2900.0	17241	14	3	500.0
1	73	1	3	1900.0	12631	8	3	240.0
2	24	2	3	595.0	15966	3	1	95.0
3	18	3	0	1450.0	25862	1	3	375.0
4	107	3	1	876.0	39954	5	2	350.0
...	...	...	...	...	...	...	...	...
2526	130	1	0	1180.0	10338	2	2	122.0
2527	130	0	0	1090.0	8073	11	2	88.0
2528	130	1	0	1295.0	10579	6	2	137.0
2529	130	1	0	1850.0	9243	6	3	171.0
2530	130	0	0	1100.0	8636	4	2	95.0

2531 rows × 8 columns

In [12]:

```
mum_prop.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2531 entries, 0 to 2530
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Region        2531 non-null   int32  
 1   Property_Age  2531 non-null   int32  
 2   Area_Tpye     2531 non-null   int32  
 3   Area_SqFt     2531 non-null   float64
 4   Rate_SqFt     2531 non-null   int64  
 5   Floor_No      2531 non-null   int64  
 6   Bedroom       2531 non-null   int64  
 7   Price_Lakh    2531 non-null   float64
dtypes: float64(2), int32(3), int64(3)
memory usage: 148.3 KB
```

4.3 Looking for Minimum & Maximum

In [13]:

```
for i in mum_prop.columns:
    print(i,'Min value :', mum_prop[i].min(),'Max value :', mum_prop[i].max())
```

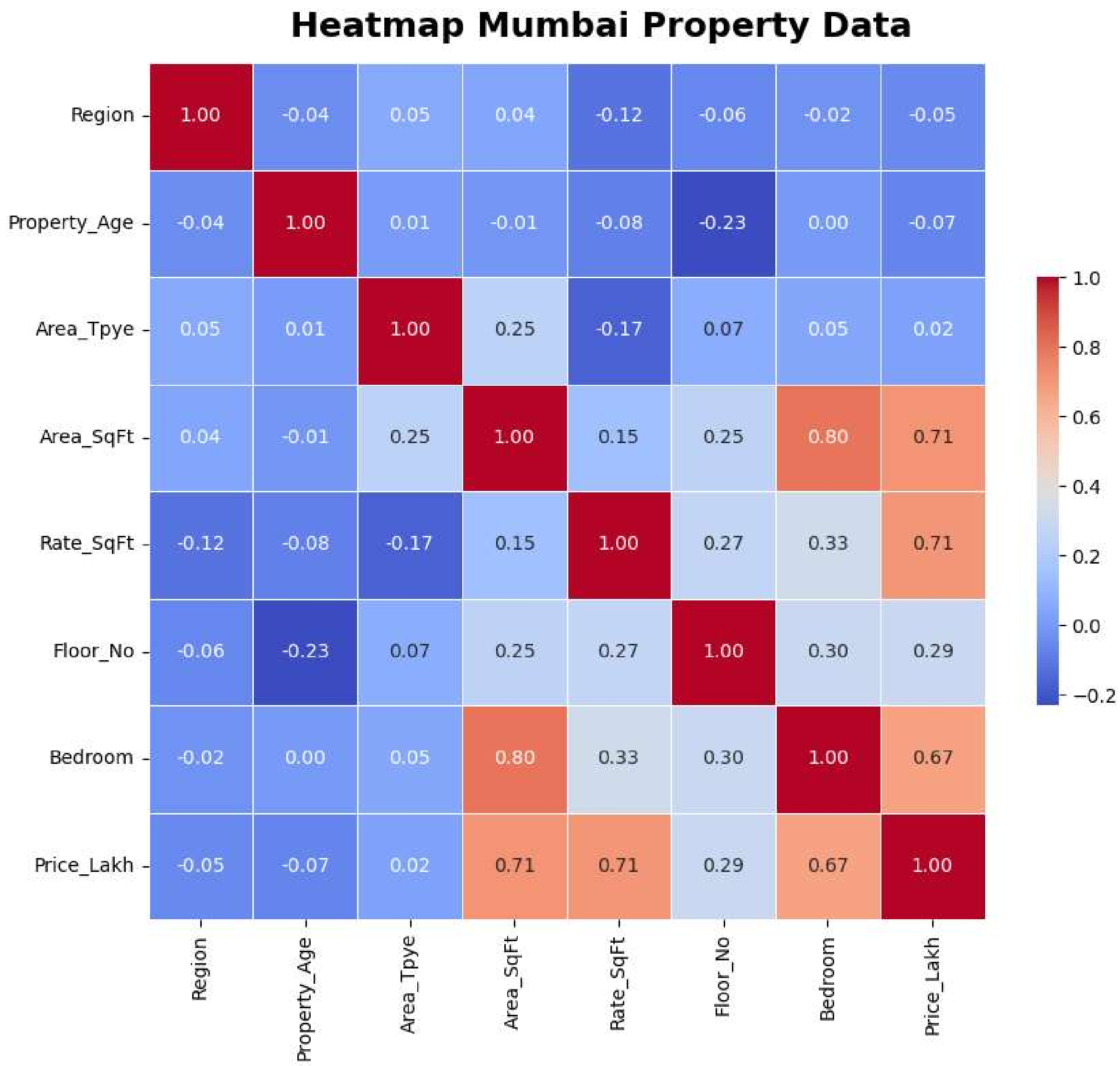
```
Region Min value : 0 Max value : 144
Property_Age Min value : 0 Max value : 4
Area_Tpye Min value : 0 Max value : 3
Area_SqFt Min value : 185.0 Max value : 5000.0
Rate_SqFt Min value : 1808 Max value : 55611
Floor_No Min value : -1 Max value : 55
Bedroom Min value : 1 Max value : 6
Price_Lakh Min value : 13.0 Max value : 1900.0
```

4.4 Correlation Heatmap

In [14]:

```
fig = plt.figure( figsize =(9,8))
rcParams = {'xtick.labelsize':'14','ytick.labelsize':'14','axes.labelsize':'16
sns.heatmap(mum_prop.corr(),annot = True, linewidths=.5, cbar_kws={"shrink": .
fig.suptitle('Heatmap Mumbai Property Data',fontsize=18, fontweight="bold")
pylab.rcParams.update(rcParams)
fig.tight_layout()
plt.show()

fig.savefig('Heatmap_Encoding', dpi = 250)
```



5. Model Building

In [15]:

```
mum_prop.head()
```

Out[15]:

	Region	Property_Age	Area_Tpye	Area_SqFt	Rate_SqFt	Floor_No	Bedroom	Price_Lakh
0	69	0	3	2900.0	17241	14	3	500.0
1	73	1	3	1900.0	12631	8	3	240.0
2	24	2	3	595.0	15966	3	1	95.0
3	18	3	0	1450.0	25862	1	3	375.0
4	107	3	1	876.0	39954	5	2	350.0

split data

In [16]:

```
X =  mum_prop.drop('Price_Lakh', axis = 1)
y =  mum_prop['Price_Lakh']
```

In [17]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size= 0.20, ran
```

In [18]:

```
print(X_train.shape, X_test.shape)
```

```
(2024, 7) (507, 7)
```

In [19]:

```
X_train
```

Out[19]:

	Region	Property_Age	Area_Tpye	Area_SqFt	Rate_SqFt	Floor_No	Bedroom
1990	107	1	3	1108.0	24368	12	2
1865	80	0	1	671.0	29657	10	2
537	18	1	1	762.0	48556	16	2
551	13	3	1	750.0	22666	13	2
1928	27	0	0	400.0	4750	3	1
...	...	...	...	...	...	...	...
1987	118	0	3	845.0	23313	1	2
1283	80	0	1	1330.0	34736	16	3
1414	69	3	1	669.0	21001	13	2
1691	11	0	1	1370.0	21897	7	3
1867	80	0	1	1363.0	30814	14	4

2024 rows × 7 columns

feature scaling

In [20]:
```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test=sc.transform(X_test)
```

5.2 Linear Regression

In [21]:
```
from sklearn.linear_model import LinearRegression

linear = LinearRegression()
linear.fit(X_train, y_train)


print("Test Accuracy     = ", linear.score(X_test, y_test))
```

```
Test Accuracy     =  0.8696528670699647
```

5.3 Decision Tree Regressor

In [22]:
```
from sklearn.tree import DecisionTreeRegressor

dt = DecisionTreeRegressor(min_samples_split=2,criterion='absolute_error')
dt.fit(X_train, y_train)

print("Test Accuracy     = ", dt.score(X_test, y_test))
```

```
Test Accuracy     =  0.9677577413282225
```

cv (cross validation use)

In [23]:
```
from sklearn.model_selection import cross_val_score
score_ds_cv = cross_val_score(DecisionTreeRegressor(min_samples_split=2,criter
print(score_ds_cv)
print("average accuracy is : ",np.average(score_ds_cv))
```

```
[0.95045369 0.93257584 0.90343312 0.88864082 0.83159896]
average accuracy is :  0.9013404866003153
```

6.1 Visualizing Results

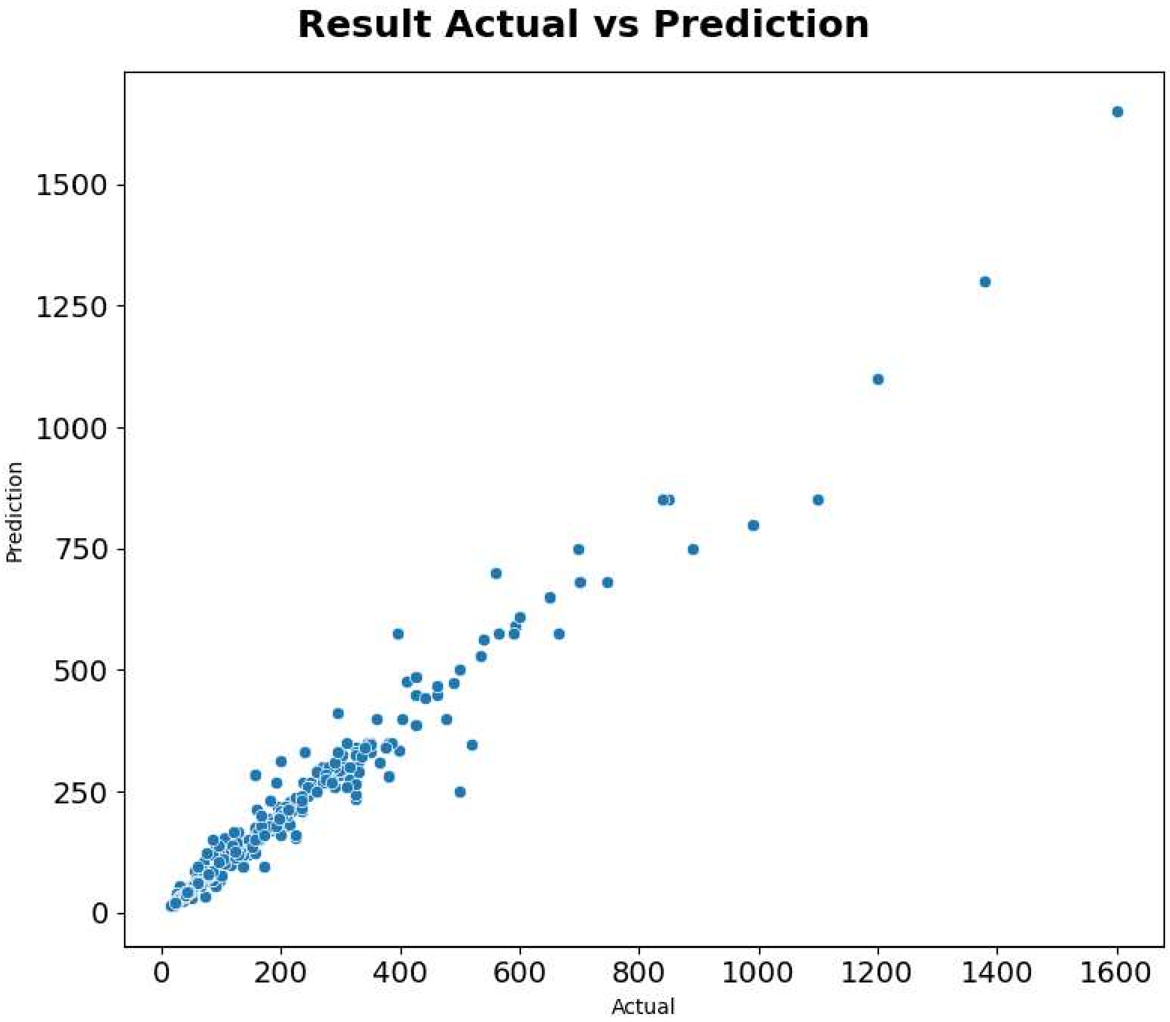
In [24]:
```
pred = dt.predict(X_test)
```

In [25]:

```
fig = plt.figure(figsize=(8,7))

sns.scatterplot(x=y_test,y=pred)
fig.suptitle('Result Actual vs Prediction', fontsize= 18 , fontweight='bold')
plt.xlabel("Actual")
plt.ylabel("Prediction")
pylab.rcParams.update(rcParams)
fig.tight_layout()
fig.subplots_adjust(top=0.92)
plt.show()

#fig.savefig('Prediction_Polynomial', dpi = 500)
```



In [26]:

```
print(list(X.loc[37]))
```

```
[18.0, 1.0, 3.0, 802.0, 22443.0, 20.0, 2.0]
```

In [27]:

```
print(y.loc[37])
```

```
180.0
```

7. Model Deployement

In [28]:

```python
input_data=(18.0, 1.0, 3.0, 802.0, 22443.0, 20.0, 2.0)
input_data_np = np.array(input_data)        # convert input_data into 1d array

input_data_re = input_data_np.reshape(1,-1)  # array form data reshape in -1 x

s_data = sc.transform(input_data_re)

pred = dt.predict(s_data)
print('property price is : ',pred, 'lakh')
```

```
property price is :  [180.] lakh
```

The End !!!

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