NAME:SUJEET P

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns


from google.colab import files
uploaded = files.upload()
```

Choose Files   No file chosen   Upload widget is only available when the cell has been executed in
the current browser session. Please rerun this cell to enable.
Saving House Price India.csv to House Price India.csv

```python
import io
df = pd.read_csv(io.BytesIO(uploaded['House Price India.csv']))
```

```python
df.head()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	co
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	

5 rows × 23 columns

```python
df.tail()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0

5 rows × 23 columns

```python
df
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4

df.columns

```
Index(['id', 'Date', 'number of bedrooms', 'number of bathrooms',
       'living area', 'lot area', 'number of floors', 'waterfront present',
       'number of views', 'condition of the house', 'grade of the house',
       'Area of the house(excluding basement)', 'Area of the basement',
       'Built Year', 'Renovation Year', 'Postal Code', 'Lattitude',
       'Longitude', 'living_area_renov', 'lot_area_renov',
       'Number of schools nearby', 'Distance from the airport', 'Price'],
      dtype='object')
```

df.dtypes

```
id                                       int64
Date                                     int64
number of bedrooms                       int64
number of bathrooms                    float64
living area                              int64
lot area                                 int64
number of floors                       float64
waterfront present                       int64
number of views                          int64
condition of the house                   int64
grade of the house                       int64
Area of the house(excluding basement)    int64
Area of the basement                     int64
Built Year                               int64
Renovation Year                          int64
Postal Code                              int64
Lattitude                              float64
Longitude                              float64
living_area_renov                        int64
lot_area_renov                           int64
Number of schools nearby                 int64
Distance from the airport                int64
Price                                    int64
dtype: object
```

df.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14620 entries, 0 to 14619
Data columns (total 23 columns):
 #   Column                                 Non-Null Count  Dtype
---  ------                                 --------------  -----
 0   id                                     14620 non-null  int64
 1   Date                                   14620 non-null  int64
 2   number of bedrooms                     14620 non-null  int64
 3   number of bathrooms                    14620 non-null  float64
 4   living area                            14620 non-null  int64
 5   lot area                               14620 non-null  int64
 6   number of floors                       14620 non-null  float64
 7   waterfront present                     14620 non-null  int64
 8   number of views                        14620 non-null  int64
 9   condition of the house                 14620 non-null  int64
 10  grade of the house                     14620 non-null  int64
 11  Area of the house(excluding basement)  14620 non-null  int64
 12  Area of the basement                   14620 non-null  int64
 13  Built Year                             14620 non-null  int64
 14  Renovation Year                        14620 non-null  int64
 15  Postal Code                            14620 non-null  int64
 16  Lattitude                              14620 non-null  float64
 17  Longitude                              14620 non-null  float64
 18  living_area_renov                      14620 non-null  int64
 19  lot_area_renov                         14620 non-null  int64
 20  Number of schools nearby               14620 non-null  int64
 21  Distance from the airport              14620 non-null  int64
 22  Price                                  14620 non-null  int64
dtypes: float64(4), int64(19)
memory usage: 2.6 MB
```

df.shape

(14620, 23)

```
print(df.describe())
```

```
                  id          Date  number of bedrooms  number of bathrooms  \
count   1.462000e+04  14620.000000        14620.000000         14620.000000
mean    6.762821e+09  42604.538646            3.379343             2.129583
std     6.237575e+03     67.347991            0.938719             0.769934
min     6.762810e+09  42491.000000            1.000000             0.500000
25%     6.762815e+09  42546.000000            3.000000             1.750000
50%     6.762821e+09  42600.000000            3.000000             2.250000
75%     6.762826e+09  42662.000000            4.000000             2.500000
max     6.762832e+09  42734.000000           33.000000             8.000000

        living area      lot area  number of floors  waterfront present  \
count  14620.000000  1.462000e+04      14620.000000        14620.000000
mean    2098.262996  1.509328e+04          1.502360            0.007661
std      928.275721  3.791962e+04          0.540239            0.087193
min      370.000000  5.200000e+02          1.000000            0.000000
25%     1440.000000  5.010750e+03          1.000000            0.000000
50%     1930.000000  7.620000e+03          1.500000            0.000000
75%     2570.000000  1.080000e+04          2.000000            0.000000
max    13540.000000  1.074218e+06          3.500000            1.000000

        number of views  condition of the house  ...    Built Year  \
count      14620.000000            14620.000000  ...  14620.000000
mean           0.233105                3.430506  ...   1970.926402
std            0.766259                0.664151  ...     29.493625
min            0.000000                1.000000  ...   1900.000000
25%            0.000000                3.000000  ...   1951.000000
50%            0.000000                3.000000  ...   1975.000000
75%            0.000000                4.000000  ...   1997.000000
max            4.000000                5.000000  ...   2015.000000

        Renovation Year    Postal Code     Lattitude     Longitude  \
count      14620.000000   14620.000000  14620.000000  14620.000000
mean          90.924008  122033.062244     52.792848   -114.404007
std          416.216661      19.082418      0.137522      0.141326
min            0.000000  122003.000000     52.385900   -114.709000
25%            0.000000  122017.000000     52.707600   -114.519000
50%            0.000000  122032.000000     52.806400   -114.421000
75%            0.000000  122048.000000     52.908900   -114.315000
max         2015.000000  122072.000000     53.007600   -113.505000

        living_area_renov  lot_area_renov  Number of schools nearby  \
count        14620.000000    14620.000000              14620.000000
mean          1996.702257    12753.500068                  2.012244
std            691.093366    26058.414467                  0.817284
min            460.000000      651.000000                  1.000000
25%           1490.000000     5097.750000                  1.000000
50%           1850.000000     7620.000000                  2.000000
75%           2380.000000    10125.000000                  3.000000
max           6110.000000   560617.000000                  3.000000

        Distance from the airport         Price
count                14620.000000  1.462000e+04
mean                    64.950958  5.389322e+05
std                      8.936008  3.675324e+05
min                     50.000000  7.800000e+04
25%                     57.000000  3.200000e+05
50%                     65.000000  4.500000e+05
75%                     73.000000  6.450000e+05
```

```
plt.hist(df['lot area'])
```

Assignment-3

```
(array([1.4313e+04, 1.7600e+02, 9.2000e+01, 1.9000e+01, 1.4000e+01,
        2.0000e+00, 0.0000e+00, 1.0000e+00, 0.0000e+00, 3.0000e+00]),
 array([5.200000e+02, 1.078898e+05, 2.152596e+05, 3.226294e+05,
        4.299992e+05, 5.373690e+05, 6.447388e+05, 7.521086e+05,
        8.594784e+05, 9.668482e+05, 1.074218e+06]),
 <BarContainer object of 10 artists>)
```



```
sns.countplot(df['number of bedrooms'])
```

<Axes: ylabel='count'>
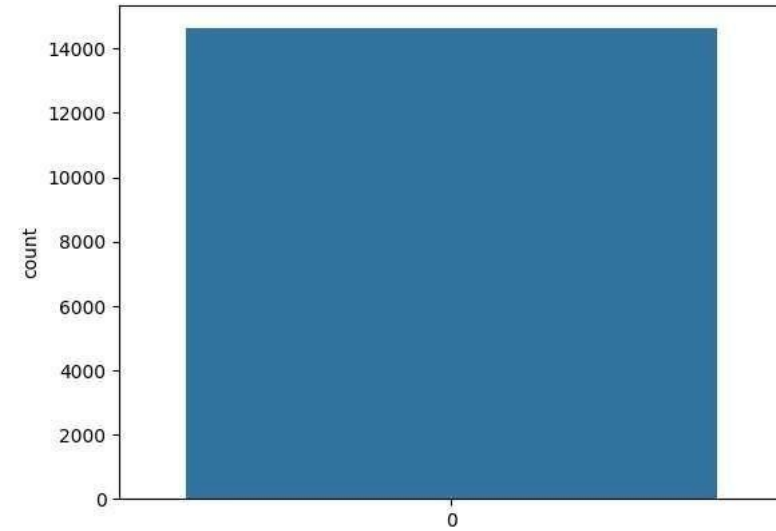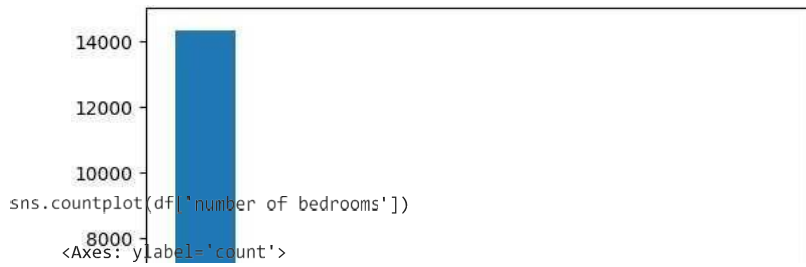

```
sns.countplot(df['number of floors'])
```

<Axes: ylabel='count'>

```
sns.boxplot(x=df['Price'])
```

`<Axes:`

Assignment-3
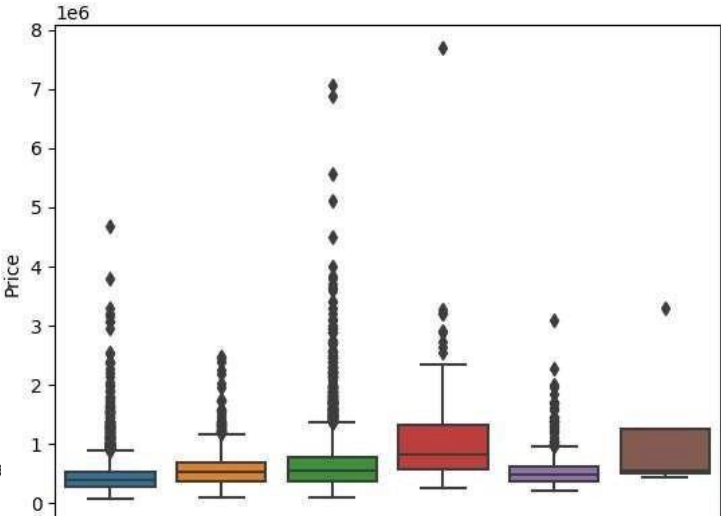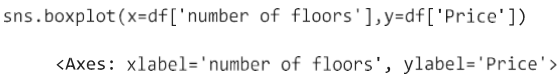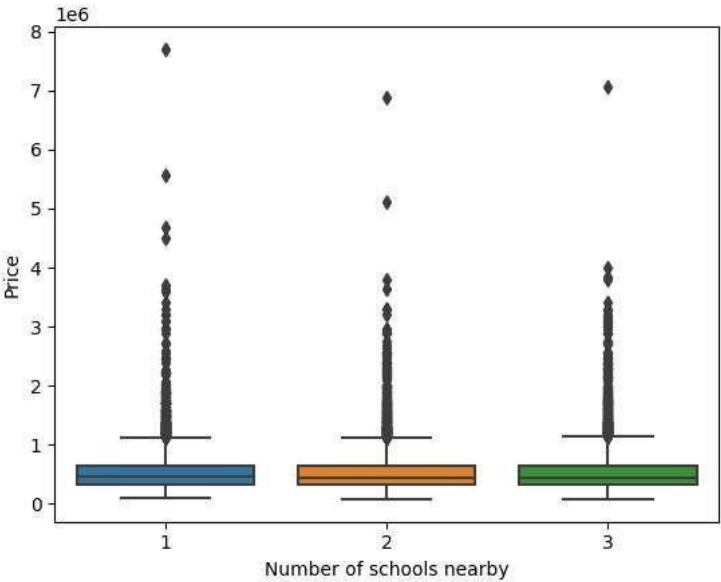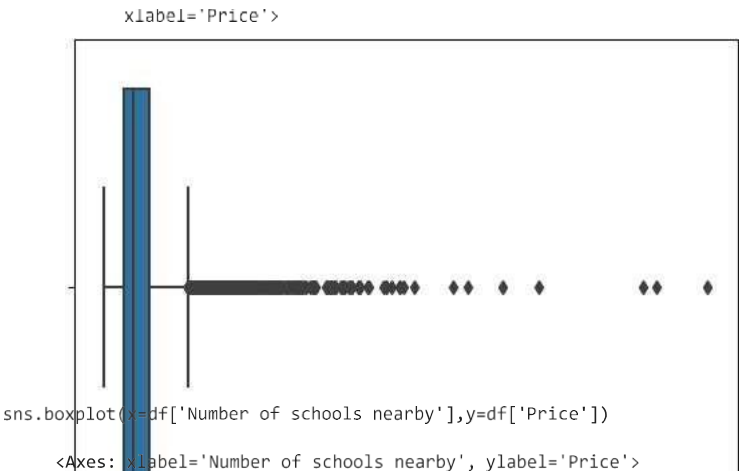
`xlabel='Price'>`

```
sns.boxplot(x=df['Number of schools nearby'],y=df['Price'])
```

`<Axes: xlabel='Number of schools nearby', ylabel='Price'>`

```
sns.boxplot(x=df['number of floors'],y=df['Price'])
```

`<Axes: xlabel='number of floors', ylabel='Price'>`

<Axes:

Assignment-3

xlabel='condition of the house' ylabel='Price'>


```
sns.lineplot(x=df.groupby('condition of the house').mean().index,y=df.groupby('condition of the house').mean()['Price'])
plt.show
```

<function matplotlib.pyplot.show(close=None, block=None)>
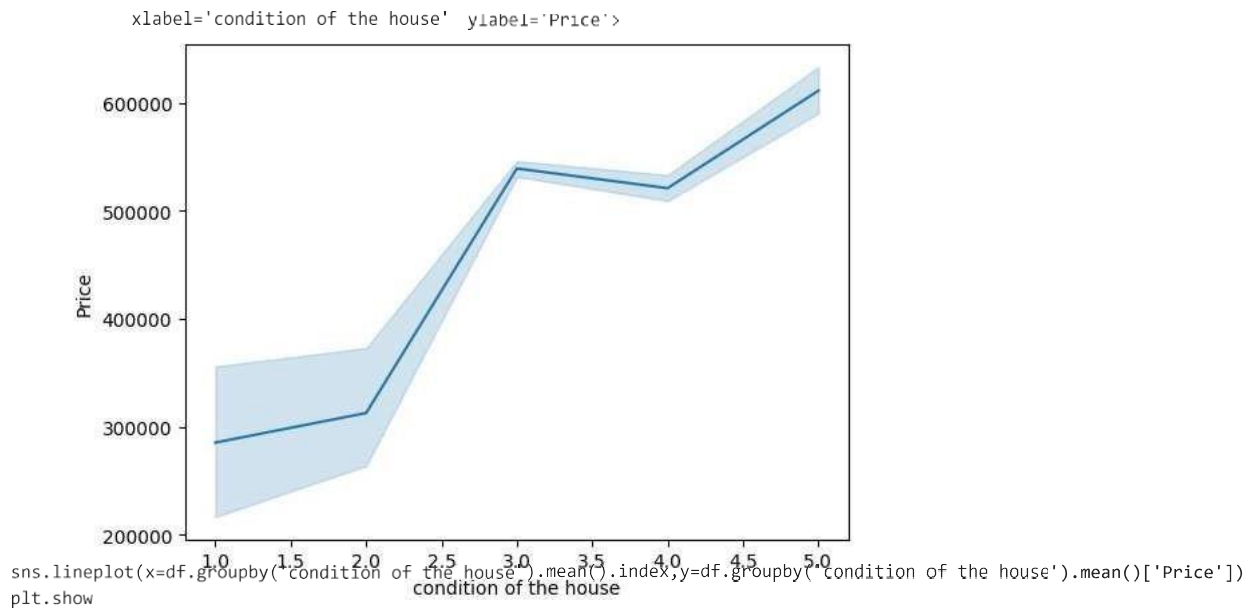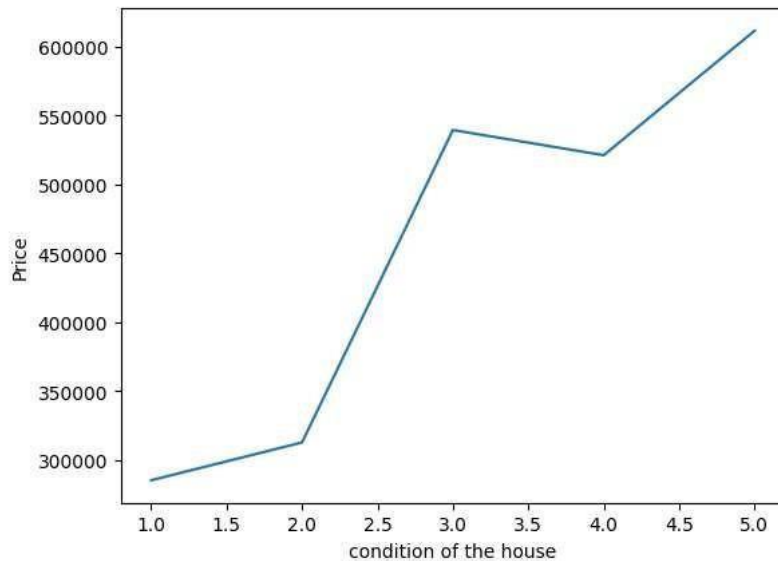

```
sns.heatmap(df[['Price','number of floors','number of bathrooms']].corr(),annot=True)
```

<Axes:

Assignment-3

>


```
sns.pairplot(df[['Price','number of bathrooms','number of views','number of floors']])
```

<seaborn.axisgrid.PairGrid at 0x7cfe168504f0>


```
sns.scatterplot(df['number of bedrooms'])
```

<Axes: ylabel='number of bedrooms'>

```
plt.subplots(figsize=(15,15))
sns.heatmap(df.drop(['id'],axis=1).corr(),linewidth=0.3,annot=True)
plt.show()
```

```
print(df.describe())
```

```
                 id           Date  number of bedrooms  number of bathrooms  \
count  1.462000e+04   14620.000000        14620.000000         14620.000000
mean   6.762821e+09   42604.538646            3.379343             2.129583
std    6.237575e+03      67.347991            0.938719             0.769934
min    6.762810e+09   42491.000000            1.000000             0.500000
25%    6.762815e+09   42546.000000            3.000000             1.750000
50%    6.762821e+09   42600.000000            3.000000             2.250000
75%    6.762826e+09   42662.000000            4.000000             2.500000
max    6.762832e+09   42734.000000           33.000000             8.000000

        living area      lot area  number of floors  waterfront present  \
count  14620.000000  1.462000e+04      14620.000000        14620.000000
mean    2098.262996  1.509328e+04          1.502360            0.007661
std      928.275721  3.791962e+04          0.540239            0.087193
min      370.000000  5.200000e+02          1.000000            0.000000
```

```
25%      1440.000000   5.010750e+03              1.000000        0.000000
50%      1930.000000   7.620000e+03              1.500000        0.000000
75%      2570.000000   1.080000e+04              2.000000        0.000000
max     13540.000000   1.074218e+06              3.500000        4.000000

            number of views  condition of the house  Built  Year
count     14620.000000           14620.000000  ...    14620.000000
mean          0.233105               3.450606  ...     1970.926102
std           0.766259               0.678259  ...       29.497970
min           0.000000               1.000000  ...     1900.000000
25%           0.000000               3.000000  ...     1951.000000
50%           0.000000               3.000000  ...     1975.000000
75%           0.000000               4.000000  ...     1997.000000
max           4.000000               5.000000  ...     2015.000000

            Renovation Year   Postal Code     Lattitude      Longitude
count     14620.000000    14620.000000   14620.000000   14620.000000
mean         90.924008   122033.062244      52.769848    -114.464068
std         416.216661       19.082418       0.137722       0.141328
min           0.000000   122003.000000      52.386000    -114.709000
25%           0.000000   122017.000000      52.676000    -114.528000
50%           0.000000   122032.000000      52.760000    -114.421000
75%           0.000000   122048.000000      52.895000    -114.315000
max        2015.000000   122072.000000      53.005000    -113.505000

            living_area_renov   lot_area_renov   Number of schools nearby  \
count     14620.000000    14620.000000               14620.000000
mean       1996.702257    12753.500000                   2.012244
std         691.093366    26058.414467                   0.817284
min         460.000000      651.000000                   1.000000
25%        1490.000000     5097.750000                   1.000000
50%        1850.000000     7620.000000                   2.000000
75%        2380.000000    10125.000000                   3.000000
max        6110.000000   560617.000000                   3.000000

            Distance from the airport          Price
count     14620.000000   1.462000e+04
mean         64.950958   5.389222e+05
std           8.936008   3.675221e+05
min          50.000000   7.800000e+04
25%          57.000000   3.200000e+05
50%          65.000000   4.500000e+05
75%          73.000000   6.450000e+05
```

```
print(df.count())
```

```
id                                    14620
Date                                  14620
number of bedrooms                    14620
number of bathrooms                   14620
living area                           14620
lot area                              14620
number of floors                      14620
waterfront present                    14620
number of views                       14620
condition of the house                14620
grade of the house                    14620
Area of the house(excluding basement) 14620
Area of the basement                  14620
Built Year                            14620
Renovation Year                       13600
Postal Code                           14620
Lattitude                             14620
Longitude                             14620
living_area_renov                     14620
lot_area_renov                        14620
Number of schools nearby              14620
Distance from the airport             14620
Price                                 14620
dtype: int64
```

```
print(df.corr())
```

```
                                    id      Date   number of bedrooms  \
id                            1.000000   0.045966           -0.329034
Date                          0.045966   1.000000           -0.015663
number of bedrooms           -0.329034  -0.015663            1.000000
number of bathrooms          -0.516909  -0.026485            0.509784
living area                  -0.648127  -0.021958            0.570526
```

```
lot area                                  -0.100269  0.004392            0.034416
number of floors                          -0.312305 -0.010335            0.177294
waterfront present                        -0.112937  0.012006           -0.006257
number of views                           -0.293004 -0.004782            0.078665
condition of the house                    -0.045061 -0.027402            0.026597
grade of the house                        -0.673448 -0.033097            0.352945
Area of the house(excluding basement) -0.565116 -0.015994            0.473599
Area of the basement                      -0.290806 -0.015711            0.300332
Built Year                                -0.068645 -0.005869            0.152954
Renovation Year                           -0.109155 -0.011636            0.016132
Postal Code                                0.294709  0.018243           -0.044156
Lattitude                                 -0.479334 -0.023327           -0.013163
Longitude                                 -0.070841 -0.018231            0.135712
living_area_renov                         -0.599900 -0.032495            0.389855
lot_area_renov                            -0.089604 -0.000050            0.029400
Number of schools nearby                  -0.004821 -0.004071            0.003397
Distance from the airport                 -0.004542  0.011457           -0.006157
Price                                     -0.773114 -0.027919            0.308460


                                       number of bathrooms  living area  \
id                                               -0.516909    -0.648127
Date                                             -0.026485    -0.021958
number of bedrooms                                0.509784     0.570526
number of bathrooms                               1.000000     0.753517
living area                                       0.753517     1.000000
lot area                                          0.080806     0.174420
number of floors                                  0.502924     0.354743
waterfront present                                0.060104     0.105837
number of views                                   0.183789     0.287728
condition of the house                           -0.128232    -0.063358
grade of the house                                0.663054     0.761835
Area of the house(excluding basement)             0.684391     0.875793
Area of the basement                              0.287190     0.441491
Built Year                                        0.498127     0.309602
Renovation Year                                   0.049669     0.059400
Postal Code                                      -0.105546    -0.080303
Lattitude                                         0.031156     0.054518
Longitude                                         0.223904     0.240208
living_area_renov                                 0.570530     0.757571
lot_area_renov                                    0.078627     0.180312
Number of schools nearby                          0.002180     0.002370
Distance from the airport                         0.009206     0.002511
Price                                             0.531735     0.712169


                           lot area  number of floors  \
id                        -0.100269         -0.312305
Date                       0.004392         -0.010335
number of bedrooms         0.034416          0.177294
number of bathrooms        0.080806          0.502924
living area                0.174420          0.354743
lot area                   1.000000         -0.004138
number of floors          -0.004138          1.000000
```

```python
print(df['Distance from the airport'].value_counts())
```

```
54    514
70    511
64    500
50    495
79    487
60    486
67    485
56    484
53    484
59    482
69    481
58    474
55    473
74    471
72    471
66    470
62    470
57    467
75    466
```

```
61    443
51    442
Name: Distance from the airport, dtype: int64
```

```python
print('Mean:',df['Area of the basement'].mean())
print('Median:',df['Distance from the airport'].median())
print('Mode:',df['grade of the house'].mode())
```

```
Mean: 296.47906976744184
Median: 65.0
Mode: 0    7
Name: grade of the house, dtype: int64
```

```python
print(df.isnull().sum())
```

```
id                                      0
Date                                    0
number of bedrooms                      0
number of bathrooms                     0
living area                             0
lot area                                0
number of floors                        0
waterfront present                      0
number of views                         0
condition of the house                  0
grade of the house                      0
Area of the house(excluding basement)   0
Area of the basement                    0
Built Year                              0
Renovation Year                         0
Postal Code                             0
Lattitude                               0
Longitude                               0
living_area_renov                       0
lot_area_renov                          0
Number of schools nearby                0
Distance from the airport               0
Price                                   0
dtype: int64
```

```python
df.dropna(inplace=True)
df.fillna(0,inplace=True)
df.interpolate(inplace=True)
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import MinMaxScaler
x=df.drop(['Price','Date'],axis=1)
x.set_index(['id'],inplace=True)
y=df[['id','Price']]
```

```python
x.head()
```

id	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	g h
6762810145	5	2.50	3650	9050	2.0	0	4	5	
6762810635	4	2.50	2920	4000	1.5	0	0	5	
6762810998	5	2.75	2910	9480	1.5	0	0	3	
6762812605	4	2.50	3310	42998	2.0	0	0	3	
6762812919	3	2.00	2710	4500	1.5	0	0	4	

```python
y.head()
```

	id	Price
0	6762810145	2380000
1	6762810635	1400000

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.metrics import r2_score
x_train,x_test,y_train,y_test = train_test_split(x,y['Price'],test_size =0.1,random_state=2)
model = GradientBoostingRegressor(n_estimators=400,max_depth=5,min_samples_split=2,learning_rate=0.1)
model.fit(x_train,y_train)
```

```
           ▼              GradientBoostingRegressor
    GradientBoostingRegressor(max_depth=5, n_estimators=400)
```

```
y_pred = model.predict(x_test)
model.score(x_test,y_test)
```

```
    0.9130901919275989
```

```
r2_score(y_pred,y_test)
```

```
    0.9026890923961436
```

```
y_pred
```

```
    array([497766.12740438, 244495.3776842 , 293819.40063242, ...,
           698495.60350629, 297006.00386358, 245881.76921871])
```

```
y_pred_list = y['id'][-len(y_pred):].tolist()
y_pred_df=pd.DataFrame(y_pred_list,columns=['ID'])
y_pred_df['Predicted Price']= y_pred.round(2)
```

```
y_pred_df
```

	ID	Predicted Price
0	6762811233	497766.13
1	6762811403	244495.38
2	6762811775	293819.40
3	6762811861	397555.35
4	6762812009	474843.29
...	...	...
1457	6762830250	1041014.57
1458	6762830339	317512.59
1459	6762830618	698495.60
1460	6762830709	297006.00
1461	6762831463	245881.77

1462 rows × 2 columns