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

Choose Files House Price India.csv
- **House Price India.csv**(text/csv) - 1524561 bytes, last modified: 9/30/2023 - 100% done
  Saving House Price India.csv to House Price India.csv

```
import pandas as pd
```

```
import numpy as np
```

```
import matplotlib.pyplot as plt
```

```
import seaborn as sns
```

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

```
df.head()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Built Year	Renovation Year	Po
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1921	0	12
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1909	0	12
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	1939	0	12
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	2001	0	12
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	1929	0	12

5 rows × 23 columns

```
df.tail()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Built Year	Renovation Year	
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0	4	...	1957	0	1
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0	4	...	1968	0	1
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0	3	...	1962	0	1
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0	4	...	1955	0	1
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0	3	...	1969	2009	1

5 rows × 23 columns

```
df
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house	...	Built Year	Renovation Year	P
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1921	0	1
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1909	0	1

df.columns   1

```
Index(['id', 'Date', 'number of bedrooms', 'number of bathrooms',                    1
       'living area', 'lot area', 'number of floors', 'waterfront present',          1
       'number of views', 'condition of the house', 'grade of the house',           1
       'Area of the house(excluding basement)', 'Area of the basement',
       'Built Year', 'Renovation Year', 'Postal Code', 'Lattitude',
       'Longitude', 'living_area_renov', 'lot_area_renov',                           1
       'Number of schools nearby', 'Distance from the airport', 'Price'],            1
      dtype='object')
```

| 14617 | 6762830618 | 42734 | 2 | 1.00 | 1070 | 6120 | 1.0 | 0 | 0 | 3 | ... | 1962 | 0 | 1 |

df.dtypes   1

```                                                                                  1
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)
```

Univariate Analysis

```
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
```
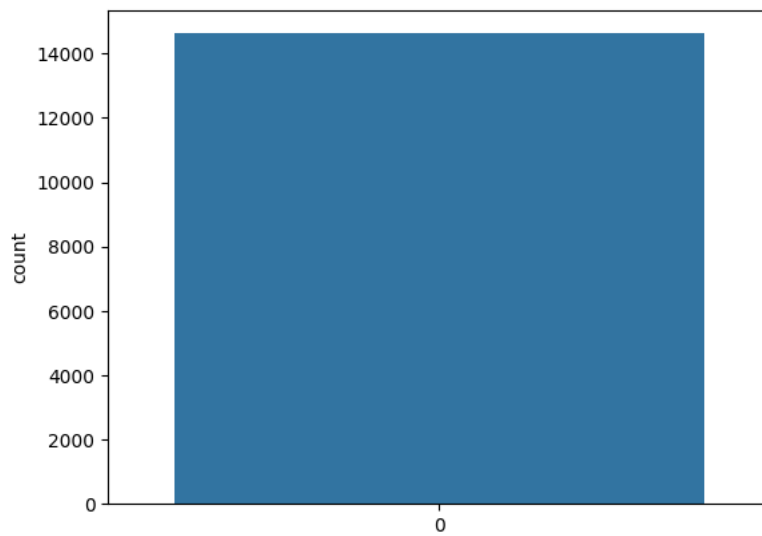
```
plt.hist(df['Area of the house(excluding basement)'])
```

```
(array([4.479e+03, 6.255e+03, 2.653e+03, 9.190e+02, 2.440e+02, 4.600e+01,
        1.800e+01, 1.000e+00, 2.000e+00, 3.000e+00]),
 array([ 370., 1274., 2178., 3082., 3986., 4890., 5794., 6698., 7602.,
        8506., 9410.]),
 <BarContainer object of 10 artists>)
```
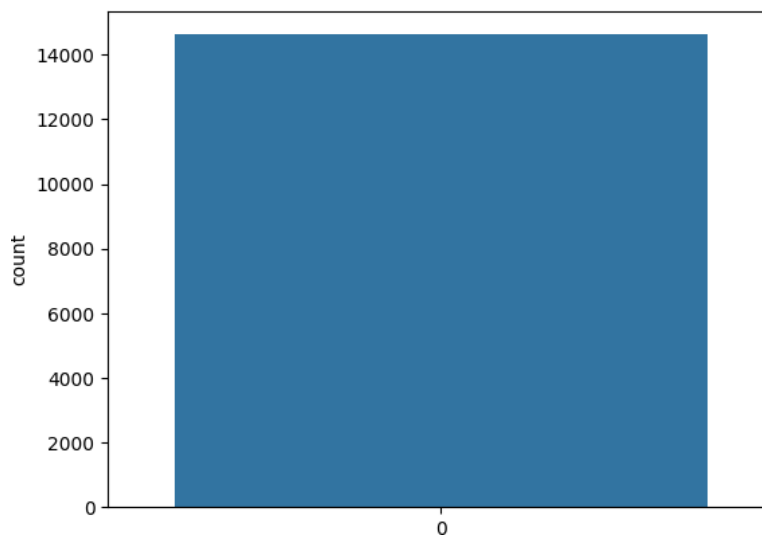
```
sns.countplot(df['number of floors'])
```

```
<Axes: ylabel='count'>
```
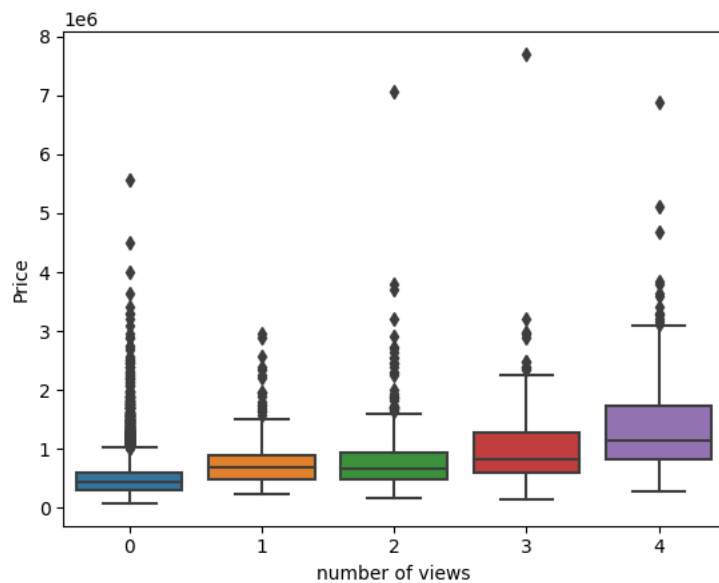


```
sns.countplot(df['number of bathrooms'])
```

```
<Axes: ylabel='count'>
```



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

```
<Axes: xlabel='Price'>
```

Bivariate Analysis

```
sns.boxplot(x=df['number of views'],y=df['Price'])
```
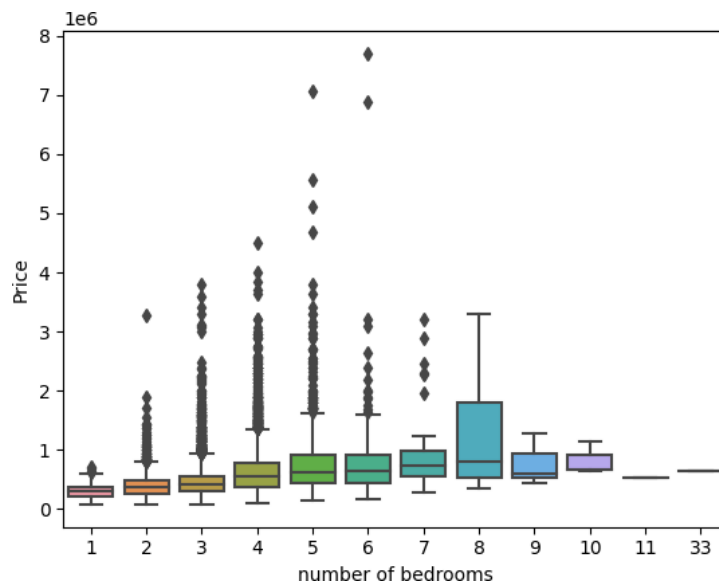
```
<Axes: xlabel='number of views', ylabel='Price'>
```



```
sns.boxplot(x=df['number of bedrooms'],y=df['Price'])
```
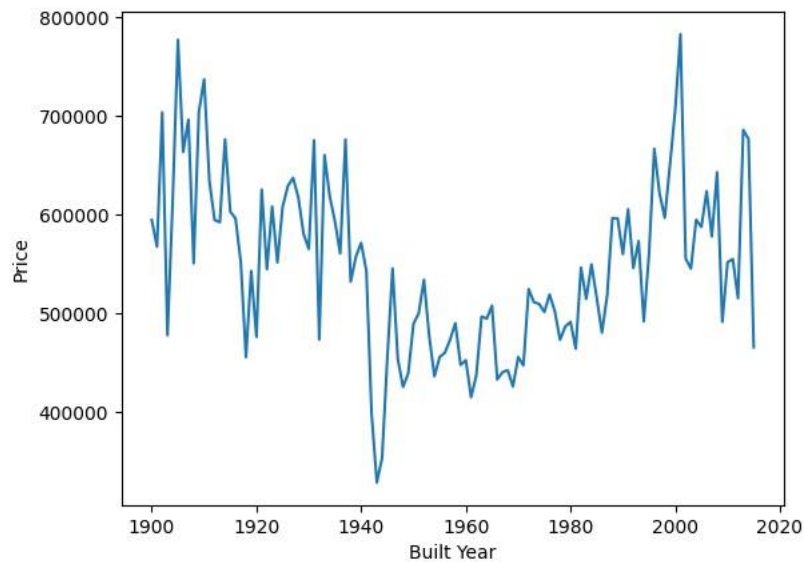
```
<Axes: xlabel='number of bedrooms', ylabel='Price'>
```



```
sns.lineplot(x=df['Built Year'],y=df['Price'])
```

```
<Axes: xlabel='Built Year', ylabel='Price'>
```



```
sns.lineplot(x=df.groupby('Built Year').mean().index,y=df.groupby('Built Year').mean()['Price'])
plt.show
()
```

()


```
sns.heatmap(df[['Price','number of bedrooms','number of bathrooms']].corr(),annot=True)
```
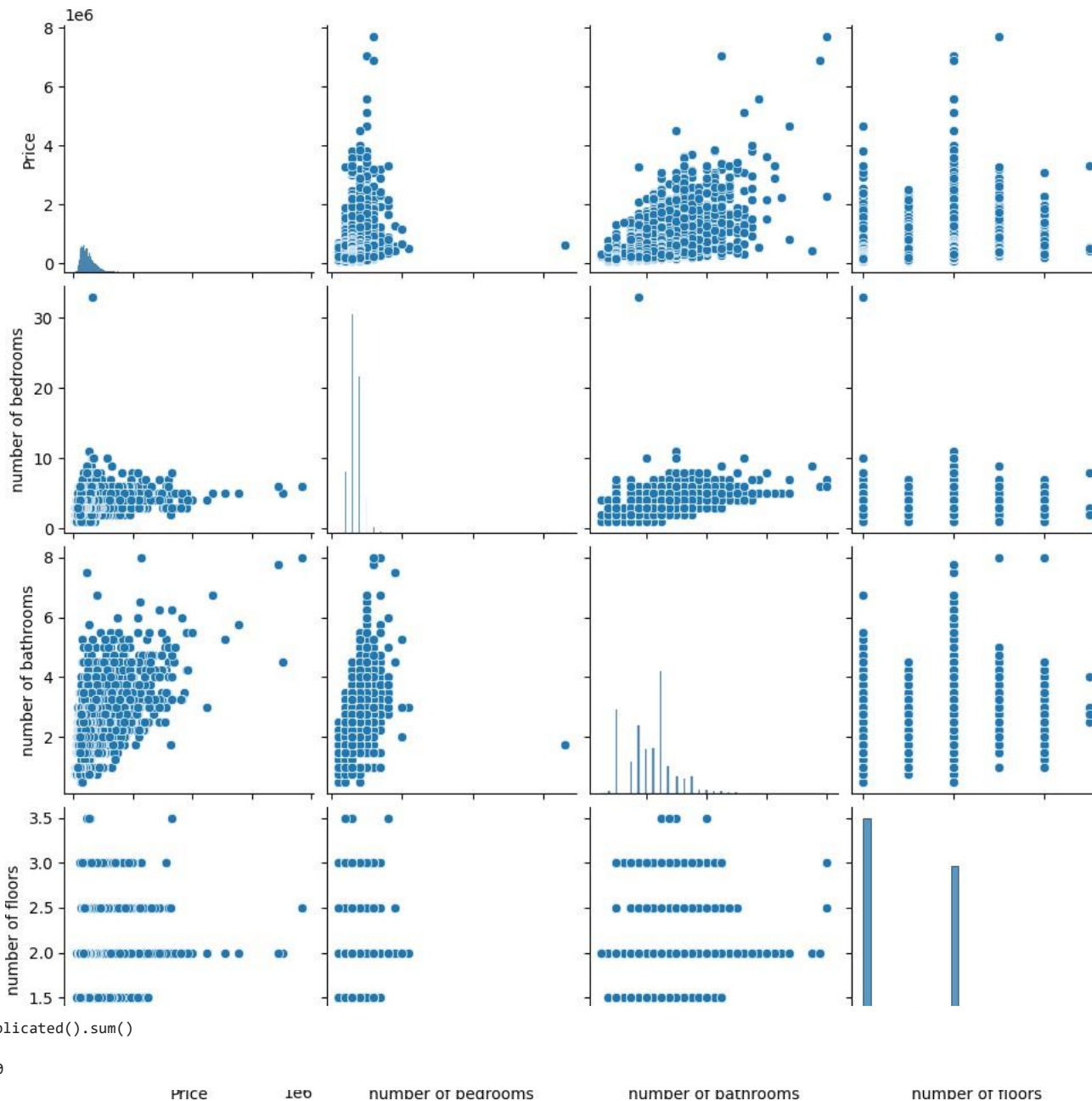
```
<Axes: >
```


Multivariate Analysis

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

<seaborn.axisgrid.PairGrid at 0x78b131d80130>


```
df.duplicated().sum()
```

0

Price   1e6   number of bedrooms   number of bathrooms   number of floors
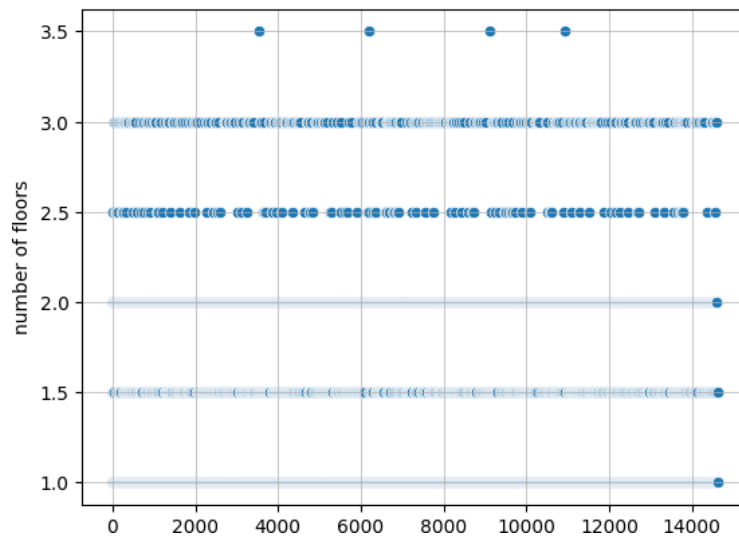
```
plt.scatter(df['waterfront present'],df['Price'])
plt.title("Waterfront present vs Price")
plt.grid(linestyle='-', linewidth=0.)
```
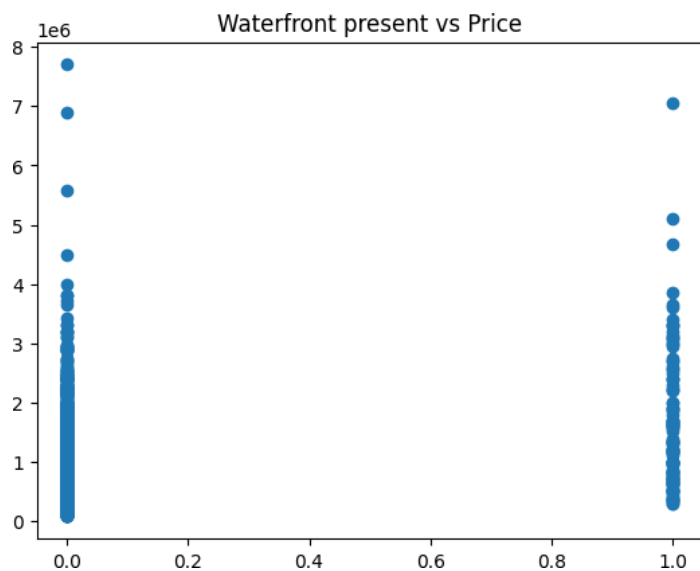


```
sns.scatterplot(df['number of floors'])
```

```
plt.grid(linestyle='-',linewidth=0.5)
```



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

	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors	waterfront present	number of views	condition of the house								
Date	1	-0.016	-0.026	-0.022	0.0044	-0.01	0.012	-0.0048	0.027	-0.033	-0.016	-0.016	0.0059	0.012	0.018	-0.023	0.018
number of bedrooms	-0.016	1	0.51	0.57	0.034	0.18	-0.0063	0.079	0.027	0.35	0.47	0.3	0.15	0.016	-0.044	-0.013	0.14
number of bathrooms	-0.026	0.51	1	0.75	0.081	0.5	0.06	0.18	-0.13	0.66	0.68	0.29	0.5	0.05	-0.11	0.031	0.22
living area	-0.022	0.57	0.75	1	0.17	0.35	0.11	0.29	-0.063	0.76	0.88	0.44	0.31	0.059	-0.08	0.055	0.24
lot area	0.0044	0.034	0.081	0.17	1	-0.0041	0.026	0.078	-0.0085	0.11	0.18	0.02	0.052	0.0068	0.07	-0.091	0.22
number of floors	-0.01	0.18	0.5	0.35	-0.0041	1	0.016	0.02	-0.27	0.46	0.53	-0.24	0.48	0.0067	-0.13	0.051	0.13
waterfront present	0.012	-0.0063	0.06	0.11	0.026	0.016	1	0.4	0.019	0.08	0.072	0.085	-0.024	0.086	0.038	-0.022	-0.048
number of views	-0.0048	0.079	0.18	0.29	0.078	0.02	0.4	1	0.053	0.25	0.16	0.29	-0.055	0.1	0.039	0.0046	-0.08
condition of the house	-0.027	0.027	-0.13	-0.063	0.0085	-0.27	0.019	0.053	1	-0.15	-0.17	0.18	-0.38	0.062	0.045	-0.003	-0.12

```
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
```

```
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                         14620
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
```

```
print(df['Number of schools nearby'].value_counts())
```

```
3    4973
2    4853
1    4794
Name: Number of schools nearby, dtype: int64
```

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

```
Mean: 64.95095759233926
Median: 0.0
Mode: 0    7
Name: grade of the house, dtype: int64
```

Handle the Missing values

```
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
```

```
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']]
```

```
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	grade of the house	Area of the house(excluding basement)	Area of the basement	Built Year	Re
6762810145	5	2.50	3650	9050	2.0	0	4	5	10	3370	280	1921	
6762810635	4	2.50	2920	4000	1.5	0	0	5	8	1910	1010	1909	
6762810998	5	2.75	2910	9480	1.5	0	0	3	8	2910	0	1939	
6762812605	4	2.50	3310	42998	2.0	0	0	3	9	3310	0	2001	
6762812919	3	2.00	2710	4500	1.5	0	0	4	8	1880	830	1929	

```
y.head()
```

	id	Price
0	6762810145	2380000
1	6762810635	1400000
2	6762810998	1200000
3	6762812605	838000
4	6762812919	805000

```python
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.metrics import r2_score
```

```python
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)
```

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

```
0.91198551249072
```

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

```
0.9015923458012287
```

```python
y_pred
```

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

```python
y_pred_list = y['id'][-len(y_pred):].tolist()
```

```python
y_pred_df=pd.DataFrame(y_pred_list,columns=['ID'])
y_pred_df['Predicted Price']= y_pred.round(2)
```

```python
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

Double-click (or enter) to edit

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