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

Choose Files House Price India.csv

- **House Price India.csv**(text/csv) - 1524561 bytes, last modified: 10/2/2023 - 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	Postal Code	Latt
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1921	0	122003	52
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1909	0	122004	52
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	1939	0	122004	52
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	2001	0	122005	52
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	1929	0	122006	52

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	Postal Code	Latt
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0	4	...	1957	0	122066	47
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0	4	...	1968	0	122072	47
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0	3	...	1962	0	122056	47
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0	4	...	1955	0	122042	47
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0	3	...	1969	2009	122018	47

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	Postal Code	Latt
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1921	0	122003	52
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1909	0	122004	52
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	1939	0	122004	52
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	2001	0	122005	52
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	1929	0	122006	52
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14615	6762830250	42734	2	1.5	1556	20000	1.0	0	0	4	...	1957	0	122066	47
14616	6762830339	42734	3	2.0	1680	7000	1.5	0	0	4	...	1968	0	122072	47
14617	6762830618	42734	2	1.0	1070	6120	1.0	0	0	3	...	1962	0	122056	47
14618	6762830709	42734	4	1.0	1030	6621	1.0	0	0	4	...	1955	0	122042	47
14619	6762831463	42734	3	1.0	900	4770	1.0	0	0	3	...	1969	2009	122018	47

14620 rows × 23 columns

```
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',
```

```
      4    'Area of the house(excluding basement)', 'Area of the
     basement',6762812919        42491     3         2.00       2710      4500
              1.5

        'Built Year', 'Renovation Year', 'Postal Code', 'Lattitude',
   ...           ...      ...          ...          ...       ...       ...
        'Longitude', 'living_area_renov', 'lot_area_renov',

     14615 'Number of schools nearby', 'Distance from the airport',
'Price'],6762830250                  42734     2      1.50    1556     20000 1.0
                           bedrooms                          floors              views      house
```

```
     Data columns (total 23 columns):
           dtype='object')
      14616  6762830339  42734         3        2.00     1680    7000      1.5           0        0          4    ...    1968           0  122072
```

```
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
      #   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

```
  i t(df d    ib ())
print(df.describe())
```

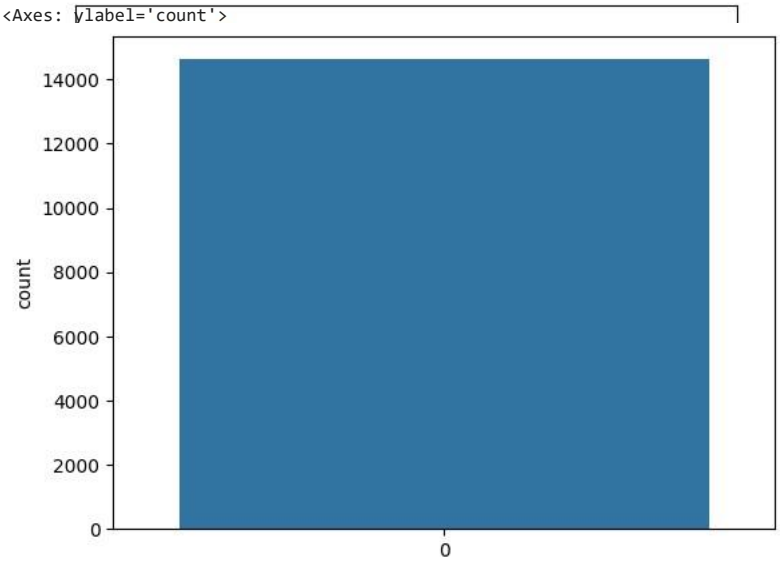
```
       std    6.237575e+03     67.347991            0.938719             0.769934   min    6.762810e+09  42491.000000
         1.000000             0.500000   25%    6.762815e+09  42546.000000            3.000000             1.750000
50%    6.762821e+09  42600.000000           3.000000            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
max                     80.000000  7.700000e+06  [8 rows x 23 columns]
```

```
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>)
```

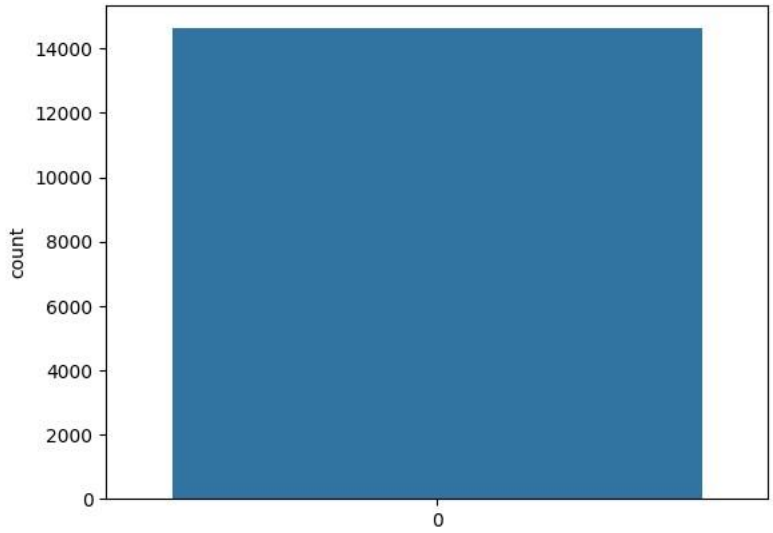
```
sns.countplot(df['lot area'])
```

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



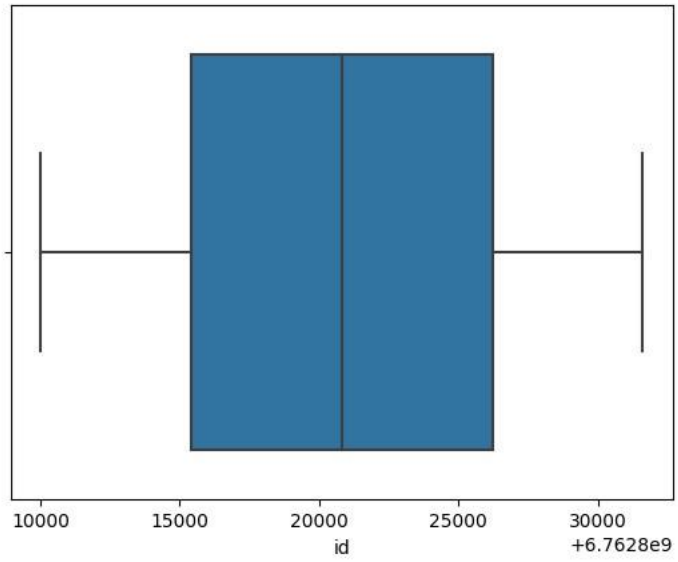

```
sns.countplot(df['number of bedrooms'])
```

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




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

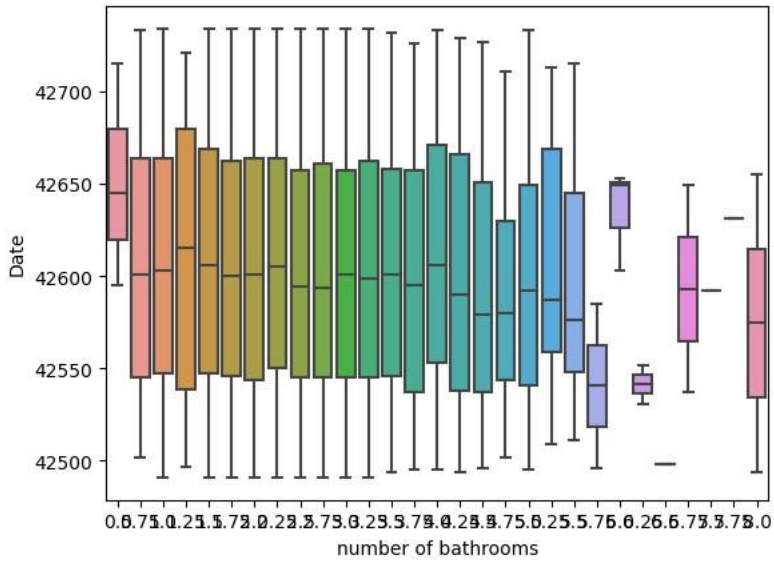
```
<Axes: xlabel='id'>
```



Bivariate Analysis

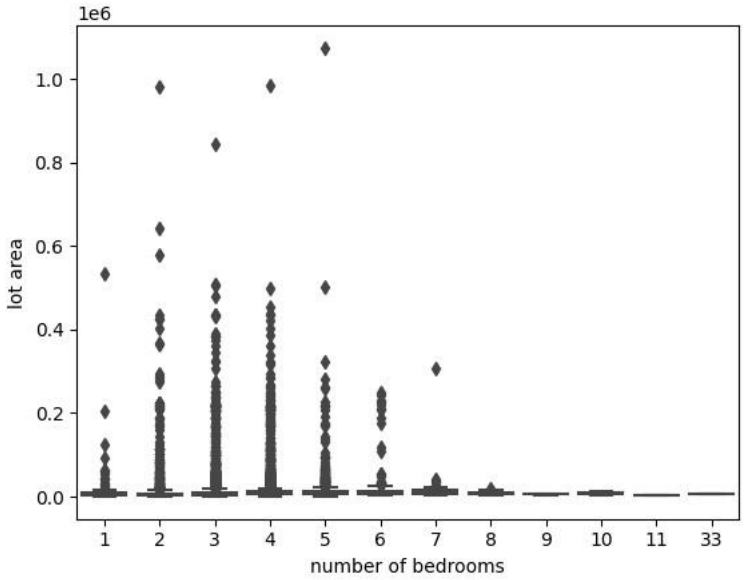
```
sns.boxplot(x=df['number of bathrooms'],y=df['Date'])
```

```
<Axes: xlabel='number of bathrooms', ylabel='Date'>
```



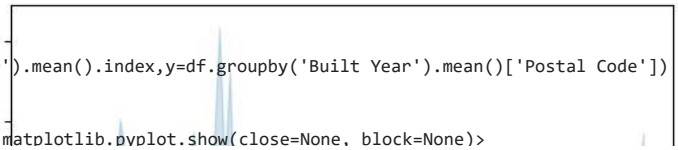

```
sns.boxplot(x=df['number of bedrooms'],y=df['lot area'])
```

```
<Axes: xlabel='number of bedrooms', ylabel='lot area'>
```



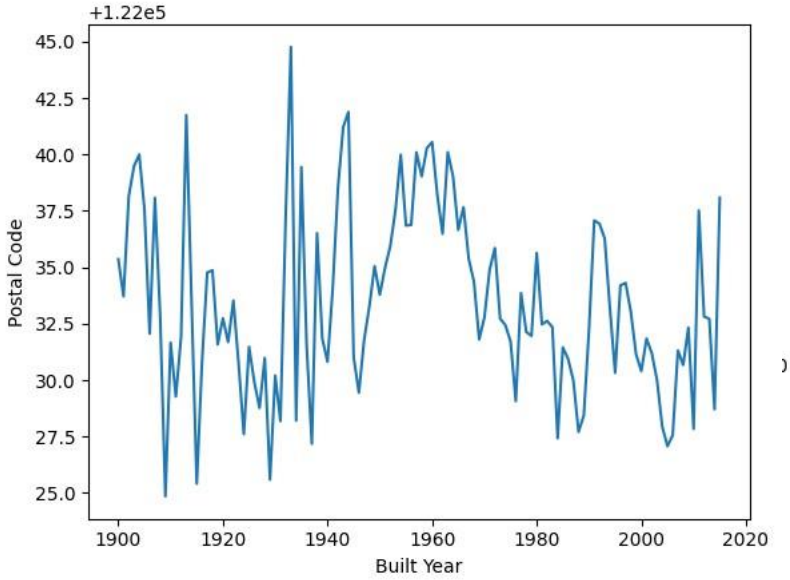

```
sns.lineplot(x=df['Built Year'],y=df['Date'])
```

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




```
pby('Built Year').mean().index,y=df.groupby('Built Year').mean()['Postal Code'])
```

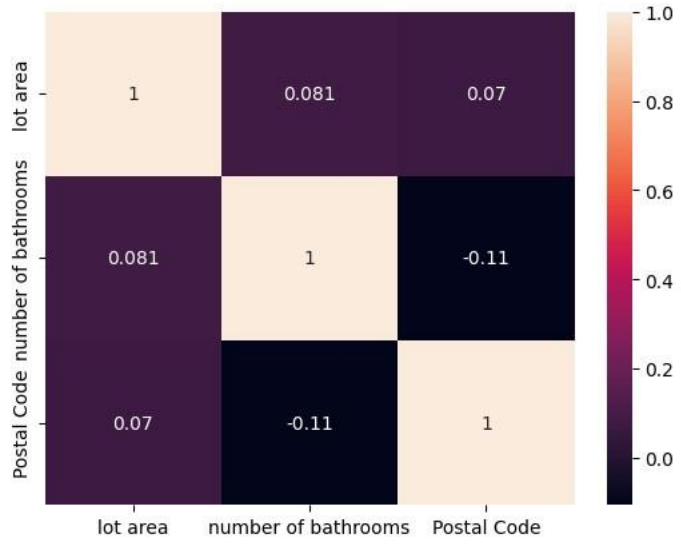
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



)

```
ns.heatmap(df[['lot area','number of bathrooms','Postal Code']].corr(),annot=True
```

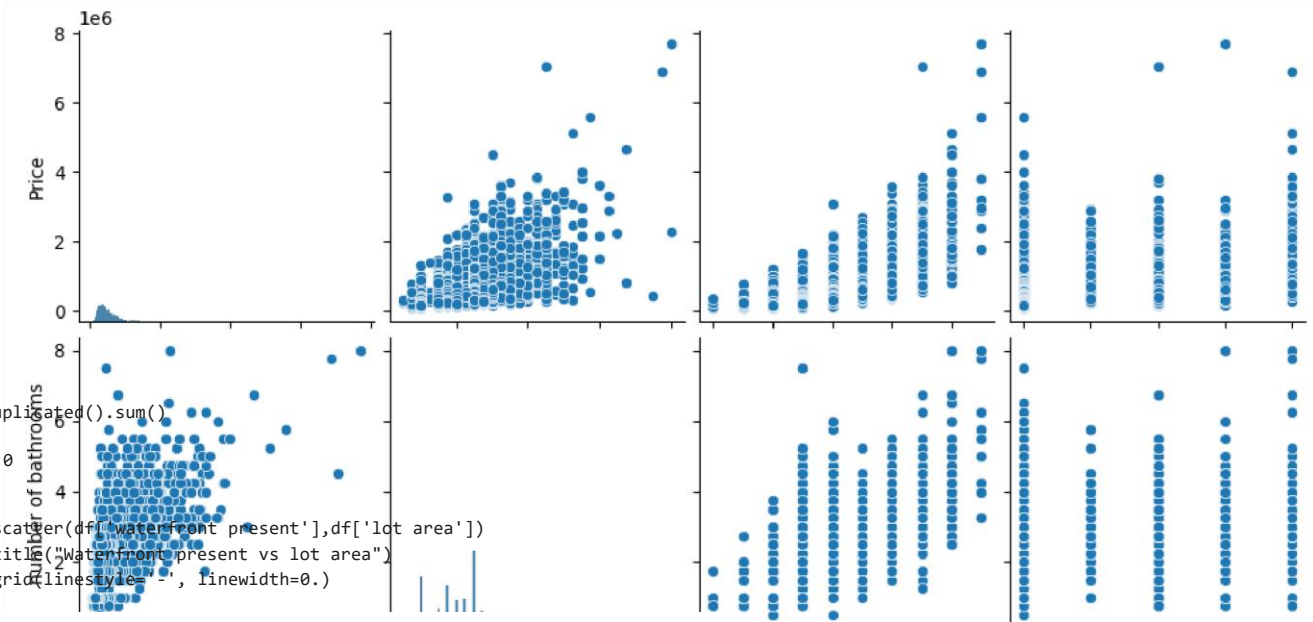
```
<Axes: >
```



Multivariate Analysis

```
t(df[['Price','number of bathrooms','grade of the house','number of views']])
```

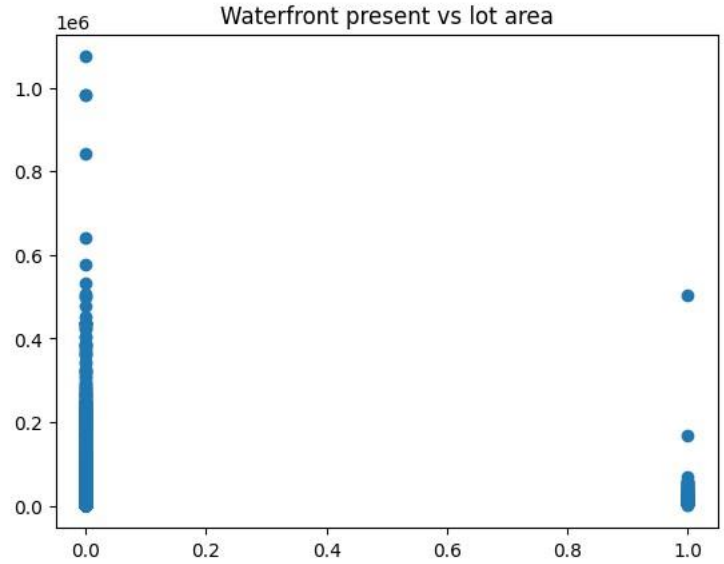
```
<seaborn.axisgrid.PairGrid at 0x7f65db33b310>
```




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

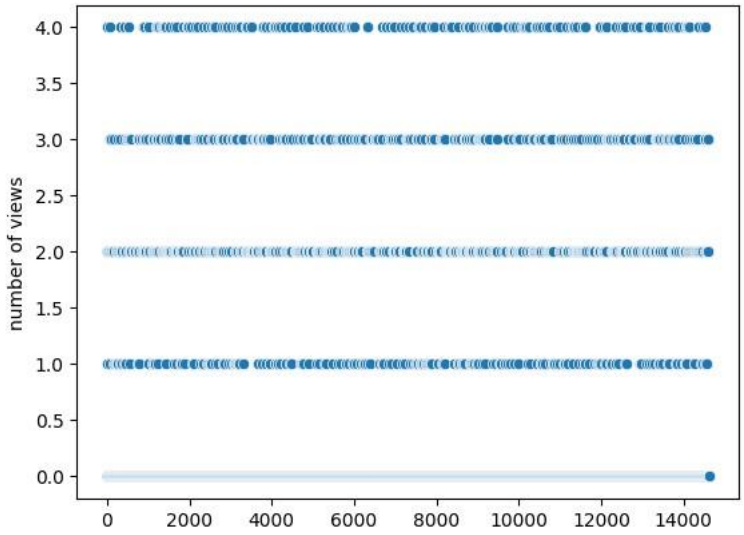
```
0
```

```
plt.scatter(df['waterfront present'],df['lot area'])
plt.title("Waterfront present vs lot area")
plt.grid(linestyle='-', linewidth=0.)
```

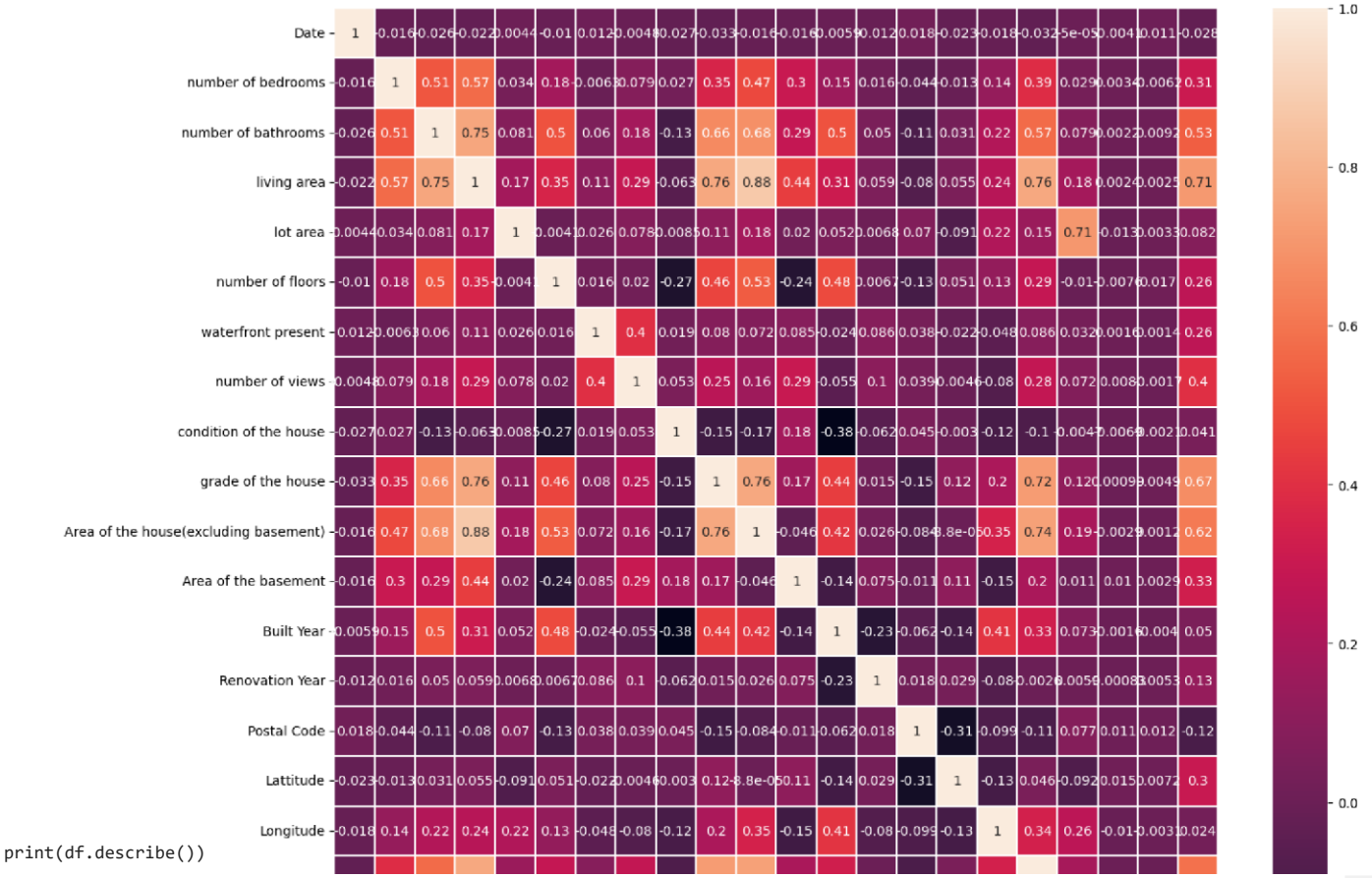



```
sns.scatterplot(df['number of views'])
```

```
<Axes: ylabel='number of views'>
```




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




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

```
              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
```

```
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
max                    80.000000  7.700000e+06

[8 rows x 23 columns]
```

```
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['number of bedrooms'].value_counts())
```

```
3     6612
4     4724
2     1844
5     1079
6      176
1      136
7       30
8       11
9        3
10       3
33       1
11       1
Name: number of bedrooms, dtype: int64
```

```
print('Mean:',df['Number of schools nearby'].mean())
print('Median:',df['Area of the house(excluding basement)'].median())
print('Mode:',df['grade of the house'].mode())
```

```
Mean: 2.0122435020519838
Median: 1580.0
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(['lot area','Date'],axis=1)
x.set_index(['id'],inplace=True)
y=df[['id','Date']]
```

```
x.head()
```

id	number of bedrooms	number of	number of	number condition of the house	Area of the house(excluding basement)	Area of the	grade number of bathrooms	number of floors	living area views	waterfront present house	of the basement)	Built Year	Renovation Year
6762810145	5	2.50	3650	2.0	0	4	5	10		3370	280	1921	0
6762810635	4	2.50	2920	1.5	0	0	5	8		1910	1010	1909	0
6762810998	5	2.75	2910	1.5	0	0	3	8		2910	0	1939	0
6762812605	4	2.50	3310	2.0	0	0	3	9		3310	0	2001	0
6762812919	3	2.00	2710	1.5	0	0	4	8		1880	830	1929	0

```
y.head()
```

	id	Date
0	6762810145	42491
1	6762810635	42491
2	6762810998	42491
3	6762812605	42491
4	6762812919	42491

```
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['Date'],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)
```

```
-0.04738772597692997
```

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

```
-12.564759862914135
```

```
y_pred
```

```
array([42608.93420433, 42601.64963548, 42609.15971575, ...,
```

```
42585.33296118, 42602.06978674, 42612.23633668])

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	42608.93
1	6762811403	42601.65
2	6762811775	42609.16
3	6762811861	42627.24
4	6762812009	42590.66
...	...	...
1457	6762830250	42611.39
1458	6762830339	42570.11
1459	6762830618	42585.33
1460	6762830709	42602.07
1461	6762831463	42612.24

1462 rows × 2 columns