

```
pip install pandas
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: pandas in /usr/local/lib/python3.9/dist-packages (1.5.3)
Requirement already satisfied: numpy>=1.20.3 in /usr/local/lib/python3.9/dist-packages (from pandas) (1.22.4)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.9/dist-packages (from pandas) (2022.7.1)
Requirement already satisfied: python-dateutil>=2.8.1 in /usr/local/lib/python3.9/dist-packages (from pandas) (2.8.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.9/dist-packages (from python-dateutil>=2.8.1->pandas) (1.16.0)
```

```
pip install seaborn
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: seaborn in /usr/local/lib/python3.9/dist-packages (0.12.2)
Requirement already satisfied: pandas>=0.25 in /usr/local/lib/python3.9/dist-packages (from seaborn) (1.5.3)
Requirement already satisfied: matplotlib!=3.6.1,>=3.1 in /usr/local/lib/python3.9/dist-packages (from seaborn) (3.7.1)
Requirement already satisfied: numpy!=1.24.0,>=1.17 in /usr/local/lib/python3.9/dist-packages (from seaborn) (1.22.4)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (1.0.7)
Requirement already satisfied: importlib-resources>=3.2.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (5.12.0)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (8.4.0)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (2.8.2)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (1.4.4)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (0.11.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (3.0.9)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (23.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib!=3.6.1,>=3.1->seaborn) (4.39.3)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.9/dist-packages (from pandas>=0.25->seaborn) (2022.7.1)
Requirement already satisfied: zipp>=3.1.0 in /usr/local/lib/python3.9/dist-packages (from importlib-resources>=3.2.0->matplotlib!=3.6.1,>=3.1->seaborn) (3.1.0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.9/dist-packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.1->seaborn) (1.16.0)
```

```
pip install matplotlib
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: matplotlib in /usr/local/lib/python3.9/dist-packages (3.7.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (2.8.2)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (1.4.4)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (1.0.7)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (4.39.3)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (23.1)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (8.4.0)
Requirement already satisfied: importlib-resources>=3.2.0 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (5.12.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (3.0.9)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (0.11.0)
Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.9/dist-packages (from matplotlib) (1.22.4)
Requirement already satisfied: zipp>=3.1.0 in /usr/local/lib/python3.9/dist-packages (from importlib-resources>=3.2.0->matplotlib) (3.1.0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.9/dist-packages (from python-dateutil>=2.7->matplotlib) (1.16.0)
```

```
pip install numpy
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: numpy in /usr/local/lib/python3.9/dist-packages (1.22.4)
```

➤ Load the dataset

```
import pandas as pd
import numpy as np
```

Double-click (or enter) to edit

```
df=pd.read_csv('/content/drive/MyDrive/House.csv')
```

```
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	..
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	.
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	.
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	.
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	.
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	.
...
14615	6762830250	42734	2	1.50	1556	20000	1.0	0	0	4	.
14616	6762830339	42734	3	2.00	1680	7000	1.5	0	0	4	.
14617	6762830618	42734	2	1.00	1070	6120	1.0	0	0	3	.
14618	6762830709	42734	4	1.00	1030	6621	1.0	0	0	4	.
14619	6762831463	42734	3	1.00	900	4770	1.0	0	0	3	.

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
Latitude	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

Visualization

Univariate Analysis

Double-click (or enter) to edit

```
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns

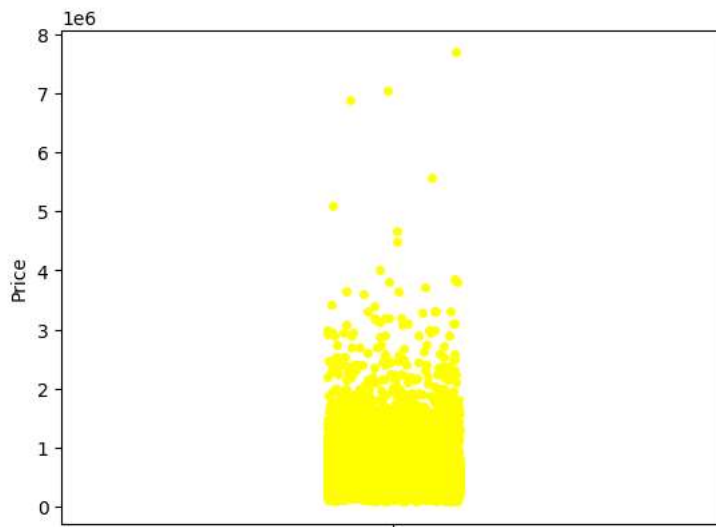
plt.hist(df['Price'])
```

```
(array([1.2916e+04, 1.4260e+03, 1.9100e+02, 6.0000e+01, 1.9000e+01,
        2.0000e+00, 2.0000e+00, 1.0000e+00, 1.0000e+00, 2.0000e+00]),
array([ 78000., 840200., 1602400., 2364600., 3126800., 3889000.,
        4651200., 5413400., 6175600., 6937800., 7700000.]),
<BarContainer object of 10 artists>)
```



```
sns.stripplot(y=df['Price'],color='yellow')
```

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

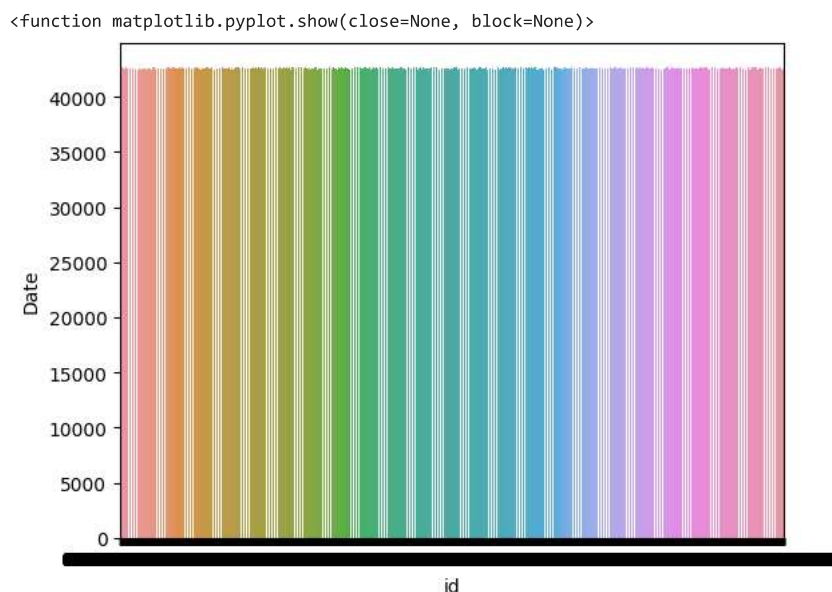


Double-click (or enter) to edit

Bi-Variate Analysis

```
rate=pd.read_csv('/content/drive/MyDrive/House.csv')
rate.plot(x='id',y='Price',kind='scatter',color='indigo');
plt.show
```

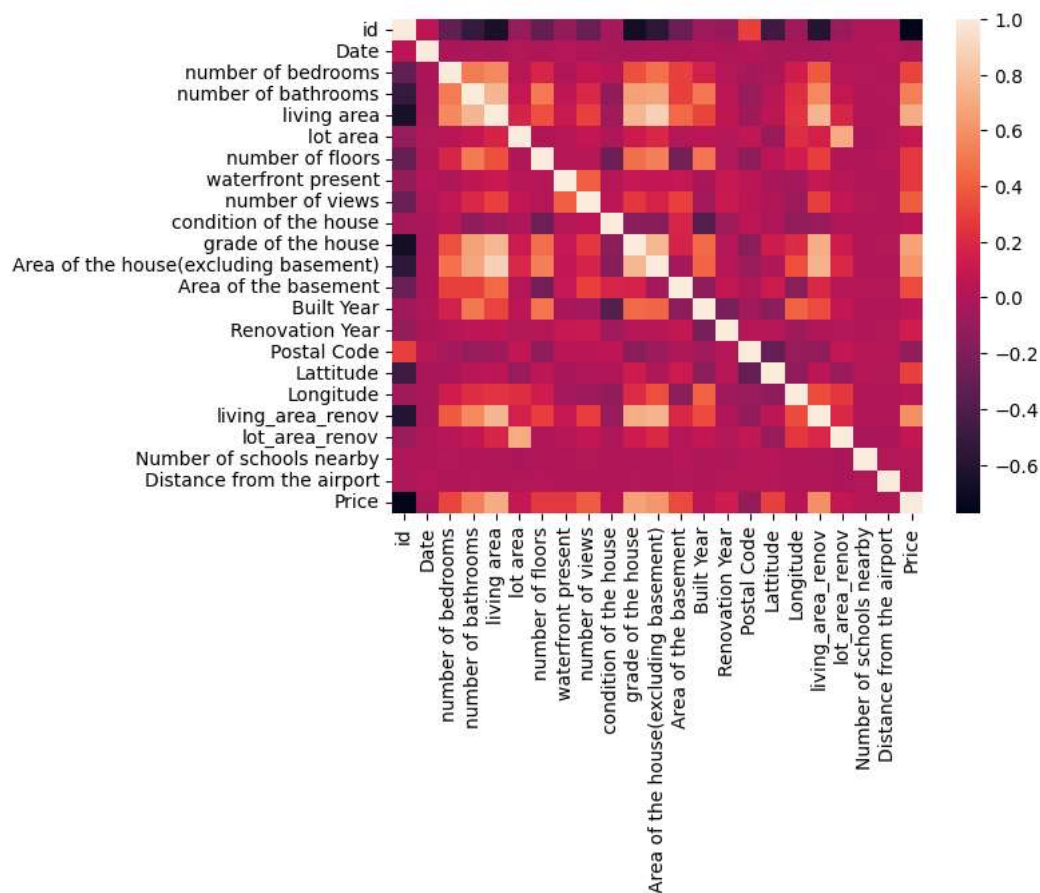
```
<function matplotlib.pyplot.show(close=None, block=None)>
sns.barplot(data=rate,x='id',y='Date');
plt.show
```



Multi-Variate Analysis

```
sns.heatmap(rate.corr(),annot=False)
```

<Axes: >



▼ Descriptive Statitics

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

import warnings
warnings.filterwarnings('ignore')

data='/content/drive/MyDrive/House.csv'
df=pd.read_csv(data)
```

```
df.shape

(14620, 23)
```

```
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	...	Bu
0	6762810145	42491	5	2.50	3650	9050	2.0	0	4	5	...	1
1	6762810635	42491	4	2.50	2920	4000	1.5	0	0	5	...	1
2	6762810998	42491	5	2.75	2910	9480	1.5	0	0	3	...	1
3	6762812605	42491	4	2.50	3310	42998	2.0	0	0	3	...	2
4	6762812919	42491	3	2.00	2710	4500	1.5	0	0	4	...	1

5 rows × 23 columns

```
df.describe()
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors
count	1.462000e+04	14620.000000	14620.000000	14620.000000	14620.000000	1.462000e+04	14620.000000
mean	6.762821e+09	42604.538646	3.379343	2.129583	2098.262996	1.509328e+04	1.502360
std	6.237575e+03	67.347991	0.938719	0.769934	928.275721	3.791962e+04	0.540239
min	6.762810e+09	42491.000000	1.000000	0.500000	370.000000	5.200000e+02	1.000000
25%	6.762815e+09	42546.000000	3.000000	1.750000	1440.000000	5.010750e+03	1.000000
50%	6.762821e+09	42600.000000	3.000000	2.250000	1930.000000	7.620000e+03	1.500000
75%	6.762826e+09	42662.000000	4.000000	2.500000	2570.000000	1.080000e+04	2.000000
max	6.762832e+09	42734.000000	33.000000	8.000000	13540.000000	1.074218e+06	3.500000

8 rows × 23 columns

```
df.describe(include='all')
```

	id	Date	number of bedrooms	number of bathrooms	living area	lot area	number of floors
count	1.462000e+04	14620.000000	14620.000000	14620.000000	14620.000000	1.462000e+04	14620.000000
mean	6.762821e+09	42604.538646	3.379343	2.129583	2098.262996	1.509328e+04	1.502360
std	6.237575e+03	67.347991	0.938719	0.769934	928.275721	3.791962e+04	0.540239

Mean

```

25% 6.762815e+09 42546.000000 3.000000 1.750000 1440.000000 5.010750e+03 1.000000
mean=df['waterfront present'].mean()
print(mean)

0.007660738714090287

```

Median

```

median=df['waterfront present'].median()
print(median)

0.0

```

Mode

```

mode=df['waterfront present'].mode()
print(mode)

0    0
Name: waterfront present, dtype: int64

```

Observation

We can see that **Mean>Median>Mode**. So, the distribution of *waterfront present* is positively skewed. I will plot its distribution to confirm the same. **bold text**

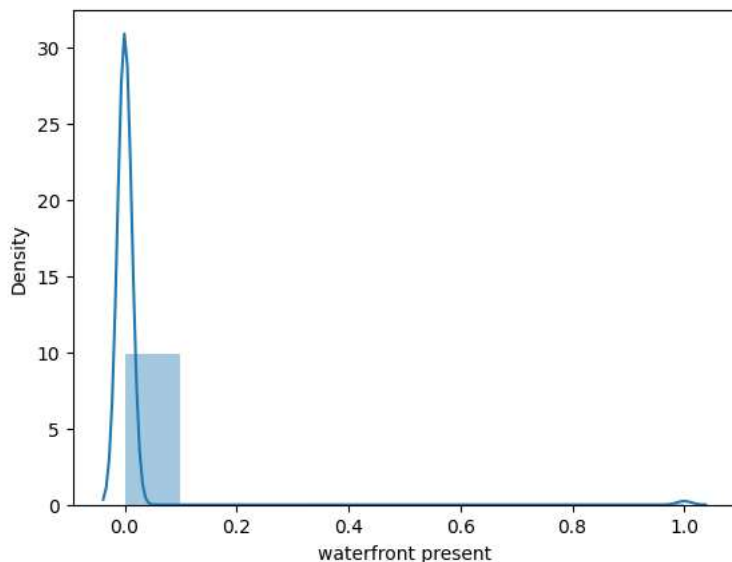
Plot the distribution

```

data=df['waterfront present']
sns.distplot(data,bins=10,hist=True,kde=True,label='waterfront present')

```

<Axes: xlabel='waterfront present', ylabel='Density'>



▼ Check for missing values

```
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   Latitude                           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
```

```
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
Latitude                          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
```

```
updated_df=df.dropna(axis=1)
```

```
updated_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

```

```
updated_df=df.dropna(axis=0)
```

```
updated_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

```

```

updated_df=df
updated_df['waterfront present']=updated_df['waterfront present'].fillna(updated_df['waterfront present'].mean())
updated_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 Latitude                 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

```

```

updated_df=df
updated_df['waterfront present missing']=updated_df['waterfront present'].isnull()
from sklearn.impute import SimpleImputer
my_imputer=SimpleImputer(strategy='median')
data_new=my_imputer.fit_transform(updated_df)
updated_df.info()

```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 14620 entries, 0 to 14619
Data columns (total 24 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  Latitude                           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
23  waterfront present missing           14620 non-null  bool
dtypes: bool(1), float64(4), int64(19)
memory usage: 2.6 MB

```