```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor,  GradientBoostingRegressor
from sklearn.metrics import mean_absolute_percentage_error,r2_score,mean_squared_error
from sklearn.metrics import mean_absolute_error, mean_squared_error

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

	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_ab
0	2014-05-02 00:00:00	3.130000e+05	3.0	1.50	1340	7912	1.5	0	0	3	
1	2014-05-02 00:00:00	2.384000e+06	5.0	2.50	3650	9050	2.0	0	4	5	
2	2014-05-02 00:00:00	3.420000e+05	3.0	2.00	1930	11947	1.0	0	0	4	
3	2014-05-02 00:00:00	4.200000e+05	3.0	2.25	2000	8030	1.0	0	0	4	
4	2014-05-02 00:00:00	5.500000e+05	4.0	2.50	1940	10500	1.0	0	0	4	
...	...	...	...	...	...	...	...	...	...	...	
4595	2014-07-09 00:00:00	3.081667e+05	3.0	1.75	1510	6360	1.0	0	0	4	
4596	2014-07-09 00:00:00	5.343333e+05	3.0	2.50	1460	7573	2.0	0	0	3	
4597	2014-07-09 00:00:00	4.169042e+05	3.0	2.50	3010	7014	2.0	0	0	3	
4598	2014-07-10 00:00:00	2.034000e+05	4.0	2.00	2090	6630	1.0	0	0	3	
4599	2014-07-10 00:00:00	2.206000e+05	3.0	2.50	1490	8102	2.0	0	0	4	

4600 rows × 18 columns

Next steps: Generate code with df View recommended plots

```
df.head()
```

	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_above	s
0	2014-05-02 00:00:00	313000.0	3.0	1.50	1340	7912	1.5	0	0	3	1340	
1	2014-05-02 00:00:00	2384000.0	5.0	2.50	3650	9050	2.0	0	4	5	3370	
2	2014-05-02 00:00:00	342000.0	3.0	2.00	1930	11947	1.0	0	0	4	1930	
3	2014-05-02 00:00:00	420000.0	3.0	2.25	2000	8030	1.0	0	0	4	1000	
4	2014-05-02 00:00:00	550000.0	4.0	2.50	1940	10500	1.0	0	0	4	1140	

Next steps: Generate code with df View recommended plots

```
df.tail()
```

	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_a
4595	2014-07-09 00:00:00	308166.666667	3.0	1.75	1510	6360	1.0	0	0	4	
4596	2014-07-09 00:00:00	534333.333333	3.0	2.50	1460	7573	2.0	0	0	3	
4597	2014-07-09 00:00:00	416904.166667	3.0	2.50	3010	7014	2.0	0	0	3	
4598	2014-07-10 00:00:00	203400.000000	4.0	2.00	2090	6630	1.0	0	0	3	
4599	2014-07-10 00:00:00	220600.000000	3.0	2.50	1490	8102	2.0	0	0	4	

```
df.shape
```

```
(4600, 18)
```

```
df.columns
```

```
Index(['date', 'price', 'bedrooms', 'bathrooms', 'sqft_living', 'sqft_lot',
       'floors', 'waterfront', 'view', 'condition', 'sqft_above',
       'sqft_basement', 'yr_built', 'yr_renovated', 'street', 'city',
       'statezip', 'country'],
      dtype='object')
```

```
df.describe()
```

	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition
count	4.600000e+03	4600.000000	4600.000000	4600.000000	4.600000e+03	4600.000000	4600.000000	4600.000000	4600.000000
mean	5.519630e+05	3.400870	2.160815	2139.346957	1.485252e+04	1.512065	0.007174	0.240652	3.451739
std	5.638347e+05	0.908848	0.783781	963.206916	3.588444e+04	0.538288	0.084404	0.778405	0.677230
min	0.000000e+00	0.000000	0.000000	370.000000	6.380000e+02	1.000000	0.000000	0.000000	1.000000
25%	3.228750e+05	3.000000	1.750000	1460.000000	5.000750e+03	1.000000	0.000000	0.000000	3.000000
50%	4.609435e+05	3.000000	2.250000	1980.000000	7.683000e+03	1.500000	0.000000	0.000000	3.000000
75%	6.549625e+05	4.000000	2.500000	2620.000000	1.100125e+04	2.000000	0.000000	0.000000	4.000000
max	2.659000e+07	9.000000	8.000000	13540.000000	1.074218e+06	3.500000	1.000000	4.000000	5.000000

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4600 entries, 0 to 4599
Data columns (total 18 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   date           4600 non-null   object
 1   price          4600 non-null   float64
 2   bedrooms       4600 non-null   float64
 3   bathrooms      4600 non-null   float64
 4   sqft_living    4600 non-null   int64
 5   sqft_lot       4600 non-null   int64
 6   floors         4600 non-null   float64
 7   waterfront     4600 non-null   int64
 8   view           4600 non-null   int64
 9   condition      4600 non-null   int64
 10  sqft_above     4600 non-null   int64
 11  sqft_basement  4600 non-null   int64
 12  yr_built       4600 non-null   int64
 13  yr_renovated   4600 non-null   int64
 14  street         4600 non-null   object
 15  city           4600 non-null   object
 16  statezip       4600 non-null   object
 17  country        4600 non-null   object
dtypes: float64(4), int64(9), object(5)
memory usage: 647.0+ KB
```

```
df.dtypes
```

```
date              object
price            float64
bedrooms         float64
bathrooms        float64
sqft_living        int64
sqft_lot           int64
floors           float64
waterfront         int64
view               int64
condition          int64
sqft_above         int64
sqft_basement      int64
yr_built           int64
yr_renovated       int64
street            object
city              object
statezip          object
country           object
dtype: object
```

```
df.isna().sum()
```

```
date             0
price            0
bedrooms         0
bathrooms        0
sqft_living      0
sqft_lot         0
floors           0
waterfront       0
view             0
condition        0
sqft_above       0
sqft_basement    0
yr_built         0
yr_renovated     0
street           0
city             0
statezip         0
country          0
dtype: int64
```

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

```
0
```

```
df.nunique(axis=0)
```

```
date               70
price            1741
bedrooms           10
bathrooms          26
sqft_living       566
sqft_lot         3113
floors              6
waterfront          2
view                5
condition           5
sqft_above        511
sqft_basement     207
yr_built          115
yr_renovated       60
street           4525
city               44
statezip           77
country             1
dtype: int64
```

```
df.dropna(inplace=True)
(df.price == 0).sum()
```

```
49
```

```
#df['price'].replace(0,np.NaN,inplace=True)
df.loc[df.price==0,'price']=np.NaN
```

```
(df.price == 0).sum()
```

```
0
```

```
df.isna().sum()
```

```
date              0
price            49
bedrooms          0
bathrooms         0
sqft_living       0
sqft_lot          0
floors            0
waterfront        0
view              0
condition         0
sqft_above        0
sqft_basement     0
yr_built          0
yr_renovated      0
street            0
city              0
statezip          0
country           0
dtype: int64
```

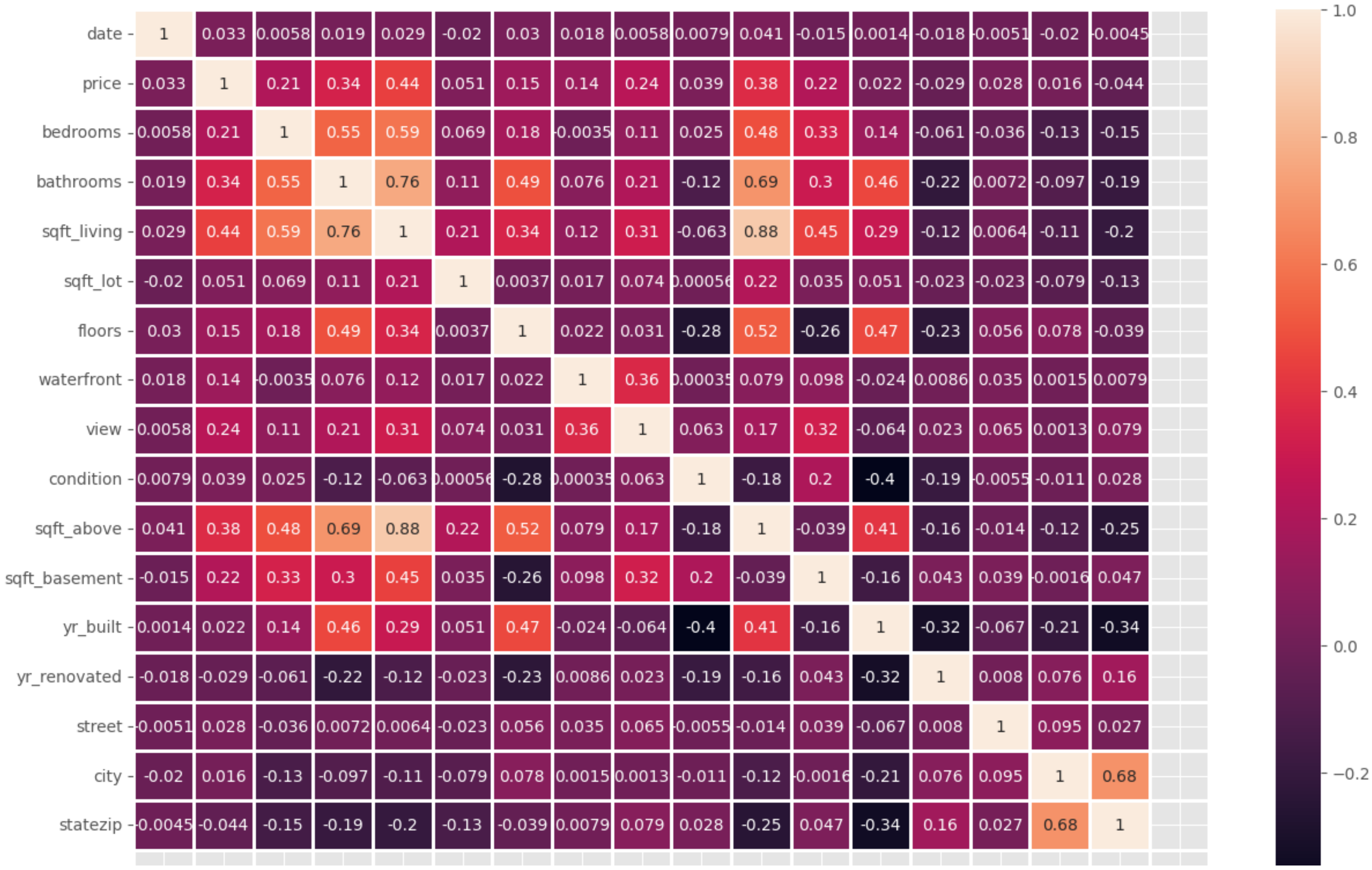
```
df['price']=df['price'].fillna(df['price'].mean())
```

```
lb=LabelEncoder()
df['street']=lb.fit_transform(df['street'])
df['city']=lb.fit_transform(df['city'])
df['statezip']=lb.fit_transform(df['statezip'])
df['country']=lb.fit_transform(df['country'])
df['date']=lb.fit_transform(df['date'])
df.dtypes
```

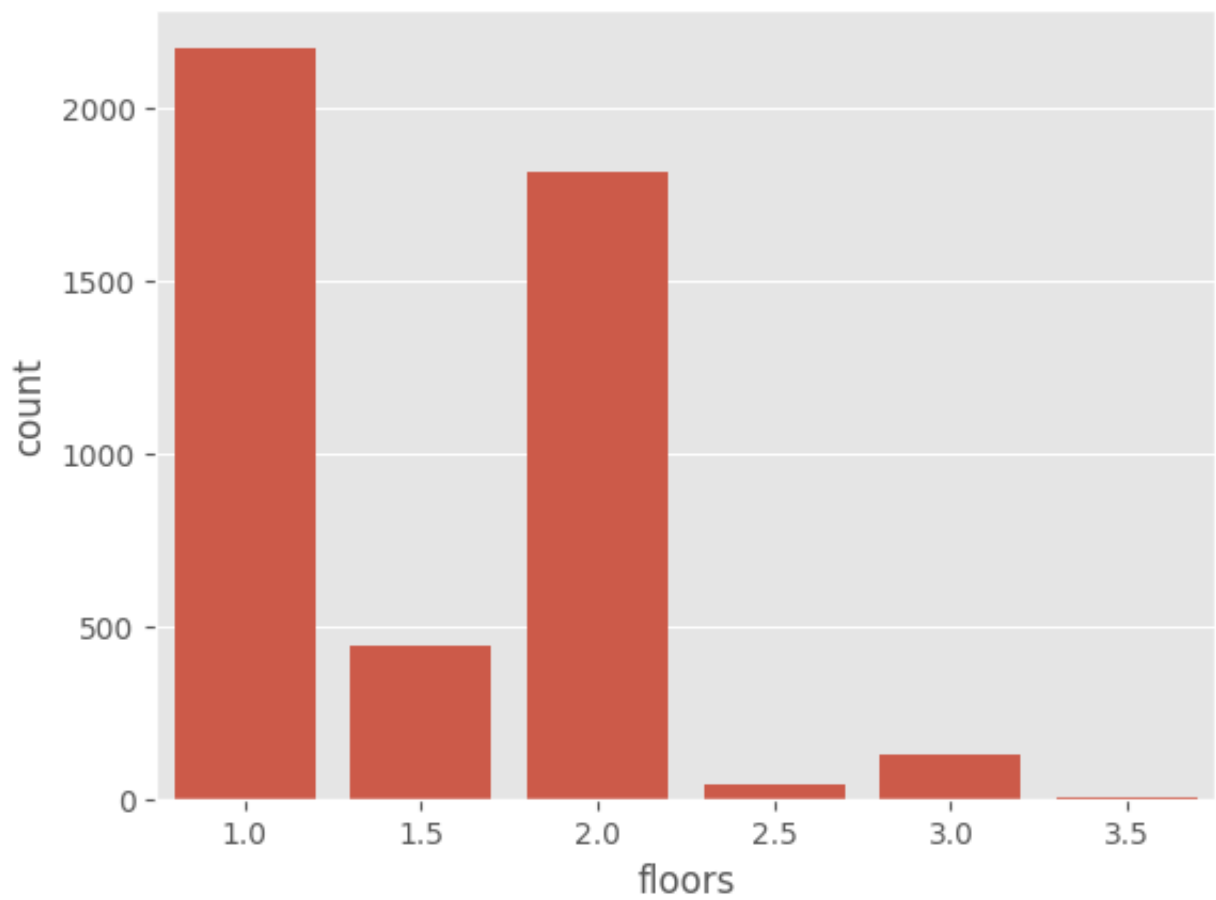
```
date               int64
price            float64
bedrooms         float64
bathrooms        float64
sqft_living        int64
sqft_lot           int64
floors           float64
waterfront         int64
view               int64
condition          int64
sqft_above         int64
sqft_basement      int64
yr_built           int64
yr_renovated       int64
street             int64
city               int64
statezip           int64
country            int64
dtype: object
```

```
plt.figure(figsize=(15,10))
sns.heatmap(df.corr(numeric_only=True),annot=True,linewidth=1)
```

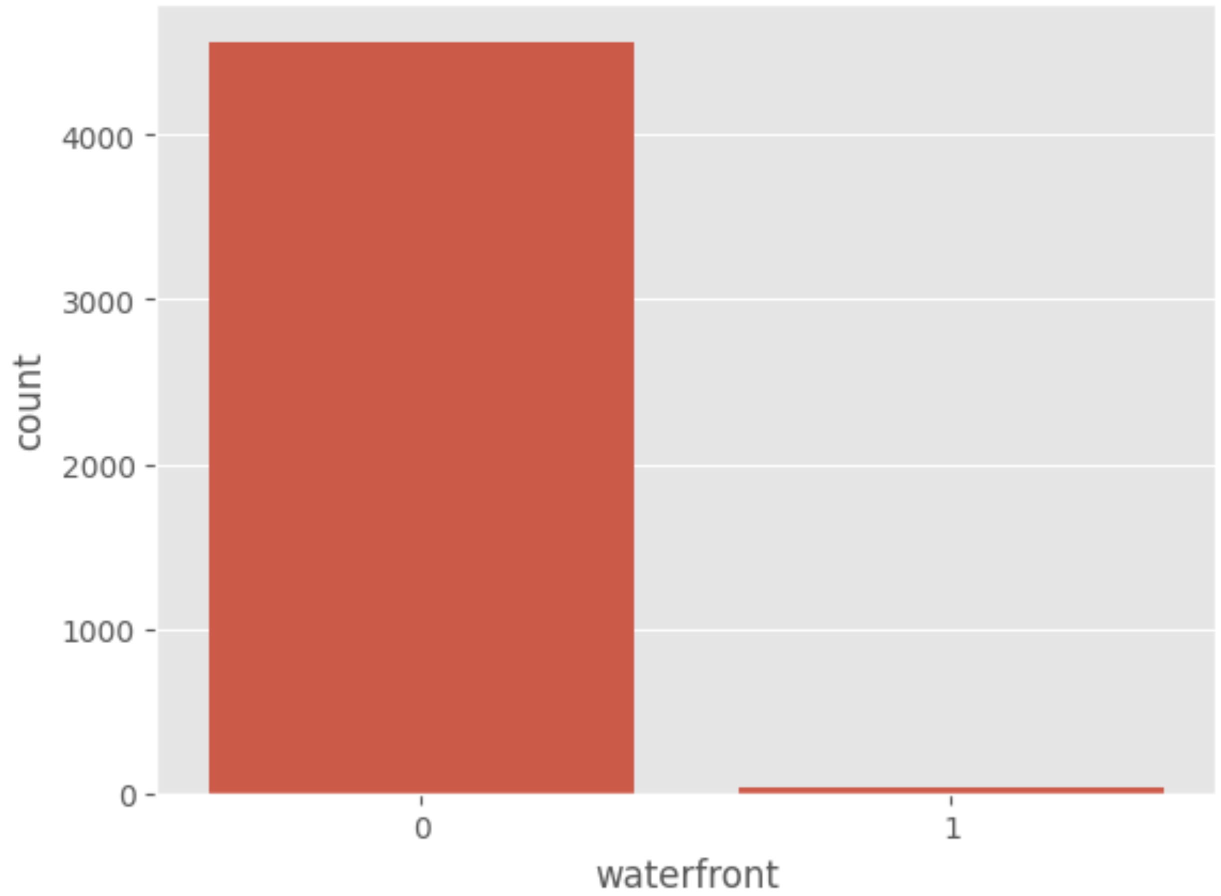
<Axes: >



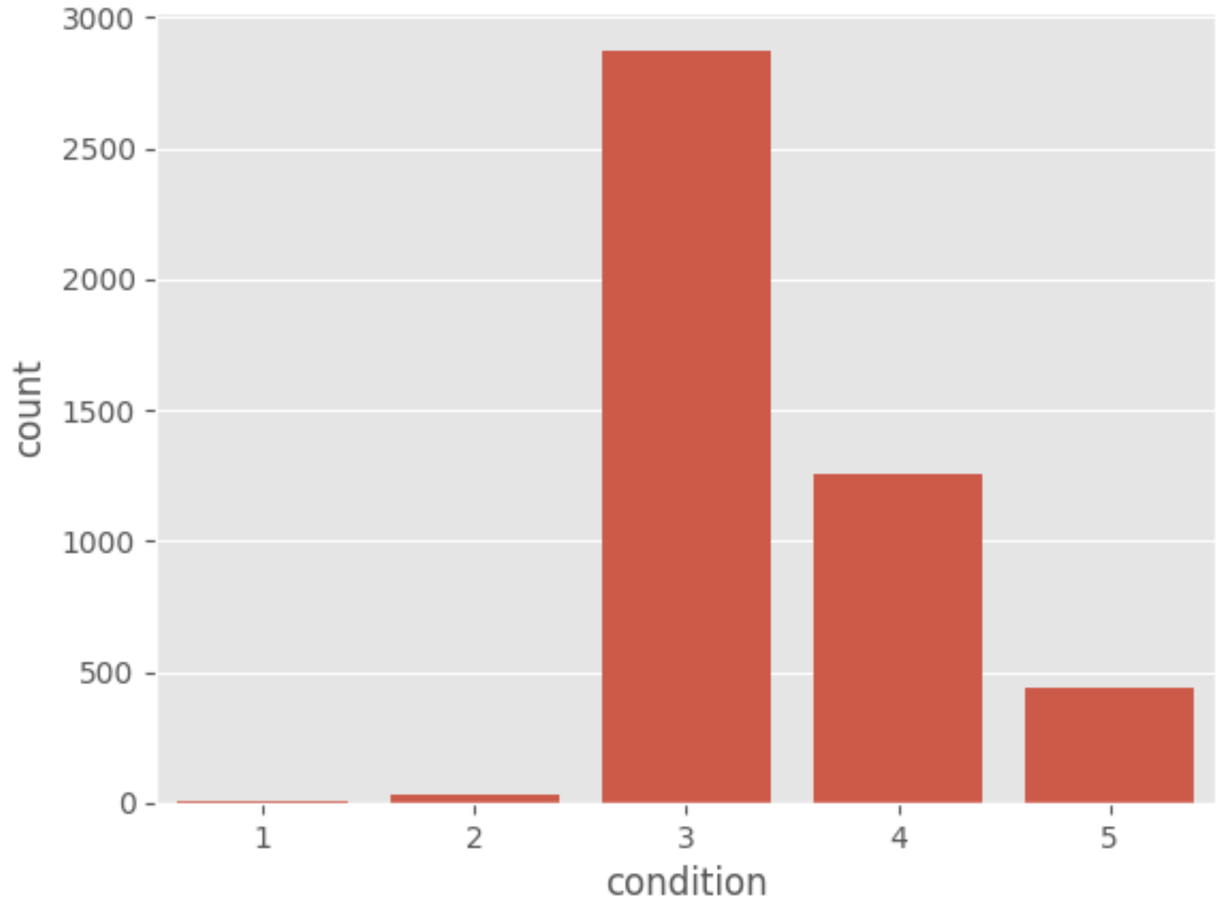

```
sns.countplot(data=df,x=df['floors'])
plt.show()
```



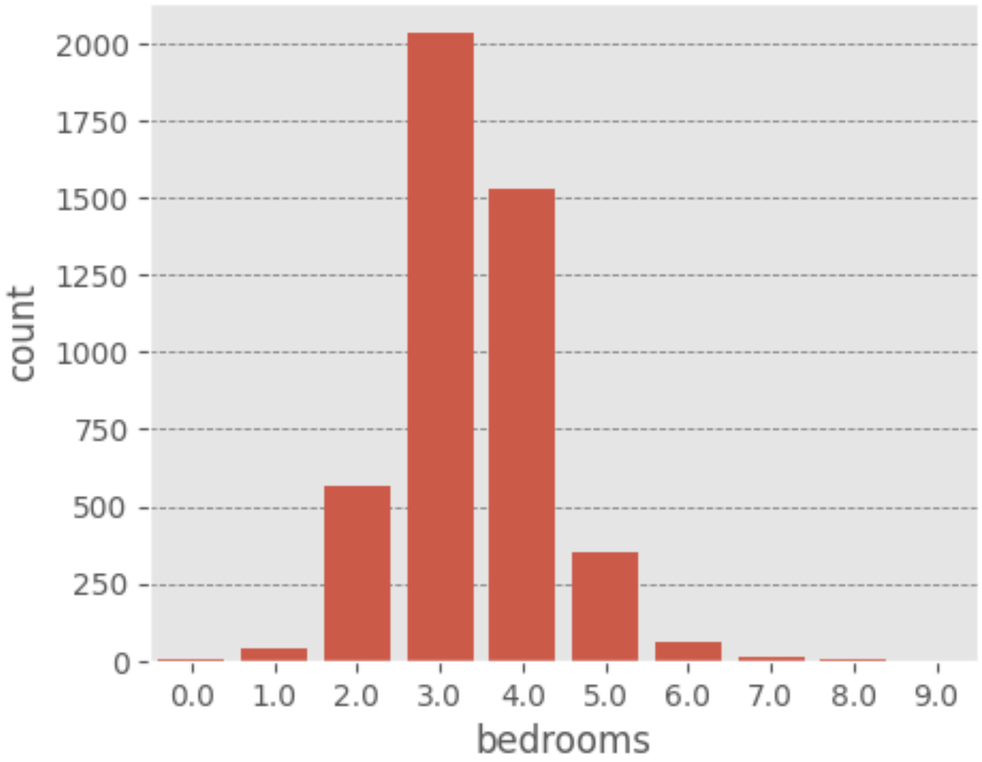
```
sns.countplot(data=df,x=df['waterfront'])
plt.show()
```



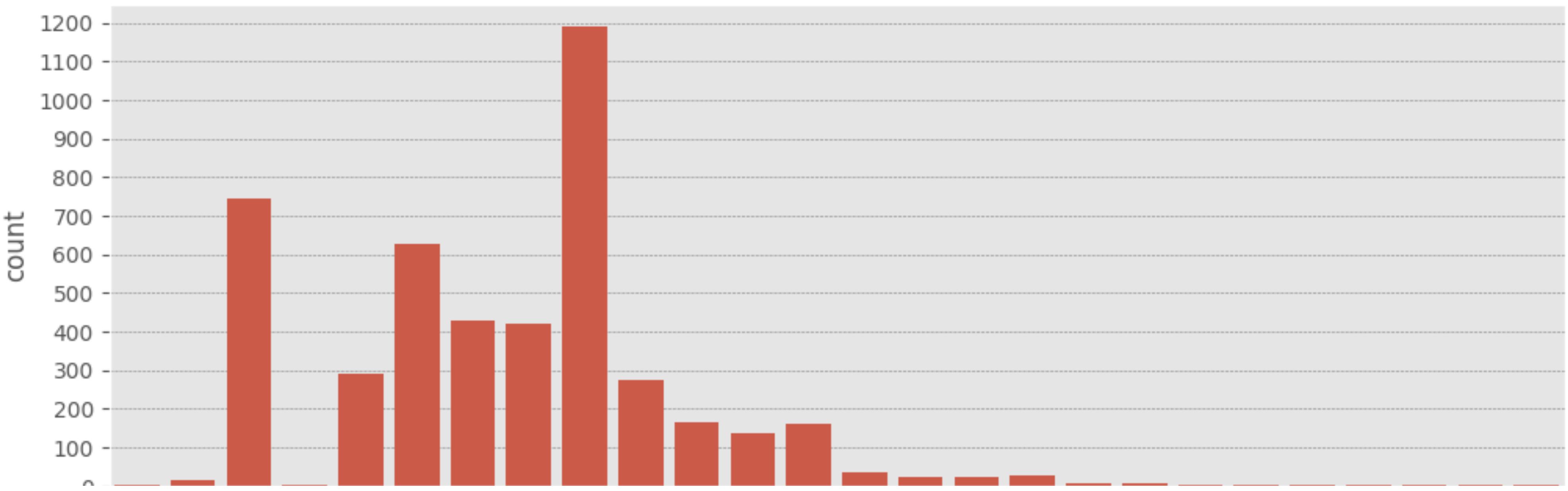

```
sns.countplot(data=df,x=df['condition'])
plt.show()
```



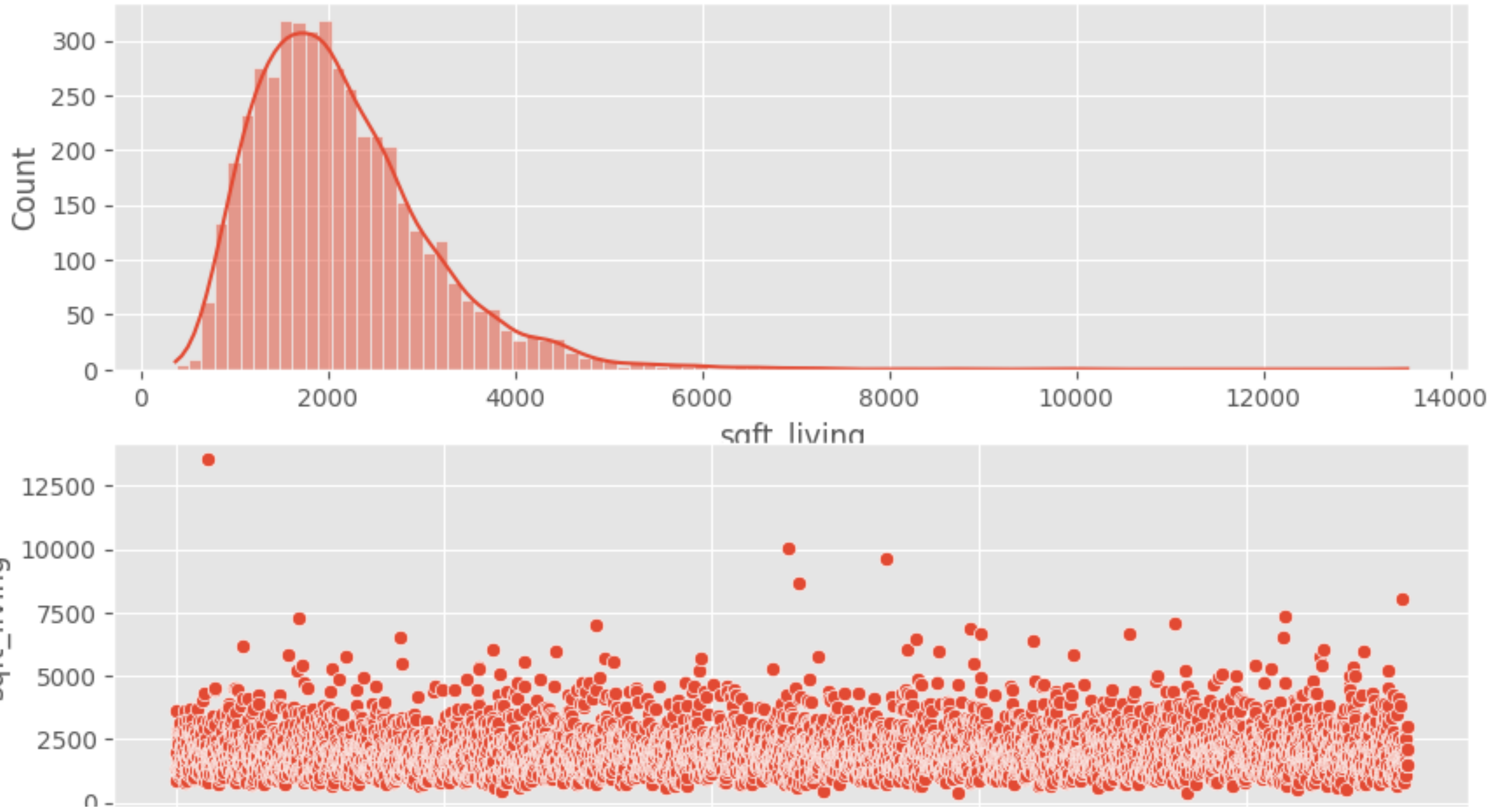
```
#univariate analysis
plt.figure(figsize=(5,4))
sns.countplot(data = df,x = "bedrooms")
plt.grid(axis="y",color="grey",linestyle="--",linewidth=0.6)
plt.style.use("ggplot")
plt.show()
```




```
plt.figure(figsize=(12,4))
sns.countplot(data = df,x = "bathrooms")
plt.grid(axis="y",color="grey",linestyle="--",linewidth=0.4)
plt.yticks(range(0,1300,100))
plt.style.use("ggplot")
plt.show()
```



```
fig,axs = plt.subplots(2,1,figsize=(10,6))
plt.subplot(2,1,1)
sns.histplot(data=df,x="sqft_living",kde=True)
plt.ticklabel_format(style='plain', axis='x')
plt.subplot(2,1,2)
sns.scatterplot(data=df,x=df.index,y="sqft_living")
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```



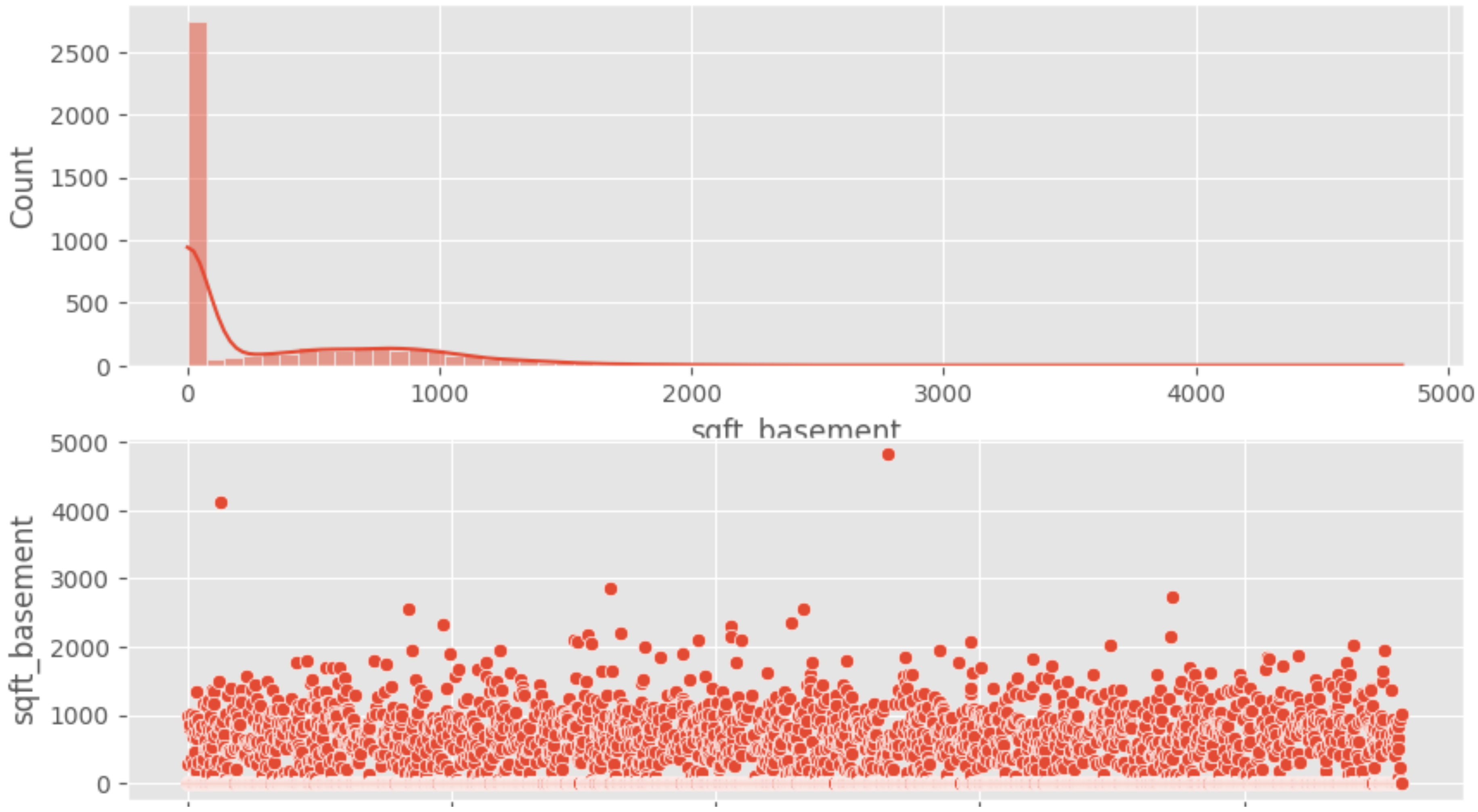

```
# Removing skewness from data

print("Before transformation skew : ",df["sqft_living"].skew())
df["sqft_living"] = np.log(df["sqft_living"])
print("After transformation skew : ",df["sqft_living"].skew())
```

```
Before transformation skew :  1.723513270622118
After transformation skew :  -0.04949693742696049
```

```
fig,axs = plt.subplots(2,1,figsize=(10,6))
plt.subplot(2,1,1)
sns.histplot(data=df,x="sqft_basement",kde=True)
plt.ticklabel_format(style='plain', axis='x')

plt.subplot(2,1,2)
sns.scatterplot(data=df,x=df.index,y="sqft_basement")
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```



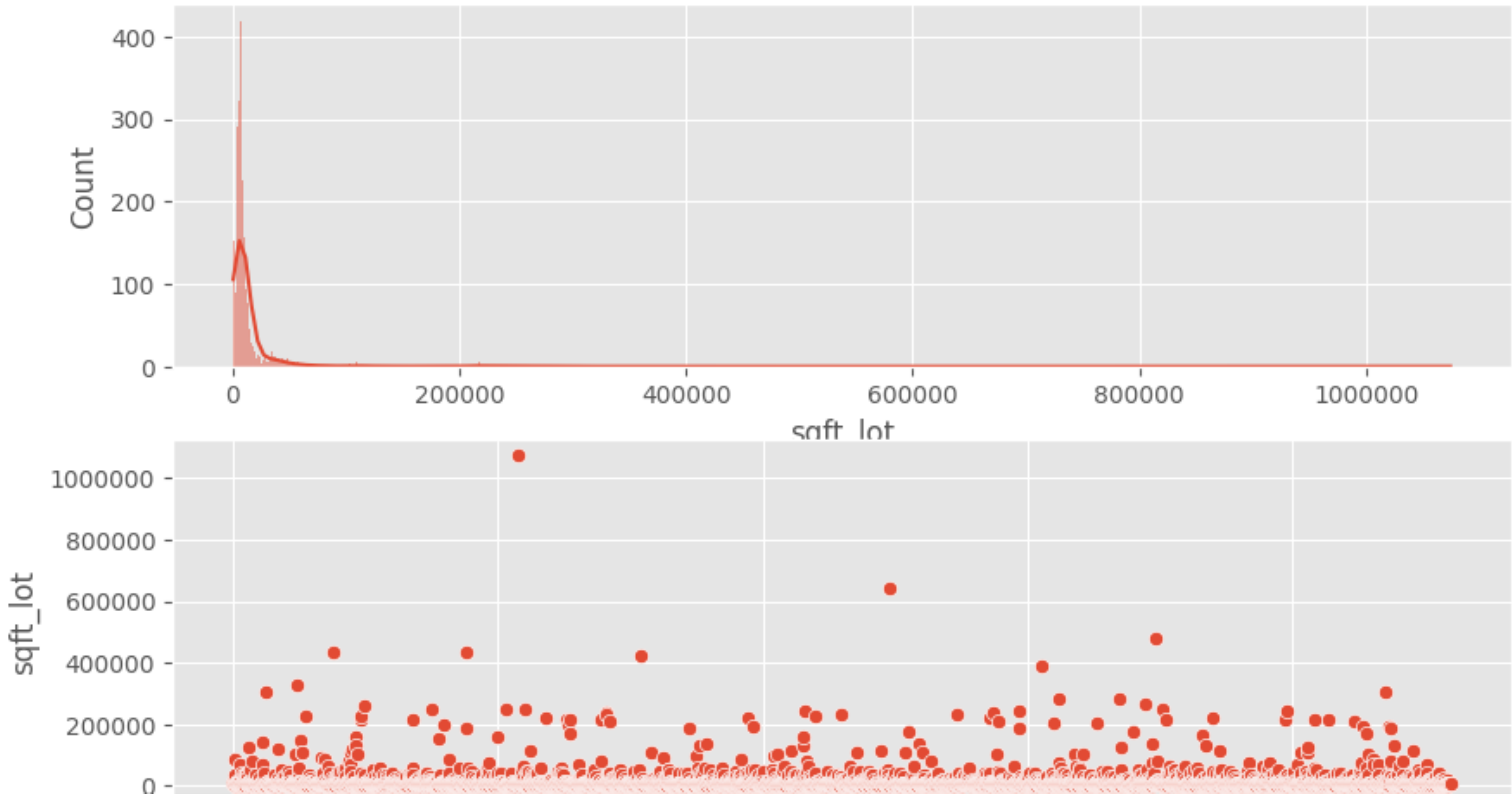

```
# Removing the skeness from data

print("Before transformation skew : ",df["sqft_basement"].skew())
df["sqft_basement"] = np.cbrt(df["sqft_basement"])
print("After transformation skew : ",df["sqft_basement"].skew())
```

```
Before transformation skew :  1.6427321922167097
After transformation skew :  0.5627140628962356
```

```
fig,axs = plt.subplots(2,1,figsize=(10,6))
plt.subplot(2,1,1)
sns.histplot(data=df,x="sqft_lot",kde=True)
plt.ticklabel_format(style='plain', axis='x')

plt.subplot(2,1,2)
sns.scatterplot(data=df,x=df.index,y="sqft_lot")
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```



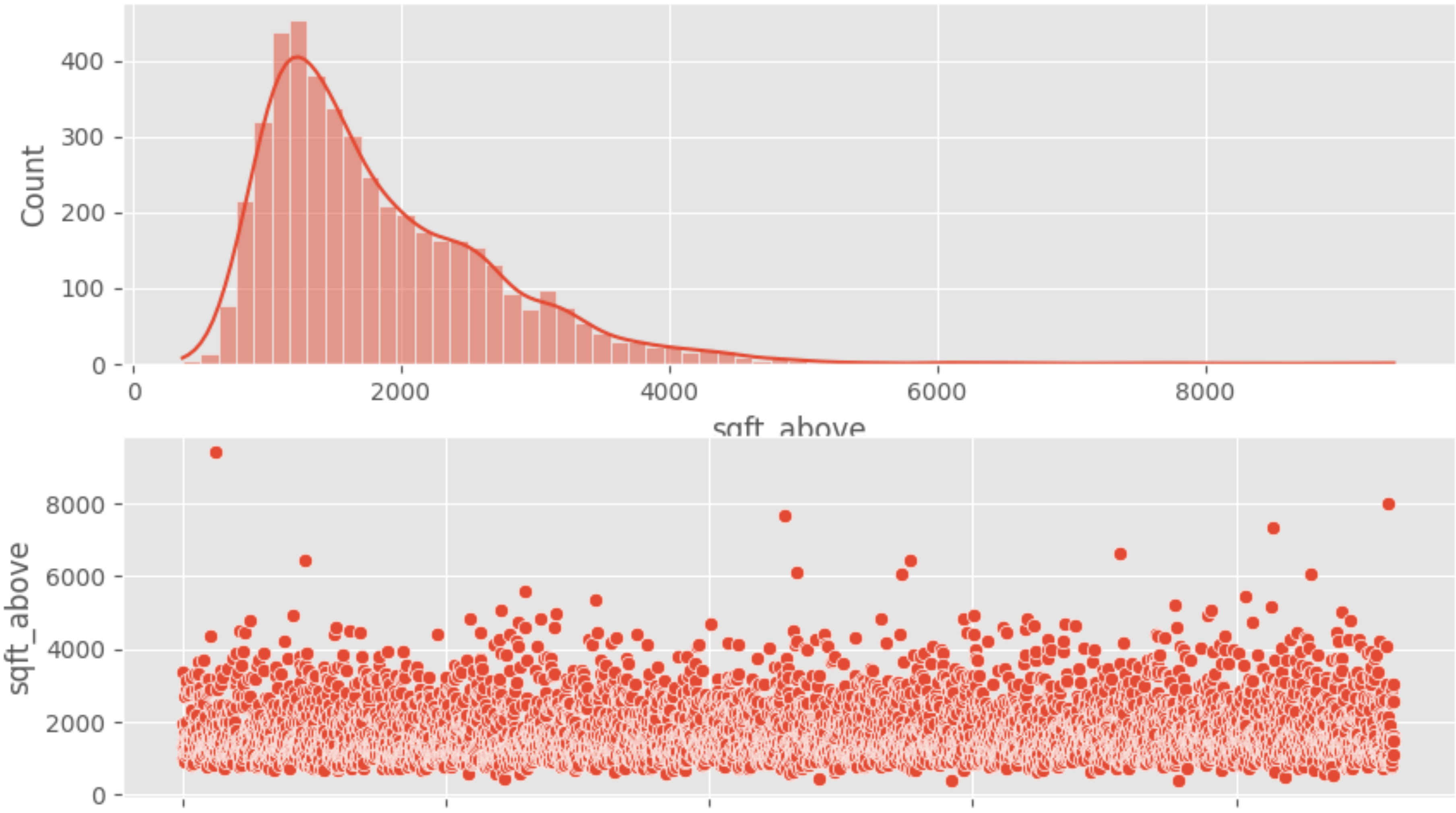

```
# Removing the skewness from data

print("Before transformation skew : ",df["sqft_lot"].skew())
df["sqft_lot"] = np.log(df["sqft_lot"])
print("After transformation skew : ",df["sqft_lot"].skew())
```

```
Before transformation skew :  11.307138748782643
After transformation skew :  0.8416221290325118
```

```
fig,axs = plt.subplots(2,1,figsize=(10,6))
plt.subplot(2,1,1)
sns.histplot(data=df,x="sqft_above",kde=True)
plt.ticklabel_format(style='plain', axis='x')

plt.subplot(2,1,2)
sns.scatterplot(data=df,x=df.index,y="sqft_above")
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```



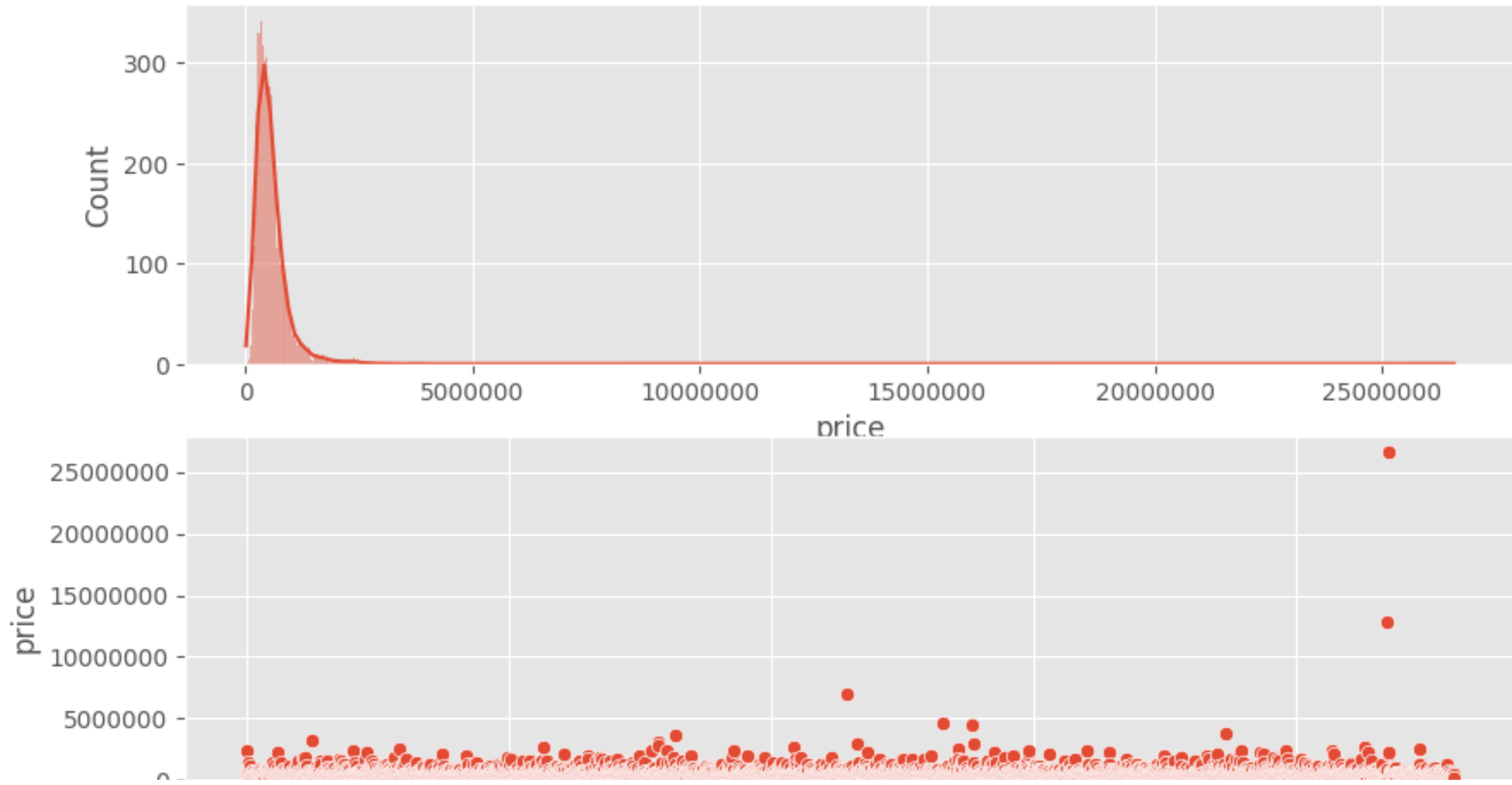

```
# Removing the skewness from data

print("Before transformation skew : ",df["sqft_above"].skew())
df["sqft_above"] = np.log(df["sqft_above"])
print("After transformation skew : ",df["sqft_above"].skew())
```

```
Before transformation skew :  1.4942107479829443
After transformation skew :  0.24540379930305353
```

```
fig,axs = plt.subplots(2,1,figsize=(10,6))
plt.subplot(2,1,1)
sns.histplot(data=df,x="price",kde=True)
plt.ticklabel_format(style='plain', axis='x')

plt.subplot(2,1,2)
sns.scatterplot(data=df,x=df.index,y="price")
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```

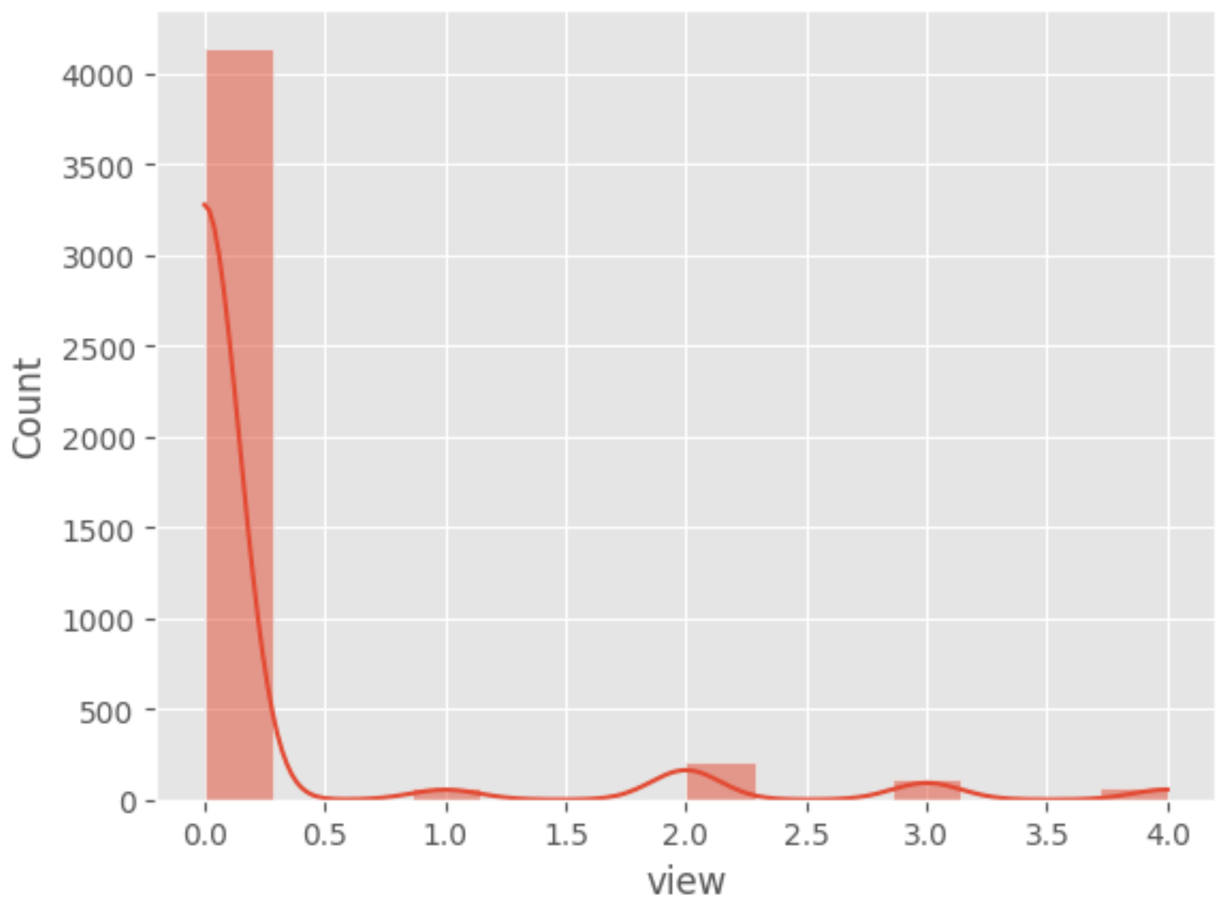



```
print("Before transformation skew : ",df["price"].skew())
df["price"] = np.log(df["price"])
print("After transformation skew : ",df["price"].skew())
```

```
Before transformation skew :  25.158082239502786
After transformation skew :  0.3216824447420246
```

```
sns.histplot(data=df,x="view",kde=True)
```

```
<Axes: xlabel='view', ylabel='Count'>
```



```
# Removing the skewness

print("Before transformation skew : ",df["view"].skew())
df["view"] = np.cbrt(df["view"])
print("After transformation skew : ",df["view"].skew())
```

```
Before transformation skew :  3.341586380673694
After transformation skew :  2.7633499389523744
```

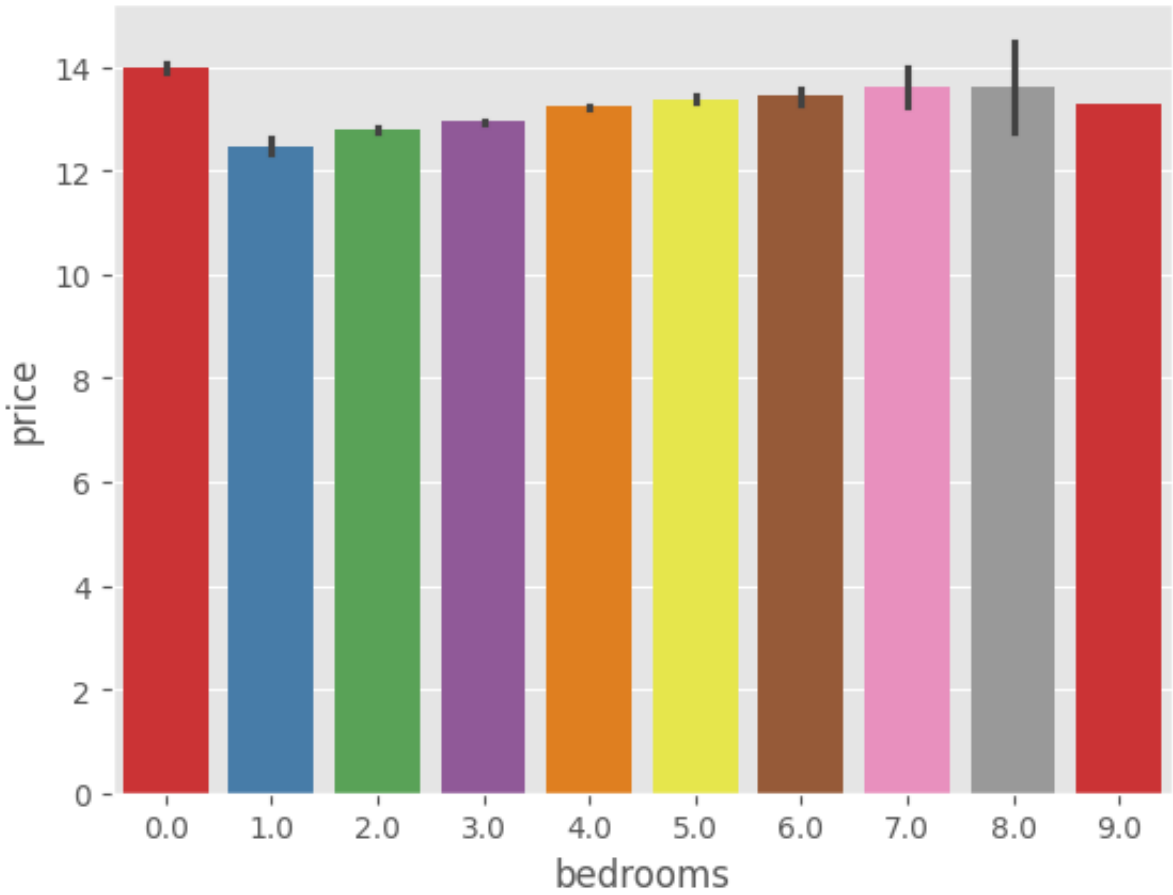
```
sns.barplot(data=df,y="price",x="bedrooms", palette='Set1')
plt.ticklabel_format(style='plain', axis='y')

plt.show()
```

```
<ipython-input-139-6d700b4f6c53>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable

  sns.barplot(data=df,y="price",x="bedrooms", palette='Set1')
```



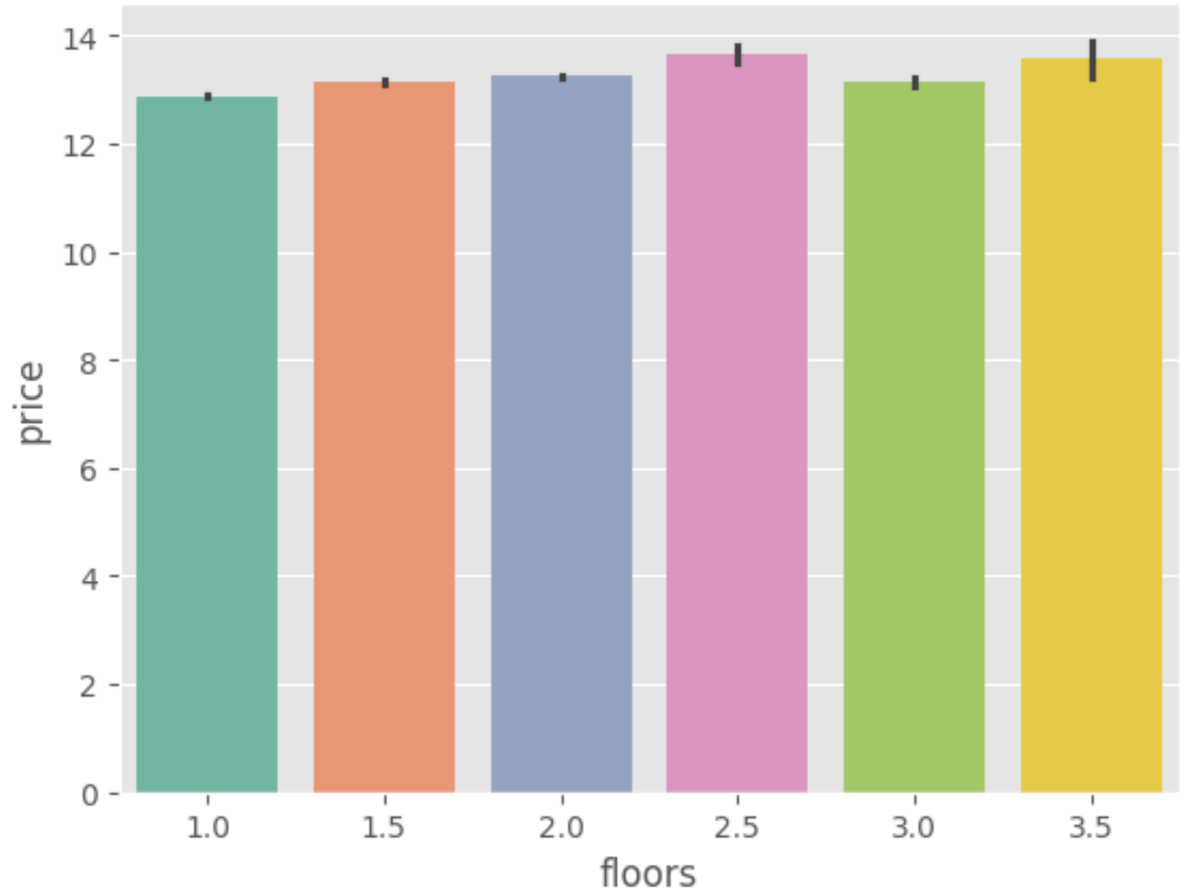
```
sns.barplot(data=df,y="price",x="floors",palette='Set2')
plt.ticklabel_format(style='plain', axis='y')

plt.show()
```

```
<ipython-input-140-3165d78db1b3>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable

  sns.barplot(data=df,y="price",x="floors",palette='Set2')
```

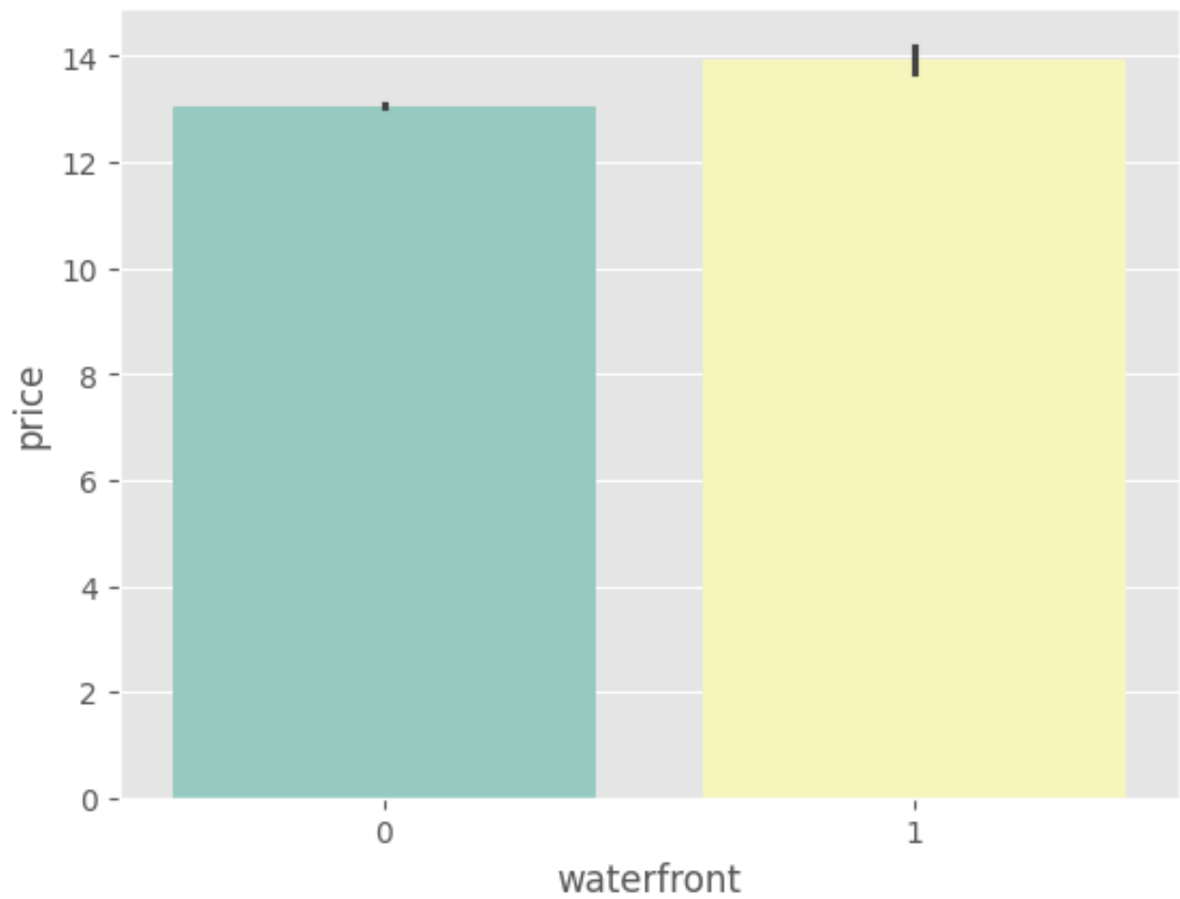



```
sns.barplot(data=df,y="price",x="waterfront",palette='Set3')
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```

```
<ipython-input-141-90507285bb24>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable

  sns.barplot(data=df,y="price",x="waterfront",palette='Set3')
```



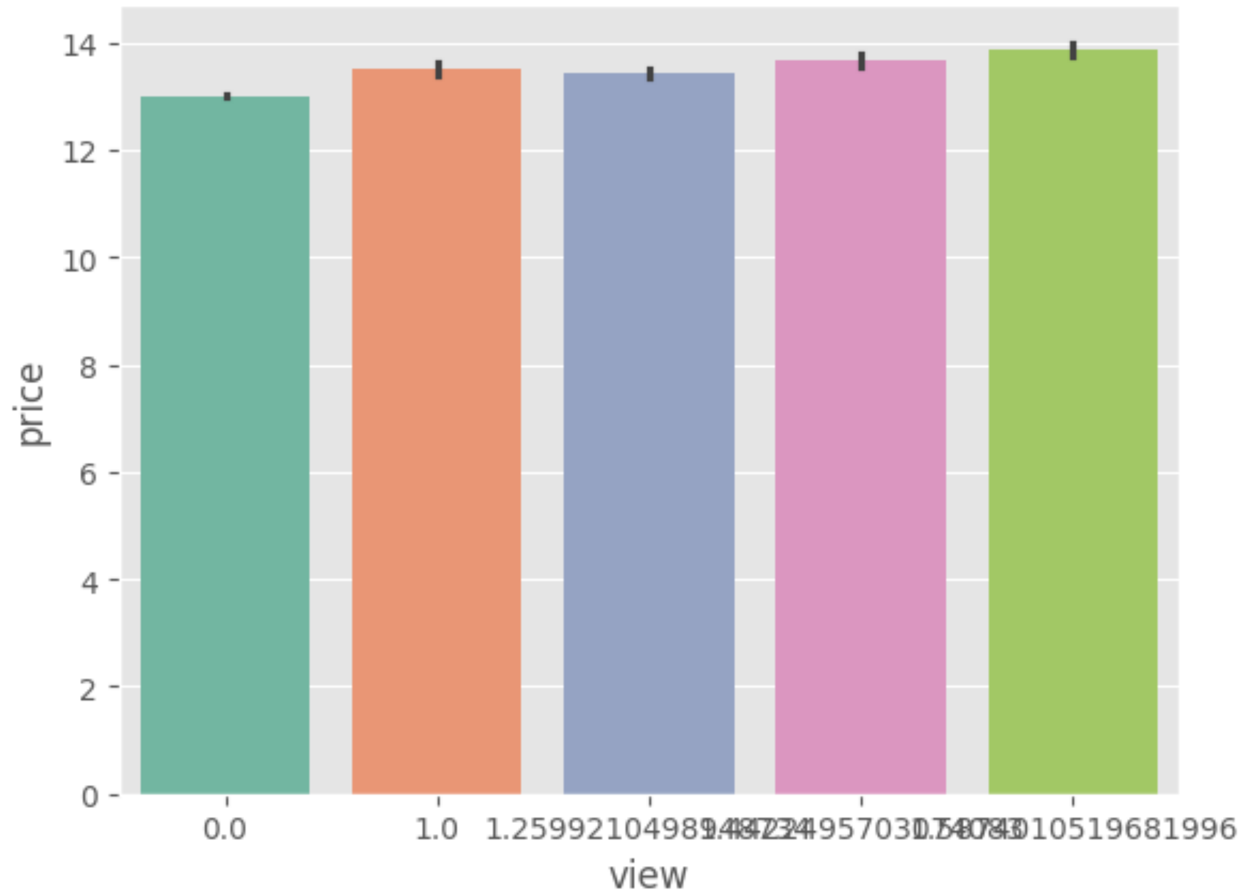
```
sns.barplot(data=df,y="price",x="view",palette='Set2')
plt.ticklabel_format(style='plain', axis='y')

plt.show()
```

```
<ipython-input-142-833f7590f7f8>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable

  sns.barplot(data=df,y="price",x="view",palette='Set2')
```

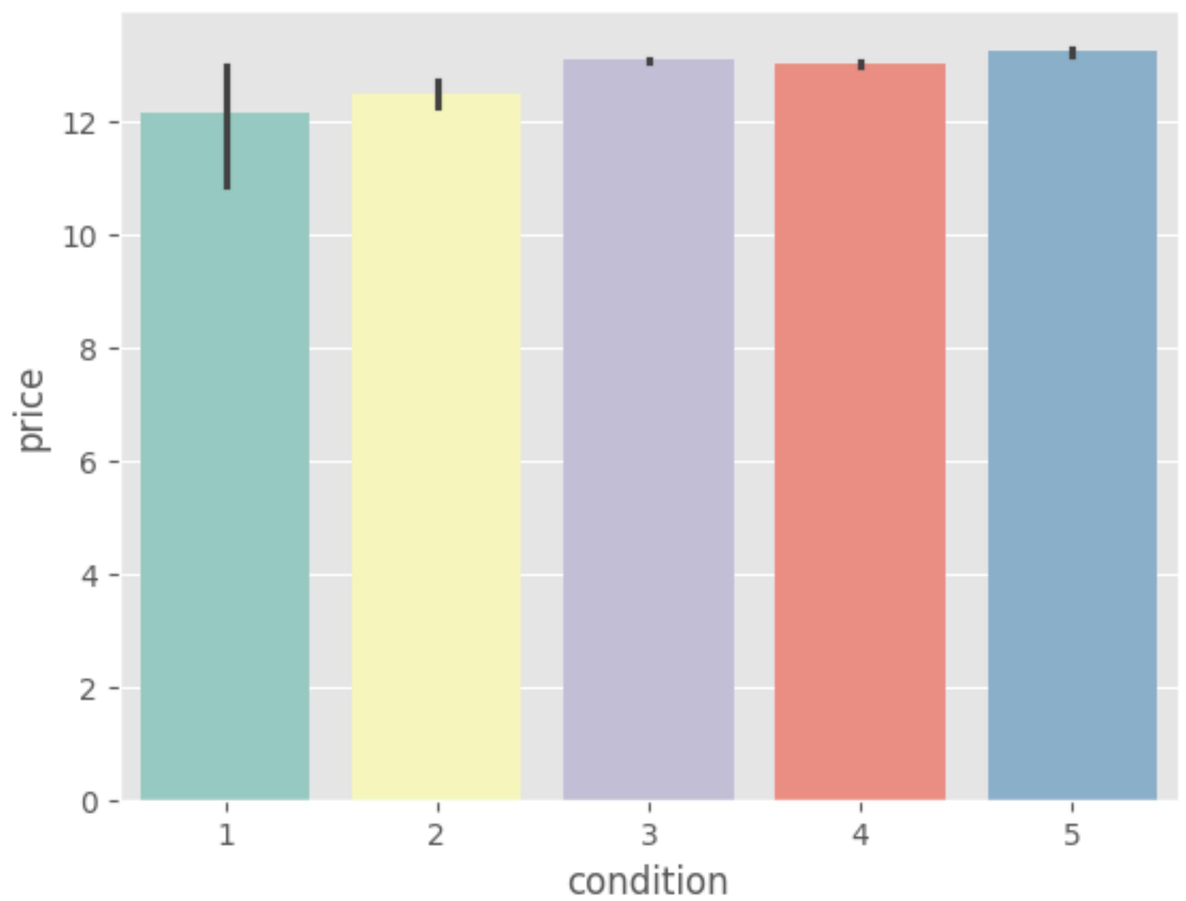



```
sns.barplot(data=df,y="price",x="condition",palette='Set3')
plt.ticklabel_format(style='plain', axis='y')
plt.show()
```

```
<ipython-input-143-e2287f8bcd8a>:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable

  sns.barplot(data=df,y="price",x="condition",palette='Set3')
```



```
df.drop(['date','street','country','statezip'],axis=1,inplace=True)
```

```
x= df.drop(columns='price',axis=1)
x
```

	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_above	sqft_basement
0	3.0	1.50	7.200425	8.976136	1.5	0	0.000000	3	7.200425	0.00000(
1	5.0	2.50	8.202482	9.110520	2.0	0	1.587401	5	8.122668	6.54213(
2	3.0	2.00	7.565275	9.388235	1.0	0	0.000000	4	7.565275	0.00000(
3	3.0	2.25	7.600902	8.990940	1.0	0	0.000000	4	6.907755	10.00000(
4	4.0	2.50	7.570443	9.259131	1.0	0	0.000000	4	7.038784	9.28317(
...	...	...	...	...	...	...	...	...	...	..
4595	3.0	1.75	7.319865	8.757784	1.0	0	0.000000	4	7.319865	0.00000(
4596	3.0	2.50	7.286192	8.932345	2.0	0	0.000000	3	7.286192	0.00000(
4597	3.0	2.50	8.009695	8.855663	2.0	0	0.000000	3	8.009695	0.00000(
4598	4.0	2.00	7.644919	8.799360	1.0	0	0.000000	3	6.975414	10.06622(
4599	3.0	2.50	7.306531	8.999866	2.0	0	0.000000	4	7.306531	0.00000(

4600 rows × 13 columns

Next steps: Generate code with x View recommended plots

```
y=df['price']
y
```

```
0       12.653958
1       14.684290
2       12.742566
3       12.948010
4       13.217674
          ...
4595    12.638396
4596    13.188775
4597    12.940612
4598    12.222930
4599    12.304106
Name: price, Length: 4600, dtype: float64
```

Train/Test split

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.30,random_state=0)
x_train
```

	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_above	sqft_basement
4452	3.0	1.00	6.946976	8.833463	2.0	0	0.00000	3	6.946976	0.000000
2457	5.0	2.75	8.107720	10.075759	2.0	0	0.00000	4	7.691657	10.415804
1390	3.0	2.25	7.770645	12.291332	2.0	0	0.00000	3	7.770645	0.000000
3402	4.0	1.75	7.642524	12.068189	1.0	0	0.00000	3	7.383989	7.802454
3197	4.0	2.50	7.803843	10.922100	2.0	0	0.00000	3	7.803843	0.000000
...	...	...	...	...	...	...	...	...	...	...
1033	3.0	1.50	7.146772	7.274480	3.0	0	0.00000	3	7.146772	0.000000
3264	2.0	1.00	6.877296	8.612503	1.0	0	0.00000	3	6.877296	0.000000
1653	5.0	2.75	7.640123	9.487138	2.0	0	0.00000	3	7.640123	0.000000
2607	4.0	2.50	8.029433	10.446161	1.0	0	1.44225	4	7.635304	10.000000
2732	3.0	1.75	7.438384	9.039789	1.0	0	0.00000	3	7.114769	7.774980

3220 rows × 13 columns

Next steps: Generate code with `x_train` View recommended plots

```
x_test
```

	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	sqft_above	sqft_basement	y
991	3.0	2.50	7.644919	8.455318	2.0	0	0.0	3	7.644919	0.000000	
2824	4.0	2.50	7.878534	9.062420	2.0	0	0.0	3	7.878534	0.000000	
1906	1.0	1.00	6.476972	9.639782	1.0	0	0.0	4	6.476972	0.000000	
1471	4.0	2.00	7.828038	10.549045	1.0	0	0.0	3	7.828038	0.000000	
1813	4.0	3.50	7.933797	9.222763	1.5	0	0.0	5	7.933797	0.000000	
...	...	...	...	...	...	...	...	...	...	...	
1523	2.0	2.50	6.956545	7.383368	2.0	0	0.0	3	6.956545	0.000000	
144	3.0	3.00	7.359468	7.609367	3.0	0	0.0	3	7.359468	0.000000	
388	4.0	2.25	8.349957	10.539244	2.0	0	0.0	3	8.349957	0.000000	
4395	4.0	1.00	7.333023	8.881836	1.5	0	0.0	3	7.244228	5.065797	
1669	2.0	1.00	7.098376	8.476371	1.0	0	0.0	3	6.966024	5.313293	

1380 rows × 13 columns

Next steps: Generate code with `x_test` View recommended plots

```
y_train
```

```
4452    11.909098
2457    13.341499
1390    13.282780
3402    13.241923
3197    13.337475
          ...
1033    12.994530
3264    12.254863
1653    13.197263
2607    14.467836
2732    13.071070
Name: price, Length: 3220, dtype: float64
```

```
y_test
```

```
991     12.574182
2824    12.971308
1906    11.767568
1471    13.304685
1813    14.076335
          ...
1523    12.691580
144     12.812436
388     13.800397
4395    11.815496
1669    12.847927
Name: price, Length: 1380, dtype: float64
```

Normalization

```
scaler=StandardScaler()
x_train=scaler.fit_transform(x_train)
x_test=scaler.fit_transform(x_test)
x_train
```

```
array([[-0.43585706, -1.46116072, -1.44531812, ..., -0.97908343,
         1.21146099,  0.77814633],
       [ 1.81508077,  0.76024509,  1.24451291, ...,  0.13894917,
        -0.82861952,  1.3632617 ],
       [-0.43585706,  0.12555772,  0.46339815, ...,  0.27446827,
         1.22676924,  0.44379469],
       ...,
       [ 1.81508077,  0.76024509,  0.16093501, ...,  0.54550647,
         1.21248154,  0.61097051],
       [ 0.68961185,  0.44290141,  1.06309532, ..., -0.70804522,
         1.19513218, -0.3084965 ],
       [-0.43585706, -0.50912966, -0.30656301, ...,  0.20670872,
         1.21656374,  0.77814633]])
```

```
x_test
```

```
array([[-0.45368999,  0.40911564,  0.12981037, ...,  1.04166915,
        -0.81889088, -1.38368358],
       [ 0.59504064,  0.40911564,  0.67863687, ...,  0.54525937,
         1.22616715,  0.52929302],
       [-2.55115124, -1.52990983, -2.61402313, ..., -0.11662032,
        -0.81889088, -0.63512752],
       ...,
       [ 0.59504064,  0.08594473,  1.78614127, ...,  0.61144734,
        -0.81889088,  1.36102198],
       [ 0.59504064, -1.52990983, -0.60292118, ..., -0.74540604,
         1.22003197,  0.77881171],
       [-1.50242061, -1.52990983, -1.15417337, ..., -0.67921807,
         1.23127979,  0.77881171]])
```

Model creation

Linear Regression

```
lr=LinearRegression()
lr.fit(x_train,y_train)
y_pred=lr.predict(x_test)
y_pred
```

```
array([12.97344108, 13.29009117, 12.0672723 , ..., 13.61302906,
       12.8589992 , 12.75376323])
```

```
y_test
```

```
991     12.574182
2824    12.971308
1906    11.767568
1471    13.304685
1813    14.076335
          ...
1523    12.691580
144     12.812436
388     13.800397
4395    11.815496
1669    12.847927
Name: price, Length: 1380, dtype: float64
```

```
mae=mean_absolute_error(y_test,y_pred)
mape=mean_absolute_percentage_error(y_test,y_pred)
mse=mean_squared_error(y_test,y_pred)
rmse=np.sqrt(mse)
r_score=r2_score(y_test,y_pred)
```

```
print("MAE:", mae)
print("MAPE",mape)
print("MSE:", mse)
print("RMSE:", rmse)
print("R2 Score:", r_score)
```

```
MAE: 0.2846265705186637
MAPE 0.021728867580299297
MSE: 0.14006035188542187
RMSE: 0.37424637858691684
R2 Score: 0.5184802888077391
```

random forest regression

```
rf=RandomForestRegressor(n_estimators=300, random_state=0)
rf.fit(x_train,y_train)
y_pred=rf.predict(x_test)
y_pred
```

```
array([12.59002474, 13.05804781, 12.4172821 , ..., 13.56657173,
       12.79312905, 12.86318677])
```

```
y_test
```

```
991     12.574182
2824    12.971308
1906    11.767568
1471    13.304685
1813    14.076335
          ...
1523    12.691580
144     12.812436
388     13.800397
4395    11.815496
1669    12.847927
Name: price, Length: 1380, dtype: float64
```

```
print("MAE:", mean_absolute_error(y_test,y_pred))
print("MAPE",mean_absolute_percentage_error(y_test,y_pred))
print("MSE:",mean_squared_error(y_test,y_pred))
print("RMSE:", np.sqrt(mse))
print("R2 Score:", r2_score(y_test,y_pred))
```

```
MAE: 0.22647090576813672
MAPE 0.017262669925558055
MSE: 0.1091462311680321
RMSE: 0.37424637858691684
R2 Score: 0.6247613189437886
```

Decision Tree Regression

```
dt=DecisionTreeRegressor()
dt.fit(x_train,y_train)
y_pred=dt.predict(x_test)
y_pred
```

```
array([12.5776362 , 13.07107008, 12.60819885, ..., 12.91195094,
       13.23194559, 13.48422485])
```

```
y_test
```

```
991     12.574182
2824    12.971308
1906    11.767568
1471    13.304685
1813    14.076335
          ...
1523    12.691580
144     12.812436
388     13.800397
4395    11.815496
1669    12.847927
Name: price, Length: 1380, dtype: float64
```

```
print("MAE:", mean_absolute_error(y_test,y_pred))
print("MAPE",mean_absolute_percentage_error(y_test,y_pred))
print("MSE:",mean_squared_error(y_test,y_pred))
print("RMSE:", np.sqrt(mse))
print("R2 Score:", r2_score(y_test,y_pred))
```

```
MAE: 0.32709069418316755
MAPE 0.024925561267985362
MSE: 0.23550563025546045
RMSE: 0.37424637858691684
R2 Score: 0.1903447225555348
```

Gradient boosting Regression

```
GBoost = GradientBoostingRegressor(n_estimators=5000,random_state =5)
GBoost.fit(x_train, y_train)
pred = GBoost.predict(x_test)
pred
```

```
array([12.51701353, 13.21149603, 12.02828778, ..., 13.51718549,
       13.04713368, 13.21249785])
```

Start coding or generate with AI.


```
array([12.51701353, 13.21149603, 12.02828778, ..., 13.51718549,
       13.04713368, 13.21249785])
```



```
print("MAE:", mean_absolute_error(y_test,pred))
print("MAPE",mean_absolute_percentage_error(y_test,pred))
print("MSE:",mean_squared_error(y_test,pred))
print("RMSE:", np.sqrt(mse))
print("R2 Score:", r2_score(y_test,pred))
```

```
MAE: 0.23258625989172707
MAPE 0.017761748561780717
MSE: 0.12089418475828281
RMSE: 0.37424637858691684
R2 Score: 0.5843725069514749
```