House Price Predicton

July 15, 2024

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib
import warnings
warnings.filterwarnings('ignore')
matplotlib.rcParams["figure.figsize"]=(20,10)
```

[2]:
```
df1=pd.read_csv("D:\\docs\\Bengaluru_House_Data.csv")
df1.head()
```

[2]:

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2 BHK	Coomee	1056	2.0	1.0	39.07
1	Plot Area	Ready To Move	Chikka Tirupathi	4 Bedroom	Theanmp	2600	5.0	3.0	120.00
2	Built-up Area	Ready To Move	Uttarahalli	3 BHK	NaN	1440	2.0	3.0	62.00
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3 BHK	Soiewre	1521	3.0	1.0	95.00
4	Super built-up Area	Ready To Move	Kothanur	2 BHK	NaN	1200	2.0	1.0	51.00

[3]:
```
df1.shape
```

[3]:
```
(13320, 9)
```

[4]:
```
df1.groupby('area_type')['area_type'].agg('count')
```

[4]:
```
area_type
Built-up  Area          2418
Carpet  Area              87
Plot  Area              2025
Super built-up  Area    8790
Name: area_type, dtype: int64
```

[5]:
```
df2=df1.drop(["area_type","society","balcony","availability"],axis="columns")
df2.head()
```

[5]:

	location	size	total_sqft	bath	price
0	Electronic City Phase II	2 BHK	1056	2.0	39.07
1	Chikka Tirupathi	4 Bedroom	2600	5.0	120.00
2	Uttarahalli	3 BHK	1440	2.0	62.00
3	Lingadheeranahalli	3 BHK	1521	3.0	95.00
4	Kothanur	2 BHK	1200	2.0	51.00

[6]:
```
df2.isnull().sum()
```

[6]:
```
location       1
size          16
total_sqft     0
bath          73
price          0
dtype: int64
```

[7]:
```
df3=df2.dropna()
df3.isnull().sum()
```

[7]:
```
location      0
size          0
total_sqft    0
bath          0
price         0
dtype: int64
```

[8]:
```
df3.shape
```

[8]:
```
(13246, 5)
```

[9]:
```
df3['size'].unique()
```

[9]:
```
array(['2 BHK', '4 Bedroom', '3 BHK', '4 BHK', '6 Bedroom', '3 Bedroom',
       '1 BHK', '1 RK', '1 Bedroom', '8 Bedroom', '2 Bedroom',
       '7 Bedroom', '5 BHK', '7 BHK', '6 BHK', '5 Bedroom', '11 BHK',
       '9 BHK', '9 Bedroom', '27 BHK', '10 Bedroom', '11 Bedroom',
       '10 BHK', '19 BHK', '16 BHK', '43 Bedroom', '14 BHK', '8 BHK',
       '12 Bedroom', '13 BHK', '18 Bedroom'], dtype=object)
```

[10]:
```
df3['bhk']=df3['size'].apply(lambda x: int(x.split(' ')[0]))
```

[11]:
```
df3.head()
```

[11]:

	location	size	total_sqft	bath	price	bhk
0	Electronic City Phase II	2 BHK	1056	2.0	39.07	2

```
1          Chikka Tirupathi  4 Bedroom       2600   5.0  120.00    4
2               Uttarahalli      3 BHK       1440   2.0   62.00    3
3        Lingadheeranahalli      3 BHK       1521   3.0   95.00    3
4                   Kothanur      2 BHK       1200   2.0   51.00    2
```

[12]:
```
df3['bhk'].unique()
```

[12]:
```
array([ 2,  4,  3,  6,  1,  8,  7,  5, 11,  9, 27, 10, 19, 16, 43, 14, 12,
       13, 18])
```

[13]:
```
df3[df3.bhk>20]
```

[13]:
```
                      location        size total_sqft  bath  price  bhk
1718  2Electronic City Phase II      27 BHK       8000  27.0  230.0   27
4684                 Munnekollal  43 Bedroom       2400  40.0  660.0   43
```

[14]:
```
df3.total_sqft.unique()
```

[14]:
```
array(['1056', '2600', '1440', …, '1133 - 1384', '774', '4689'],
      dtype=object)
```

[15]:
```
def is_float(x):
    try:
        float(x)
    except:
        return False
    return True
```

[16]:
```
df3[~df3["total_sqft"].apply(is_float)].head(10) # ~is not key that is it gives␣
↪all the toatl_sqft that is not in float
```

[16]:
```
               location       size      total_sqft  bath    price  bhk
30            Yelahanka      4 BHK     2100 - 2850   4.0  186.000    4
122              Hebbal      4 BHK     3067 - 8156   4.0  477.000    4
137  8th Phase JP Nagar      2 BHK     1042 - 1105   2.0   54.005    2
165            Sarjapur      2 BHK     1145 - 1340   2.0   43.490    2
188            KR Puram      2 BHK     1015 - 1540   2.0   56.800    2
410             Kengeri      1 BHK  34.46Sq. Meter   1.0   18.500    1
549         Hennur Road      2 BHK     1195 - 1440   2.0   63.770    2
648             Arekere  9 Bedroom       4125Perch   9.0  265.000    9
661            Yelahanka      2 BHK     1120 - 1145   2.0   48.130    2
672        Bettahalsoor  4 Bedroom     3090 - 5002   4.0  445.000    4
```

[17]:
```
def range_to_num(x):
    tokens=x.split('-')
    if len(tokens)==2:
        return ((float(tokens[0])+float(tokens[1]))/2)
    try:
```

```
        return float(x)
    except:
        return None
```

[18]:
```
df4=df3.copy()
df4
```

[18]:

	location	size	total_sqft	bath	price	bhk
0	Electronic City Phase II	2 BHK	1056	2.0	39.07	2
1	Chikka Tirupathi	4 Bedroom	2600	5.0	120.00	4
2	Uttarahalli	3 BHK	1440	2.0	62.00	3
3	Lingadheeranahalli	3 BHK	1521	3.0	95.00	3
4	Kothanur	2 BHK	1200	2.0	51.00	2
…	…	…	…	…	…	…
13315	Whitefield	5 Bedroom	3453	4.0	231.00	5
13316	Richards Town	4 BHK	3600	5.0	400.00	4
13317	Raja Rajeshwari Nagar	2 BHK	1141	2.0	60.00	2
13318	Padmanabhanagar	4 BHK	4689	4.0	488.00	4
13319	Doddathoguru	1 BHK	550	1.0	17.00	1

[13246 rows x 6 columns]

[19]:
```
df4["total_sqft"]=df4["total_sqft"].apply(range_to_num)
```

[20]:
```
df4
```

[20]:

	location	size	total_sqft	bath	price	bhk
0	Electronic City Phase II	2 BHK	1056.0	2.0	39.07	2
1	Chikka Tirupathi	4 Bedroom	2600.0	5.0	120.00	4
2	Uttarahalli	3 BHK	1440.0	2.0	62.00	3
3	Lingadheeranahalli	3 BHK	1521.0	3.0	95.00	3
4	Kothanur	2 BHK	1200.0	2.0	51.00	2
…	…	…	…	…	…	…
13315	Whitefield	5 Bedroom	3453.0	4.0	231.00	5
13316	Richards Town	4 BHK	3600.0	5.0	400.00	4
13317	Raja Rajeshwari Nagar	2 BHK	1141.0	2.0	60.00	2
13318	Padmanabhanagar	4 BHK	4689.0	4.0	488.00	4
13319	Doddathoguru	1 BHK	550.0	1.0	17.00	1

[13246 rows x 6 columns]

[21]:
```
df4.loc[30]
```

[21]:
```
location      Yelahanka
size              4 BHK
total_sqft       2475.0
bath                4.0
```

```
price             186.0
bhk                   4
Name: 30, dtype: object
```

[22]:
```
df4.head()
```

[22]:

	location	size	total_sqft	bath	price	bhk
0	Electronic City Phase II	2 BHK	1056.0	2.0	39.07	2
1	Chikka Tirupathi	4 Bedroom	2600.0	5.0	120.00	4
2	Uttarahalli	3 BHK	1440.0	2.0	62.00	3
3	Lingadheeranahalli	3 BHK	1521.0	3.0	95.00	3
4	Kothanur	2 BHK	1200.0	2.0	51.00	2

[23]:
```
df5=df4.copy()
```

[24]:
```
df5["price_per_sqft"]=df5["price"]*100000/df5["total_sqft"]
df5.head()
```

[24]:

	location	size	total_sqft	bath	price	bhk	\
0	Electronic City Phase II	2 BHK	1056.0	2.0	39.07	2	
1	Chikka Tirupathi	4 Bedroom	2600.0	5.0	120.00	4	
2	Uttarahalli	3 BHK	1440.0	2.0	62.00	3	
3	Lingadheeranahalli	3 BHK	1521.0	3.0	95.00	3	
4	Kothanur	2 BHK	1200.0	2.0	51.00	2	

	price_per_sqft
0	3699.810606
1	4615.384615
2	4305.555556
3	6245.890861
4	4250.000000

[25]:
```
len(df5["location"].unique())
```

[25]:
```
1304
```

[26]:
```
df5.location= df5.location.apply(lambda x: x.strip())
location_stats=df5.groupby('location')["location"].agg('count').
 ↪sort_values(ascending=False)
location_stats
```

[26]:
```
location
Whitefield                535
Sarjapur  Road            392
Electronic City           304
Kanakpura Road            266
Thanisandra               236
                         ...
```

```
adigondanhalli                 1
akshaya nagar t c palya        1
anjananager magdi road         1
arudi                          1
2Electronic City Phase II      1
Name: location, Length: 1293, dtype: int64
```

[27]:
```
len(location_stats[location_stats<=10])
```

[27]:
```
1052
```

[28]:
```
location_stats_less_than_10=location_stats[location_stats<=10]
location_stats_less_than_10
```

[28]:
```
location
Ganga Nagar                   10
Gunjur Palya                  10
BTM 1st Stage                 10
Sadashiva Nagar               10
Kalkere                       10
                              ..
adigondanhalli                 1
akshaya nagar t c palya        1
anjananager magdi road         1
arudi                          1
2Electronic City Phase II      1
Name: location, Length: 1052, dtype: int64
```

[29]:
```
df5.location=df5.location.apply(lambda x: 'other' if x in␣
 ↪location_stats_less_than_10 else x)
len(df5.location.unique())
```

[29]:
```
242
```

[30]:
```
df5.head(30)
```

[30]:

	location	size	total_sqft	bath	price	bhk
0	Electronic City Phase II	2 BHK	1056.0	2.0	39.07	2
1	Chikka Tirupathi	4 Bedroom	2600.0	5.0	120.00	4
2	Uttarahalli	3 BHK	1440.0	2.0	62.00	3
3	Lingadheeranahalli	3 BHK	1521.0	3.0	95.00	3
4	Kothanur	2 BHK	1200.0	2.0	51.00	2
5	Whitefield	2 BHK	1170.0	2.0	38.00	2
6	Old Airport Road	4 BHK	2732.0	4.0	204.00	4
7	Rajaji Nagar	4 BHK	3300.0	4.0	600.00	4
8	Marathahalli	3 BHK	1310.0	3.0	63.25	3
9	other	6 Bedroom	1020.0	6.0	370.00	6
10	Whitefield	3 BHK	1800.0	2.0	70.00	3

11	Whitefield	4 Bedroom	2785.0	5.0	295.00	4
12	7th Phase JP Nagar	2 BHK	1000.0	2.0	38.00	2
13	Gottigere	2 BHK	1100.0	2.0	40.00	2
14	Sarjapur	3 Bedroom	2250.0	3.0	148.00	3
15	Mysore Road	2 BHK	1175.0	2.0	73.50	2
16	Bisuvanahalli	3 BHK	1180.0	3.0	48.00	3
17	Raja Rajeshwari Nagar	3 BHK	1540.0	3.0	60.00	3
18	other	3 BHK	2770.0	4.0	290.00	3
19	other	2 BHK	1100.0	2.0	48.00	2
20	Kengeri	1 BHK	600.0	1.0	15.00	1
21	Binny Pete	3 BHK	1755.0	3.0	122.00	3
22	Thanisandra	4 Bedroom	2800.0	5.0	380.00	4
23	Bellandur	3 BHK	1767.0	3.0	103.00	3
24	Thanisandra	1 RK	510.0	1.0	25.25	1
25	other	3 BHK	1250.0	3.0	56.00	3
26	Electronic City	2 BHK	660.0	1.0	23.10	2
27	Whitefield	3 BHK	1610.0	3.0	81.00	3
28	Ramagondanahalli	2 BHK	1151.0	2.0	48.77	2
29	Electronic City	3 BHK	1025.0	2.0	47.00	3

	price_per_sqft
0	3699.810606
1	4615.384615
2	4305.555556
3	6245.890861
4	4250.000000
5	3247.863248
6	7467.057101
7	18181.818182
8	4828.244275
9	36274.509804
10	3888.888889
11	10592.459605
12	3800.000000
13	3636.363636
14	6577.777778
15	6255.319149
16	4067.796610
17	3896.103896
18	10469.314079
19	4363.636364
20	2500.000000
21	6951.566952
22	13571.428571
23	5829.088851
24	4950.980392
25	4480.000000

```
26     3500.000000
27     5031.055901
28     4237.185056
29     4585.365854
```

[31]:
```
df5.shape
```

[31]:
```
(13246, 7)
```

[32]:
```
df6=df5[~(df5.total_sqft/df5.bhk<300)]
df6.shape
```

[32]:
```
(12502, 7)
```

[33]:
```
df6.price_per_sqft.describe()
```

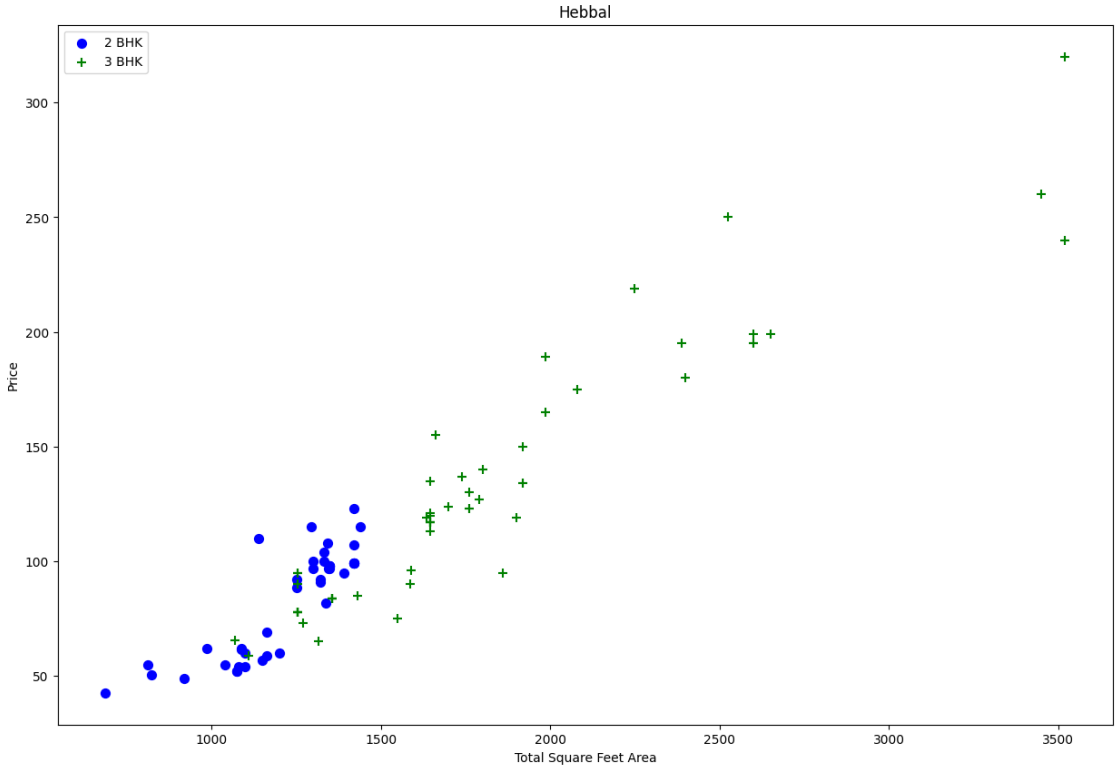
[33]:
```
count     12456.000000
mean       6308.502826
std        4168.127339
min         267.829813
25%        4210.526316
50%        5294.117647
75%        6916.666667
max      176470.588235
Name: price_per_sqft, dtype: float64
```

[34]:
```
def remove_outlier(df):
    df_out=pd.DataFrame()
    for key,subdf in df.groupby('location'):
        m=np.mean(subdf.price_per_sqft)
        st=np.std(subdf.price_per_sqft)
        reduced_df=subdf[(subdf.price_per_sqft>(m-st))&(subdf.
 ↪price_per_sqft<=(m+st))]
        df_out=pd.concat([df_out,reduced_df],ignore_index=True)
    return df_out

df7=remove_outlier(df6)
df7.shape
```

[34]:
```
(10241, 7)
```

[35]:
```
def scatter_chart(df,location):
    bhk2=df[(df.location==location)&(df.bhk==2)]
    bhk3=df[(df.location==location)&(df.bhk==3)]
    matplotlib.rcParams['figure.figsize']=(15,10)
    plt.scatter(bhk2.total_sqft,bhk2.price,color='blue',label='2 BHK',s=50)
    plt.scatter(bhk3.total_sqft,bhk3.price,marker='+',color='green',label='3␣
 ↪BHK',s=50)
```

```
    plt.xlabel("Total Square Feet Area")
    plt.ylabel("Price")
    plt.title(location)
    plt.legend()

scatter_chart(df7,"Hebbal")
```

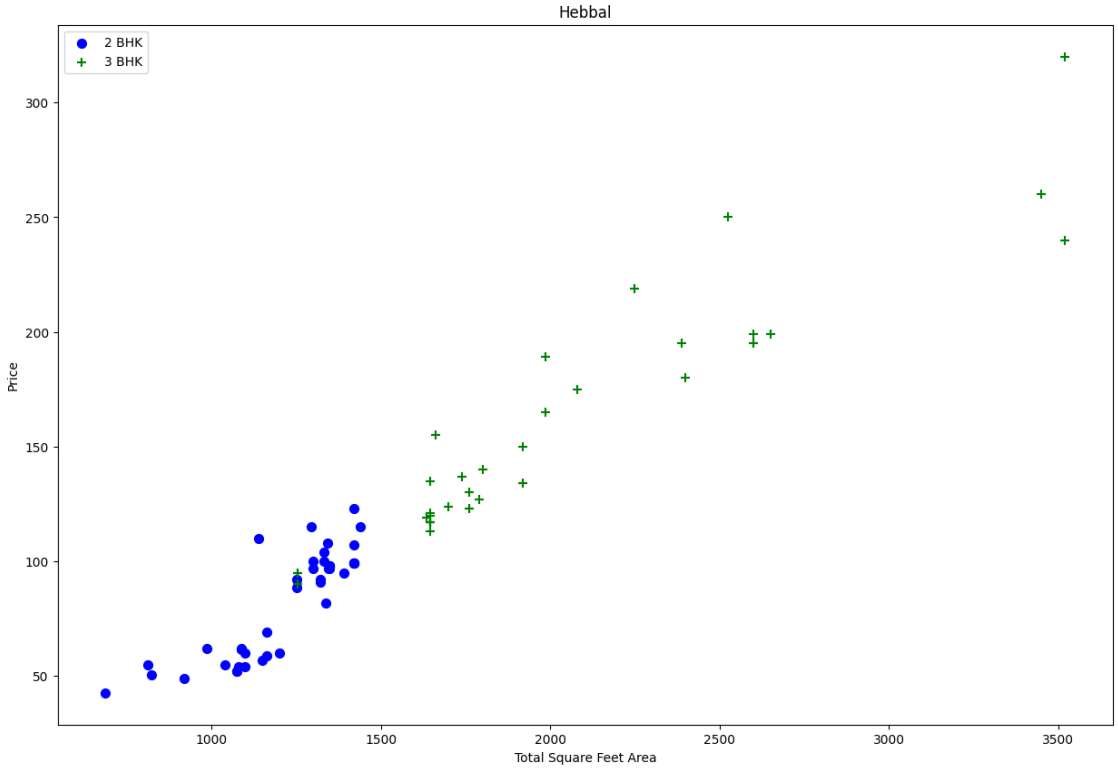


[36]:
```
def remove_bhk_outliers(df):
    exclude_indices=np.array([])
    for location,location_df in df.groupby('location'):
        bhk_stats={}
        for bhk,bhk_df in location_df.groupby('bhk'):
            bhk_stats[bhk]={
                'mean':np.mean(bhk_df.price_per_sqft),
                'std':np.std(bhk_df.price_per_sqft),
                'count':bhk_df.shape[0]
            }
        for bhk,bhk_df in location_df.groupby('bhk'):
            stats=bhk_stats.get(bhk-1)
            if stats and stats['count']>5:
                exclude_indices=np.append(exclude_indices,bhk_df[bhk_df.
 ↪price_per_sqft<(stats['mean'])].index.values)
```

```
    return df.drop(exclude_indices,axis='index')
df8=remove_bhk_outliers(df7)
df8.shape
```

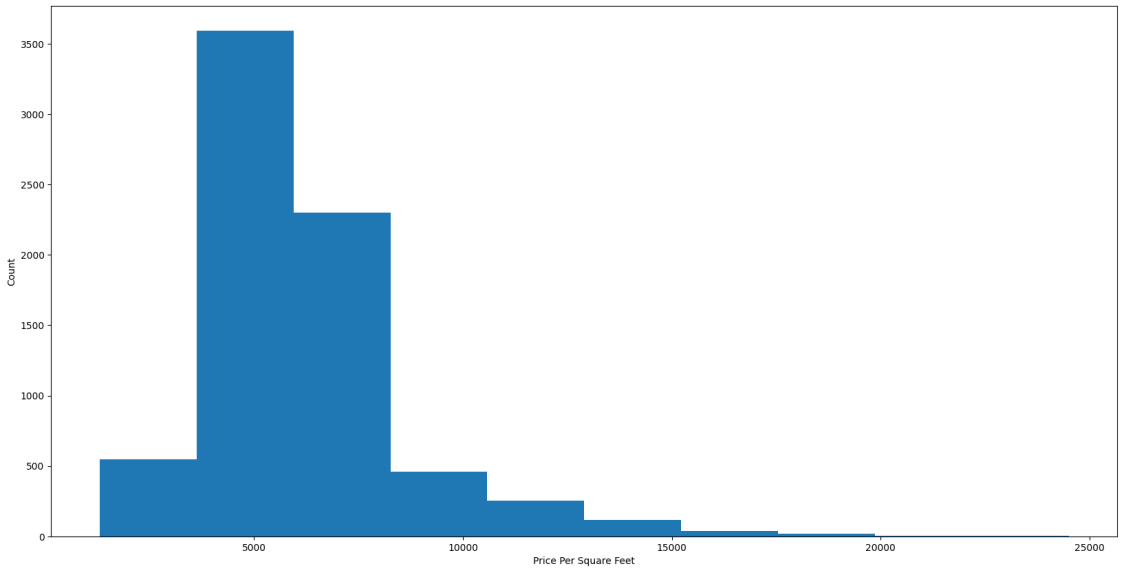
[36]: (7329, 7)

[37]:
```
scatter_chart(df8,"Hebbal")
```



[38]:
```
matplotlib.rcParams['figure.figsize']=(20,10)
plt.hist(df8.price_per_sqft)
plt.xlabel("Price Per Square Feet")
plt.ylabel("Count")
```

[38]: Text(0, 0.5, 'Count')



[39]:
```
df8.bath.unique()
```

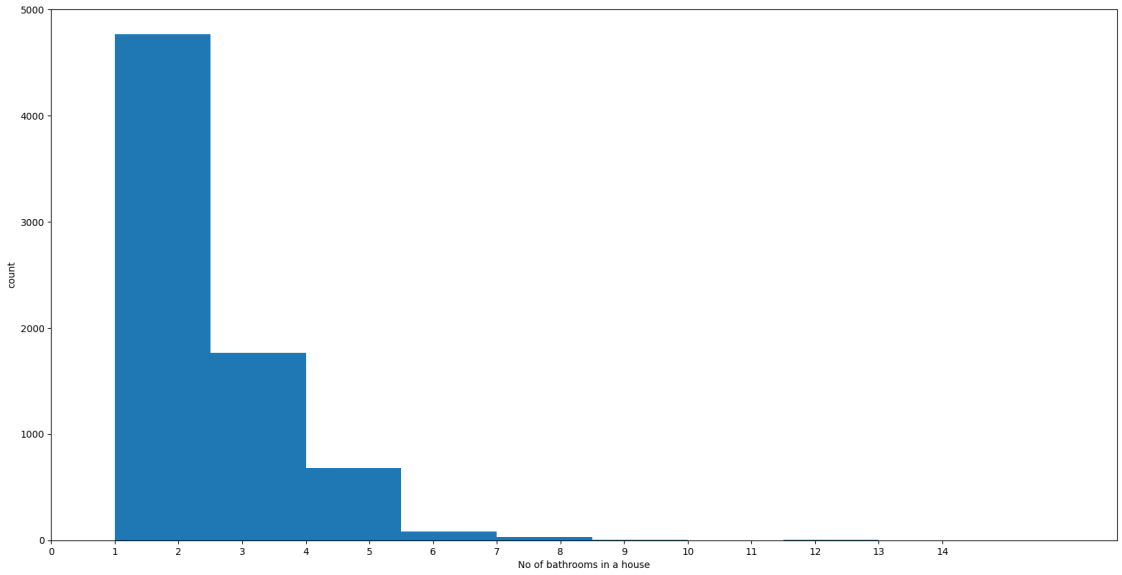
[39]:
```
array([ 4.,  3.,  2.,  5.,  8.,  1.,  6.,  7.,  9., 12., 16., 13.])
```

[40]:
```
df8[df8.bath>10]
```

[40]:

	location	size	total_sqft	bath	price	bhk	price_per_sqft
5277	Neeladri Nagar	10 BHK	4000.0	12.0	160.0	10	4000.000000
8486	other	10 BHK	12000.0	12.0	525.0	10	4375.000000
8575	other	16 BHK	10000.0	16.0	550.0	16	5500.000000
9308	other	11 BHK	6000.0	12.0	150.0	11	2500.000000
9639	other	13 BHK	5425.0	13.0	275.0	13	5069.124424

[41]:
```
plt.hist(df8.bath)
plt.xlabel("No of bathrooms in a house")
plt.ylabel("count")
base=np.arange(0,15)
plt.xticks(base)
plt.show()
```



[42]:
```
df9=df8[df8.bath<df8.bhk+2]
df9
```

[42]:

	location	size	total_sqft	bath	price	bhk	\
0	1st Block Jayanagar	4 BHK	2850.0	4.0	428.0	4	
1	1st Block Jayanagar	3 BHK	1630.0	3.0	194.0	3	
2	1st Block Jayanagar	3 BHK	1875.0	2.0	235.0	3	
3	1st Block Jayanagar	3 BHK	1200.0	2.0	130.0	3	
4	1st Block Jayanagar	2 BHK	1235.0	2.0	148.0	2	
…	…	…	…	…	…	…	
10232	other	2 BHK	1200.0	2.0	70.0	2	
10233	other	1 BHK	1800.0	1.0	200.0	1	
10236	other	2 BHK	1353.0	2.0	110.0	2	
10237	other	1 Bedroom	812.0	1.0	26.0	1	
10240	other	4 BHK	3600.0	5.0	400.0	4	

	price_per_sqft
0	15017.543860
1	11901.840491
2	12533.333333
3	10833.333333
4	11983.805668
…	…
10232	5833.333333
10233	11111.111111
10236	8130.081301
10237	3201.970443
10240	11111.111111

```
[7251 rows x 7 columns]
```

[43]:
```
df10=df9.drop(["size","price_per_sqft"],axis="columns")
df10
```

[43]:

	location	total_sqft	bath	price	bhk
0	1st Block Jayanagar	2850.0	4.0	428.0	4
1	1st Block Jayanagar	1630.0	3.0	194.0	3
2	1st Block Jayanagar	1875.0	2.0	235.0	3
3	1st Block Jayanagar	1200.0	2.0	130.0	3
4	1st Block Jayanagar	1235.0	2.0	148.0	2
…	…	…	…	…	…
10232	other	1200.0	2.0	70.0	2
10233	other	1800.0	1.0	200.0	1
10236	other	1353.0	2.0	110.0	2
10237	other	812.0	1.0	26.0	1
10240	other	3600.0	5.0	400.0	4

```
[7251 rows x 5 columns]
```

[44]:
```
df10[df10["location"]=="other"]
```

[44]:

	location	total_sqft	bath	price	bhk
7940	other	2770.0	4.0	290.0	3
7943	other	600.0	1.0	38.0	1
7946	other	1500.0	2.0	185.0	2
7947	other	840.0	2.0	45.0	2
7948	other	4395.0	3.0	240.0	3
…	…	…	…	…	…
10232	other	1200.0	2.0	70.0	2
10233	other	1800.0	1.0	200.0	1
10236	other	1353.0	2.0	110.0	2
10237	other	812.0	1.0	26.0	1
10240	other	3600.0	5.0	400.0	4

```
[1134 rows x 5 columns]
```

[45]:
```
dummies=pd.get_dummies(df10.location,dtype=int)
```

[46]:
```
df11=pd.concat([df10,dummies.drop('other',axis='columns')],axis="columns")
```

[47]:
```
df11
```

[47]:

	location	total_sqft	bath	price	bhk	1st Block Jayanagar	\
0	1st Block Jayanagar	2850.0	4.0	428.0	4	1	
1	1st Block Jayanagar	1630.0	3.0	194.0	3	1	
2	1st Block Jayanagar	1875.0	2.0	235.0	3	1	

```
3      1st Block Jayanagar      1200.0   2.0  130.0    3                    1
4      1st Block Jayanagar      1235.0   2.0  148.0    2                    1
…                    …          …   …    …  …                  …
10232                other      1200.0   2.0   70.0    2                    0
10233                other      1800.0   1.0  200.0    1                    0
10236                other      1353.0   2.0  110.0    2                    0
10237                other       812.0   1.0   26.0    1                    0
10240                other      3600.0   5.0  400.0    4                    0

       1st Phase JP Nagar  2nd Phase Judicial Layout  2nd Stage Nagarbhavi  \
0                       0                          0                     0
1                       0                          0                     0
2                       0                          0                     0
3                       0                          0                     0
4                       0                          0                     0
…                     …                          …                   …
10232                   0                          0                     0
10233                   0                          0                     0
10236                   0                          0                     0
10237                   0                          0                     0
10240                   0                          0                     0

       5th Block Hbr Layout  …  Vijayanagar  Vishveshwarya Layout  \
0                         0  …            0                     0
1                         0  …            0                     0
2                         0  …            0                     0
3                         0  …            0                     0
4                         0  …            0                     0
…                       …  …          …                   …
10232                     0  …            0                     0
10233                     0  …            0                     0
10236                     0  …            0                     0
10237                     0  …            0                     0
10240                     0  …            0                     0

       Vishwapriya Layout  Vittasandra  Whitefield  Yelachenahalli  Yelahanka  \
0                       0            0           0               0          0
1                       0            0           0               0          0
2                       0            0           0               0          0
3                       0            0           0               0          0
4                       0            0           0               0          0
…                     …          …         …             …        …
10232                   0            0           0               0          0
10233                   0            0           0               0          0
10236                   0            0           0               0          0
10237                   0            0           0               0          0
10240                   0            0           0               0          0
```

```
       Yelahanka New Town  Yelenahalli  Yeshwanthpur
0                       0            0             0
1                       0            0             0
2                       0            0             0
3                       0            0             0
4                       0            0             0
…                     …          …           …
10232                   0            0             0
10233                   0            0             0
10236                   0            0             0
10237                   0            0             0
10240                   0            0             0

[7251 rows x 246 columns]
```

[48]:
```
df12=df11.drop('location',axis="columns")
df12.head()
```

[48]:
```
   total_sqft  bath  price  bhk  1st Block Jayanagar  1st Phase JP Nagar  \
0      2850.0   4.0  428.0    4                    1                   0
1      1630.0   3.0  194.0    3                    1                   0
2      1875.0   2.0  235.0    3                    1                   0
3      1200.0   2.0  130.0    3                    1                   0
4      1235.0   2.0  148.0    2                    1                   0

   2nd Phase Judicial Layout  2nd Stage Nagarbhavi  5th Block Hbr Layout  \
0                          0                     0                     0
1                          0                     0                     0
2                          0                     0                     0
3                          0                     0                     0
4                          0                     0                     0

   5th Phase JP Nagar  …  Vijayanagar  Vishveshwarya Layout  \
0                   0  …            0                     0
1                   0  …            0                     0
2                   0  …            0                     0
3                   0  …            0                     0
4                   0  …            0                     0

   Vishwapriya Layout  Vittasandra  Whitefield  Yelachenahalli  Yelahanka  \
0                   0            0           0               0          0
1                   0            0           0               0          0
2                   0            0           0               0          0
3                   0            0           0               0          0
4                   0            0           0               0          0
```

```
   Yelahanka New Town  Yelenahalli  Yeshwanthpur
0                   0            0             0
1                   0            0             0
2                   0            0             0
3                   0            0             0
4                   0            0             0

[5 rows x 245 columns]
```

[49]:
```
X=df12.drop('price',axis="columns")
y=df12["price"]
```

[50]:
```
X.head()
```

[50]:
```
   total_sqft  bath  bhk  1st Block Jayanagar  1st Phase JP Nagar  \
0      2850.0   4.0    4                    1                   0
1      1630.0   3.0    3                    1                   0
2      1875.0   2.0    3                    1                   0
3      1200.0   2.0    3                    1                   0
4      1235.0   2.0    2                    1                   0

   2nd Phase Judicial Layout  2nd Stage Nagarbhavi  5th Block Hbr Layout  \
0                          0                     0                     0
1                          0                     0                     0
2                          0                     0                     0
3                          0                     0                     0
4                          0                     0                     0

   5th Phase JP Nagar  6th Phase JP Nagar  …  Vijayanagar  \
0                   0                   0  …            0
1                   0                   0  …            0
2                   0                   0  …            0
3                   0                   0  …            0
4                   0                   0  …            0

   Vishveshwarya Layout  Vishwapriya Layout  Vittasandra  Whitefield  \
0                     0                   0            0           0
1                     0                   0            0           0
2                     0                   0            0           0
3                     0                   0            0           0
4                     0                   0            0           0

   Yelachenahalli  Yelahanka  Yelahanka New Town  Yelenahalli  Yeshwanthpur
0               0          0                   0            0             0
1               0          0                   0            0             0
2               0          0                   0            0             0
3               0          0                   0            0             0
```

```
4              0          0                    0            0             0

[5 rows x 244 columns]
```

[51]:
```
y.head()
```

[51]:
```
0    428.0
1    194.0
2    235.0
3    130.0
4    148.0
Name: price, dtype: float64
```

[52]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(X,y,test_size=0.
  ↪2,random_state=10)
```

[53]:
```
from sklearn.linear_model import LinearRegression
lr_clf=LinearRegression()
lr_clf.fit(x_train,y_train)
lr_clf.score(x_test,y_test)
```

[53]:
```
0.8452277697874374
```

[54]:
```
from sklearn.model_selection import ShuffleSplit#it will randomize the samples
from sklearn.model_selection import cross_val_score
cv=ShuffleSplit(n_splits=5,test_size=0.2,random_state=0)
cross_val_score(LinearRegression(),X,y,cv=cv)
```

[54]:
```
array([0.82430186, 0.77166234, 0.85089567, 0.80837764, 0.83653286])
```

[55]:
```
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import Lasso
from sklearn.tree import DecisionTreeRegressor
def best_model(X,y):
    algos={
        'linear_regression':{
            'model':LinearRegression(),
            'params':{
                'fit_intercept':[True,False]
            }
        },
        'lasso':{
            'model':Lasso(),
            'params':{
                'alpha':[1,2],
                'selection':['random','cyclic']
            }
```

```
        },
        'decision_tree':{
            'model':DecisionTreeRegressor(),
            'params':{
                'criterion':['mse','friedman_mse'],
                'splitter':['best','random']
            }
        }
    }
    scores=[]
    cv=ShuffleSplit(n_splits=5,test_size=0.2,random_state=0)
    for algo_name,config in algos.items():
        ␣
↪gs=GridSearchCV(config['model'],config['params'],cv=cv,return_train_score=False)
        gs.fit(X,y)
        scores.append({
            'model':algo_name,
            'best_score':gs.best_score_,
            'best_params':gs.best_params_
        })
    return pd.DataFrame(scores,columns=['model','best_score','best_params'])
```

[56]:
```
best_model(X,y)
```

[56]:
```
                model  best_score  \
0  linear_regression    0.819001
1              lasso    0.687559
2      decision_tree    0.718272

                                          best_params
0                            {'fit_intercept': False}
1                 {'alpha': 1, 'selection': 'random'}
2  {'criterion': 'friedman_mse', 'splitter': 'best'}
```

[57]:
```
X.columns
```

[57]:
```
Index(['total_sqft', 'bath', 'bhk', '1st Block Jayanagar',
       '1st Phase JP Nagar', '2nd Phase Judicial Layout',
       '2nd Stage Nagarbhavi', '5th Block Hbr Layout', '5th Phase JP Nagar',
       '6th Phase JP Nagar',
       …
       'Vijayanagar', 'Vishveshwarya Layout', 'Vishwapriya Layout',
       'Vittasandra', 'Whitefield', 'Yelachenahalli', 'Yelahanka',
       'Yelahanka New Town', 'Yelenahalli', 'Yeshwanthpur'],
      dtype='object', length=244)
```

[58]:
```
def predict_price(location,sqft,bath,bhk):
    loc_index=np.where(X.columns==location)[0][0]
    x=np.zeros(len(X.columns))
    x[0]=sqft
    x[1]=bath
    x[2]=bhk
    if loc_index>=0:
        x[loc_index]=1
    return lr_clf.predict([x])[0]
```

[59]:
```
predict_price('1st Phase JP Nagar',1000,2,2)
```

[59]:
```
np.float64(83.49904677204199)
```

[60]:
```
import pickle
with open("D:\\docs\\bengaluru_home_prices_model.pickle",'wb') as f:
    pickle.dump(lr_clf,f)
```

[61]:
```
import json
columns={
    'data_columns':[col.lower() for col in X.columns]
}
with open("D:\\docs\\columns.json","w") as f:
    f.write(json.dumps(columns))
```