In [1]:

```
#Mounting the google drive
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

Importing Libraries

In [2]:

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

Reading the File

In [3]:

```
fmw = pd.read_csv("/content/drive/My Drive/Estate/melb_data.csv")
fmw.head()
```

Out[3]:

	Suburb	Address	Rooms	Type	Price	Method	SellerG	Date	Distance	Postcode	Bedroom2	Bathroom
0	Abbotsford	85 Turner St	2	h	1480000.0	S	Biggin	3/12/2016	2.5	3067.0	2.0	1.0
1	Abbotsford	25 Bloomburg St	2	h	1035000.0	S	Biggin	4/02/2016	2.5	3067.0	2.0	1.0
2	Abbotsford	5 Charles St	3	h	1465000.0	SP	Biggin	4/03/2017	2.5	3067.0	3.0	2.0
3	Abbotsford	40 Federation La	3	h	850000.0	PI	Biggin	4/03/2017	2.5	3067.0	3.0	2.0
4	Abbotsford	55a Park St	4	h	1600000.0	VB	Nelson	4/06/2016	2.5	3067.0	3.0	1.0

Data Preprocessing

In [4]:

```
fmw.shape
```

Out[4]:

```
(13580, 21)
```

Drop the unrequired data attributes, which were a noise

In [5]:

```
fmw1=fmw.drop(['Method','Landsize','Rooms','Type','Address','SellerG','Date','Distance','
Postcode','YearBuilt','CouncilArea','Lattitude','Longtitude','Propertycount','Regionname'
],axis=1)
fmw1.head()
```

Out[5]:

	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea
0	Abbotsford	1480000.0	2.0	1.0	1.0	NaN
1	Abbotsford	1035000.0	2.0	1.0	0.0	79.0
2	Abbotsford	1465000.0	3.0	2.0	0.0	150.0
3	Abbotsford	850000.0	3.0	2.0	1.0	NaN
4	Abbotsford	1600000.0	3.0	1.0	2.0	142.0

Name of the Various Unique Suburbs Around Melbourne(Total:314)

In [6]:

```
fmw1.Suburb.unique()
```

Out[6]:

```
array(['Abbotsford', 'Airport West', 'Albert Park', 'Alphington',
       'Altona', 'Altona North', 'Armadale', 'Ascot Vale', 'Ashburton',
       'Ashwood', 'Avondale Heights', 'Balaclava', 'Balwyn',
       'Balwyn North', 'Bentleigh', 'Bentleigh East', 'Box Hill',
       'Braybrook', 'Brighton', 'Brighton East', 'Brunswick',
       'Brunswick West', 'Bulleen', 'Burwood', 'Camberwell', 'Canterbury',
       'Carlton North', 'Carnegie', 'Caulfield', 'Caulfield North',
       'Caulfield South', 'Chadstone', 'Clifton Hill', 'Coburg',
       'Coburg North', 'Collingwood', 'Doncaster', 'Eaglemont',
       'Elsternwick', 'Elwood', 'Essendon', 'Essendon North', 'Fairfield',
       'Fitzroy', 'Fitzroy North', 'Flemington', 'Footscray', 'Glen Iris',
       'Glenroy', 'Gowanbrae', 'Hadfield', 'Hampton', 'Hampton East',
       'Hawthorn', 'Heidelberg Heights', 'Heidelberg West', 'Hughesdale',
       'Ivanhoe', 'Kealba', 'Keilor East', 'Kensington', 'Kew',
       'Kew East', 'Kooyong', 'Maidstone', 'Malvern', 'Malvern East',
       'Maribyrnong', 'Melbourne', 'Middle Park', 'Mont Albert',
       'Moonee Ponds', 'Moorabbin', 'Newport', 'Niddrie',
       'North Melbourne', 'Northcote', 'Oak Park', 'Oakleigh South',
       'Parkville', 'Pascoe Vale', 'Port Melbourne', 'Prahran', 'Preston',
       'Reservoir', 'Richmond', 'Rosanna', 'Seddon', 'South Melbourne',
       'South Yarra', 'Southbank', 'Spotswood', 'St Kilda', 'Strathmore',
       'Sunshine', 'Sunshine North', 'Sunshine West', 'Surrey Hills',
       'Templestowe Lower', 'Thornbury', 'Toorak', 'Viewbank', 'Watsonia',
       'West Melbourne', 'Williamstown', 'Williamstown North', 'Windsor',
       'Yallambie', 'Yarraville', 'Aberfeldie', 'Bellfield',
       'Brunswick East', 'Burnley', 'Campbellfield', 'Carlton',
       'East Melbourne', 'Essendon West', 'Fawkner', 'Hawthorn East',
       'Heidelberg', 'Ivanhoe East', 'Jacana', 'Kingsbury', 'Kingsville',
       'Murrumbeena', 'Ormond', 'West Footscray', 'Albion', 'Brooklyn',
       'Glen Huntly', 'Oakleigh', 'Ripponlea', 'Cremorne', 'Docklands',
       'South Kingsville', 'Strathmore Heights', 'Travancore',
       'Caulfield East', 'Seaholme', 'Keilor Park', 'Gardenvale',
       'Princes Hill', 'Bayswater', 'Bayswater North', 'Beaumaris',
       'Berwick', 'Boronia', 'Briar Hill', 'Broadmeadows', 'Bundoora',
       'Burnside Heights', 'Burwood East', 'Cairnlea', 'Caroline Springs',
       'Cheltenham', 'Craigieburn', 'Cranbourne', 'Croydon', 'Dandenong',
       'Dandenong North', 'Diamond Creek', 'Dingley Village',
       'Doncaster East', 'Donvale', 'Doreen', 'Eltham', 'Epping',
       'Forest Hill', 'Frankston', 'Frankston North', 'Frankston South',
       'Gisborne', 'Gladstone Park', 'Greensborough', 'Hallam',
       'Healesville', 'Highett', 'Hillside', 'Huntingdale',
       'Keilor Downs', 'Keilor Lodge', 'Keysborough', 'Kings Park',
       'Lalor', 'Lower Plenty', 'Melton', 'Mernda', 'Mill Park',
       'Mitcham', 'Montmorency', 'Mordialloc', 'Mount Waverley',
       'Narre Warren', 'Nunawading', 'Oakleigh East', 'Parkdale',
       'Point Cook', 'Ringwood East', 'Rockbank', 'Rowville',
       'Sandringham', 'Seaford', 'Skye', 'South Morang', 'Springvale',
       'St Albans', 'Sunbury', 'Tarneit', 'Taylors Hill', 'Taylors Lakes',
       'The Basin', 'Thomastown', 'Truganina', 'Tullamarine', 'Vermont',
       'Wantirna', 'Wantirna South', 'Werribee', 'Westmeadows',
```

```
'Williams Landing', 'Wollert', 'Wyndham Vale', 'Black Rock',
'Blackburn', 'Blackburn North', 'Bonbeach', 'Carrum', 'Chelsea',
'Clayton', 'Doveton', 'Ferntree Gully', 'Glen Waverley',
'Greenvale', 'Heathmont', 'Hoppers Crossing', 'McKinnon',
'Melton South', 'Melton West', 'Mentone', 'Mooroolbark',
'Mulgrave', 'Ringwood', 'Roxburgh Park', 'Seabrook', 'Templestowe',
'Vermont South', 'Warrandyte', 'Watsonia North', 'Wheelers Hill',
'Altona Meadows', 'Blackburn South', 'Carrum Downs',
'Clayton South', 'Croydon North', 'Langwarrin', 'Noble Park',
'Notting Hill', 'Ringwood North', 'Sydenham', 'Albanvale',
'Beaconsfield Upper', 'Chelsea Heights', 'Dallas', 'Deer Park',
'Eltham North', 'Keilor', 'Meadow Heights', 'Mount Evelyn',
'North Warrandyte', 'Pakenham', 'Riddells Creek', 'Sandhurst',
'Scoresby', 'Silvan', 'Aspendale', 'Chirnside Park',
'Croydon Hills', 'Croydon South', 'Derrimut', 'Diggers Rest',
'Edithvale', 'Hampton Park', 'Knoxfield', 'St Helena', 'Upwey',
'Bacchus Marsh', 'Coolaroo', 'Cranbourne North', 'Kilsyth',
'Montrose', 'Aspendale Gardens', 'Bullengarook', 'Clarinda',
'Deepdene', 'Delahey', 'Hurstbridge', 'Kurunjang', 'Wonga Park',
'Endeavour Hills', 'Officer', 'Waterways', 'Ardeer',
'Beaconsfield', 'Springvale South', 'Yarra Glen', 'Brookfield',
'Emerald', 'Whittlesea', 'Burnside', 'Attwood', 'Wallan',
'New Gisborne', 'Plumpton', 'Monbulk'], dtype=object)
```

In [7]:

```
fmw1.groupby('Suburb')['Suburb'].agg('count')
```

Out[7]:

```
Suburb
Abbotsford       56
Aberfeldie       44
Airport West     67
Albanvale         6
Albert Park      69
                ...
Wonga Park        1
Wyndham Vale      4
Yallambie        24
Yarra Glen        1
Yarraville      164
Name: Suburb, Length: 314, dtype: int64
```

Removing The Null Values

In [8]:

```
fmw1.isnull().sum()
```

Out[8]:

```
Suburb            0
Price             0
Bedroom2          0
Bathroom          0
Car              62
BuildingArea    6450
dtype: int64
```

In [9]:

```
fmw2 = fmw1.dropna()
print(fmw2.isnull().sum())
print("New Shape", fmw2.shape)
```

```
Suburb          0
Price           0
Bedroom2        0
Bathroom        0
Car             0
BuildingArea    0
```

```
dtype: int64
New Shape (7101, 6)
```

In [10]:

```
fmw2.head()
```

Out[10]:

	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea
1	**Abbotsford**	**1035000.0**	**2.0**	**1.0**	**0.0**	**79.0**
2	**Abbotsford**	**1465000.0**	**3.0**	**2.0**	**0.0**	**150.0**
4	**Abbotsford**	**1600000.0**	**3.0**	**1.0**	**2.0**	**142.0**
6	**Abbotsford**	**1876000.0**	**4.0**	**2.0**	**0.0**	**210.0**
7	**Abbotsford**	**1636000.0**	**2.0**	**1.0**	**2.0**	**107.0**

Download The New CSV File After The Data Preprocessing

In [ ]:

```
fmw2.to_csv('New_Melb.csv')
from google.colab import files
files.download("New_Melb.csv")
```

Data Cleansing

In [11]:

```
df=fmw2.copy()
df.head()
```

Out[11]:

	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea
1	**Abbotsford**	**1035000.0**	**2.0**	**1.0**	**0.0**	**79.0**
2	**Abbotsford**	**1465000.0**	**3.0**	**2.0**	**0.0**	**150.0**
4	**Abbotsford**	**1600000.0**	**3.0**	**1.0**	**2.0**	**142.0**
6	**Abbotsford**	**1876000.0**	**4.0**	**2.0**	**0.0**	**210.0**
7	**Abbotsford**	**1636000.0**	**2.0**	**1.0**	**2.0**	**107.0**

In [12]:

```
df.Bedroom2.unique()
```

Out[12]:

```
array([2., 3., 4., 1., 6., 5., 9., 0., 7., 8.])
```

In [ ]:

```
df.pivot_table(index=['Bedroom2'], aggfunc='size')
```

Out[ ]:

```
Bedroom2
0.0        5
1.0      356
2.0     1910
3.0     2964
4.0     1494
```

```
5.0     328
6.0      35
7.0       4
8.0       2
9.0       3
dtype: int64
```

Removing The Outliers In The Bedroom

In [ ]:

```
df1=df[(df.Bedroom2 != 0) & (df.Bedroom2 != 8) & (df.Bedroom2 != 9) ]
```

In [ ]:

```
df1.pivot_table(index=['Bedroom2'], aggfunc='size')
```

Out[ ]:

```
Bedroom2
1.0     356
2.0    1910
3.0    2964
4.0    1494
5.0     328
6.0      35
7.0       4
dtype: int64
```

In [ ]:

```
df1.Bedroom2.unique()
```

Out[ ]:

```
array([2., 3., 4., 1., 6., 5., 7.])
```

In [ ]:

```
df1.Bedroom2.describe()
```

Out[ ]:

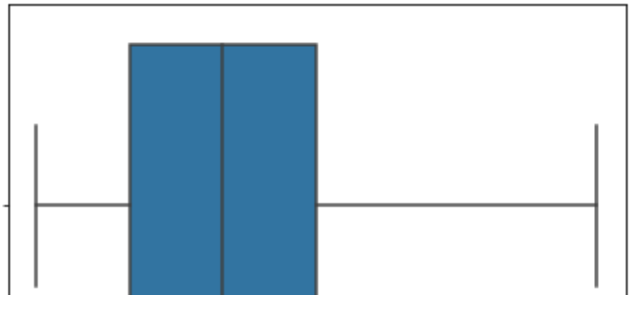
```
count    7091.000000
mean        2.950501
std         0.957608
min         1.000000
25%         2.000000
50%         3.000000
75%         4.000000
max         7.000000
Name: Bedroom2, dtype: float64
```

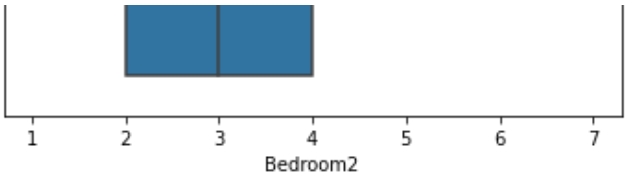
In [ ]:

```
# 0<Room<7
import seaborn as sns
sns.boxplot(x=df1['Bedroom2'])
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f917f4deeb8>
```





Removing The Outliers In The Bathroom

In [ ]:

```
df.Bathroom.unique()
```

Out[ ]:

```
array([1., 2., 3., 4., 7., 5., 6., 8.])
```

In [ ]:

```
df.Bathroom.describe()
```

Out[ ]:

```
count    7101.000000
mean        1.601183
std         0.720969
min         1.000000
25%         1.000000
50%         1.000000
75%         2.000000
max         8.000000
Name: Bathroom, dtype: float64
```

In [ ]:

```
df.pivot_table(index=['Bathroom'], aggfunc='size')
```

Out[ ]:

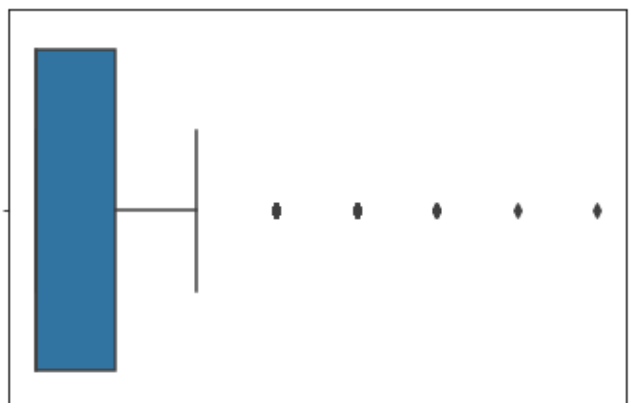
```
Bathroom
1.0    3637
2.0    2797
3.0     566
4.0      74
5.0      20
6.0       5
7.0       1
8.0       1
dtype: int64
```

In [ ]:

```
# 1<BathroomRoom<3
import seaborn as sns
sns.boxplot(x=df['Bathroom'])
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f917d105a20>
```



In [ ]:

```
df1=df[(df.Bathroom != 4) & (df.Bathroom != 5) & (df.Bathroom != 6) & (df.Bathroom != 7)
& (df.Bathroom != 8)    ]
```

In [ ]:

```
df1.pivot_table(index=['Bathroom'], aggfunc='size')
```

Out[ ]:

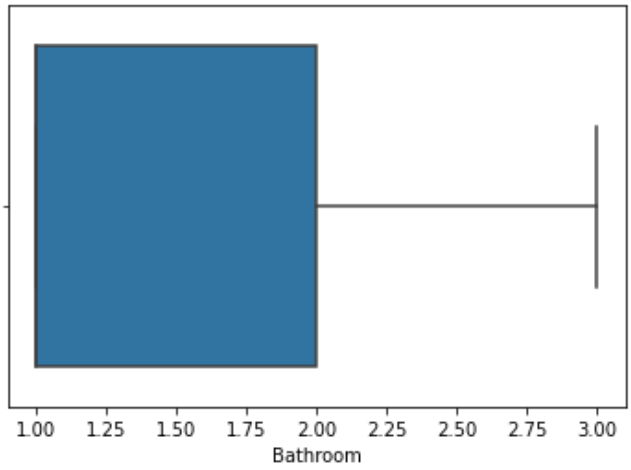
```
Bathroom
1.0    3637
2.0    2797
3.0     566
dtype: int64
```

In [ ]:

```
# 1<BathroomRoom<3
import seaborn as sns
sns.boxplot(x=df1['Bathroom'])
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f917ccb2c88>
```



Removing The Outliers In The Garage Space For The Car

In [ ]:

```
df1.Car.unique()
```

Out[ ]:

```
array([ 0.,  2.,  1.,  6.,  5.,  4.,  3.,  8.,  7.,  9., 10.])
```

In [ ]:

```
df1.Car.describe()
```

Out[ ]:

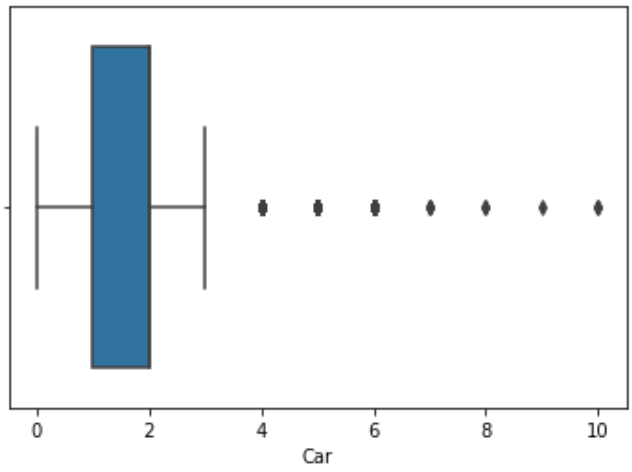
```
count    7000.000000
mean        1.595143
std         0.932394
min         0.000000
25%         1.000000
50%         2.000000
75%         2.000000
max        10.000000
Name: Car, dtype: float64
```

In [ ]:

```
import seaborn as sns
sns.boxplot(x=df1['Car'])
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f917cc217f0>
```



In [ ]:

```
df1=df[(df.Car != 4) & (df.Car != 5) & (df.Car != 6)& (df.Car != 7) & (df.Car != 8) & (
df.Car != 9) & (df.Car != 10)   ]
```

After Data Preprocessing And Cleansing, We are left with 6771 values for the Data ML Model

In [ ]:

```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 6771 entries, 0 to 7100
Data columns (total 7 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Unnamed: 0     6771 non-null   int64  
 1   Suburb         6771 non-null   object 
 2   Price          6771 non-null   float64
 3   Bedroom2       6771 non-null   float64
 4   Bathroom       6771 non-null   float64
 5   Car            6771 non-null   float64
 6   BuildingArea   6771 non-null   float64
dtypes: float64(5), int64(1), object(1)
memory usage: 423.2+ KB
```

Finding The Value Of Price Per Square Metre For All The Locations Mentioned In The Data

In [ ]:

```
df1['price_per_sqm'] = df1['Price']/df1['BuildingArea']
df1.head()
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_g
uide/indexing.html#returning-a-view-versus-a-copy
  """Entry point for launching an IPython kernel.
```

Out[ ]:

Unnamed: 0	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea	price_per_sqm

	Unnamed: 0	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea	price_per_sqm
0	1	Abbotsford	1035000.0	2.0	1.0	0.0	79.0	13101.265823
1	2	Abbotsford	1465000.0	3.0	2.0	0.0	150.0	9766.666667
2	4	Abbotsford	1600000.0	3.0	1.0	2.0	142.0	11267.605634
3	6	Abbotsford	1876000.0	4.0	2.0	0.0	210.0	8933.333333
4	7	Abbotsford	1636000.0	2.0	1.0	2.0	107.0	15289.719626

In [ ]:

```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 6771 entries, 0 to 7100
Data columns (total 8 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Unnamed: 0      6771 non-null   int64  
 1   Suburb          6771 non-null   object 
 2   Price           6771 non-null   float64
 3   Bedroom2        6771 non-null   float64
 4   Bathroom        6771 non-null   float64
 5   Car             6771 non-null   float64
 6   BuildingArea    6771 non-null   float64
 7   price_per_sqm   6771 non-null   float64
dtypes: float64(6), int64(1), object(1)
memory usage: 476.1+ KB
```

In [ ]:

```
len(df1['Suburb'].unique())
```

Out[ ]:

```
297
```

Preparing The Data For Distribution Into Train and Test Datasets

In [ ]:

```
df1.Suburb = df1.Suburb.apply(lambda x: x.strip())

location = df1.groupby("Suburb")['Suburb'].agg('count').sort_values(ascending = False)
location
```

```
/usr/local/lib/python3.6/dist-packages/pandas/core/generic.py:5168: SettingWithCopyWarnin
g:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_g
uide/indexing.html#returning-a-view-versus-a-copy
  self[name] = value
```

Out[ ]:

```
Suburb
Reservoir              161
Richmond               146
Brunswick              130
Bentleigh East         119
Coburg                 109
                      ...
Warrandyte               1
Montrose                 1
Beaconsfield Upper       1
Beaconsfield             1
Seabrook                 1
Name: Suburb, Length: 297, dtype: int64
```

In [ ]:

```
len(location[location<=5])
```

Out[ ]:

```
101
```

In [ ]:

```
other_loc = location[location<=5]
other_loc
```

Out[ ]:

```
Suburb
Westmeadows            5
Wheelers Hill          5
Caroline Springs       5
Burnley                5
Brooklyn               5
                     ..
Warrandyte             1
Montrose               1
Beaconsfield Upper     1
Beaconsfield           1
Seabrook               1
Name: Suburb, Length: 101, dtype: int64
```

In [ ]:

```
df2=df1.copy()
```

In [ ]:

```
df2.Suburb = df2.Suburb.apply(lambda x: 'other 'if x in other_loc else x)
print(len(df2.Suburb.unique()))
df2.head(10)
```

```
197
```

Out[ ]:

	Unnamed: 0	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea	price_per_sqm
0	1	Abbotsford	1035000.0	2.0	1.0	0.0	79.0	13101.265823
1	2	Abbotsford	1465000.0	3.0	2.0	0.0	150.0	9766.666667
2	4	Abbotsford	1600000.0	3.0	1.0	2.0	142.0	11267.605634
3	6	Abbotsford	1876000.0	4.0	2.0	0.0	210.0	8933.333333
4	7	Abbotsford	1636000.0	2.0	1.0	2.0	107.0	15289.719626
5	9	Abbotsford	1097000.0	3.0	1.0	2.0	75.0	14626.666667
6	11	Abbotsford	1350000.0	3.0	2.0	2.0	190.0	7105.263158
7	12	Abbotsford	750000.0	2.0	2.0	1.0	94.0	7978.723404
8	15	Abbotsford	1310000.0	2.0	1.0	2.0	97.0	13505.154639
9	16	Abbotsford	1200000.0	3.0	2.0	1.0	110.0	10909.090909

In [ ]:

```
df2.Suburb = df2.Suburb.apply(lambda x: x.strip())

df2.groupby("Suburb")['Suburb'].agg('count').sort_values(ascending = False)
```

Out[ ]:

```
Suburb
other              265
Reservoir          161
Richmond           146
Brunswick          130
```

```
Bentleigh East    119
                  ...
Taylors Hill        6
Mooroolbark         6
Keilor Downs        6
Kealba              6
Travancore          6
Name: Suburb, Length: 197, dtype: int64
```

In [ ]:

```
df2[(df2.BuildingArea/df2.Bedroom2) > 200].head()
print(df2.shape)
```

```
(6771, 8)
```

Error: The data shows infinite mean.

In [ ]:

```
df2.price_per_sqm.describe()
```

Out[ ]:

```
count    6771.000000
mean             inf
std              NaN
min       188.484759
25%      5721.825397
50%      7456.140351
75%      9458.793769
max              inf
Name: price_per_sqm, dtype: float64
```

In [ ]:

```
df2.isnull().sum()
```

Out[ ]:

```
Unnamed: 0       0
Suburb           0
Price            0
Bedroom2         0
Bathroom         0
Car              0
BuildingArea     0
price_per_sqm    0
dtype: int64
```

Further Removal Of The Outliers

In [ ]:

```
#Cleansing data for mean
def remove_pps_outliers(df):
    df_out = pd.DataFrame()
    for key, subdf in df.groupby('Suburb'):
        m = np.mean(subdf.price_per_sqm)
        st = np.std(subdf.price_per_sqm)
        reduced_df = subdf[(subdf.price_per_sqm>(m-st)) & (subdf.price_per_sqm<=(m+st))]
        df_out = pd.concat([df_out,reduced_df],ignore_index=True)
    return df_out
df3 = remove_pps_outliers(df2)
df3.shape
```

Out[ ]:

```
(4964, 8)
```

In [ ]:

```
df3.to_csv('Melb_Mean.csv')
from google.colab import files
files.download("Melb_Mean.csv")
```

In [ ]:

```
df3.price_per_sqm.describe()
```

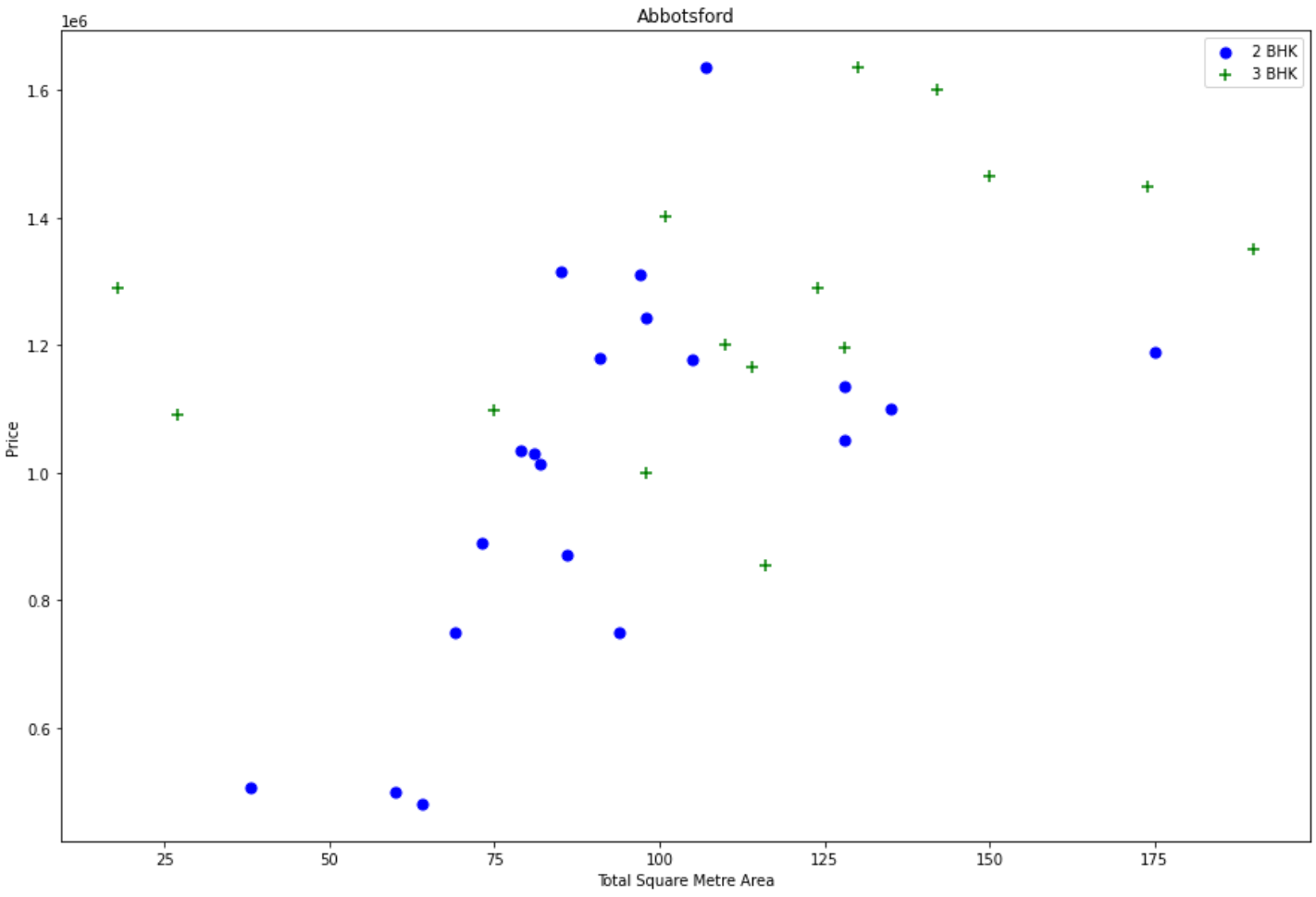
Out[ ]:

```
count     4964.000000
mean      7812.934287
std       3296.514531
min        474.695708
25%       5860.997596
50%       7405.063291
75%       9120.879121
max      76923.076923
Name: price_per_sqm, dtype: float64
```

In [ ]:

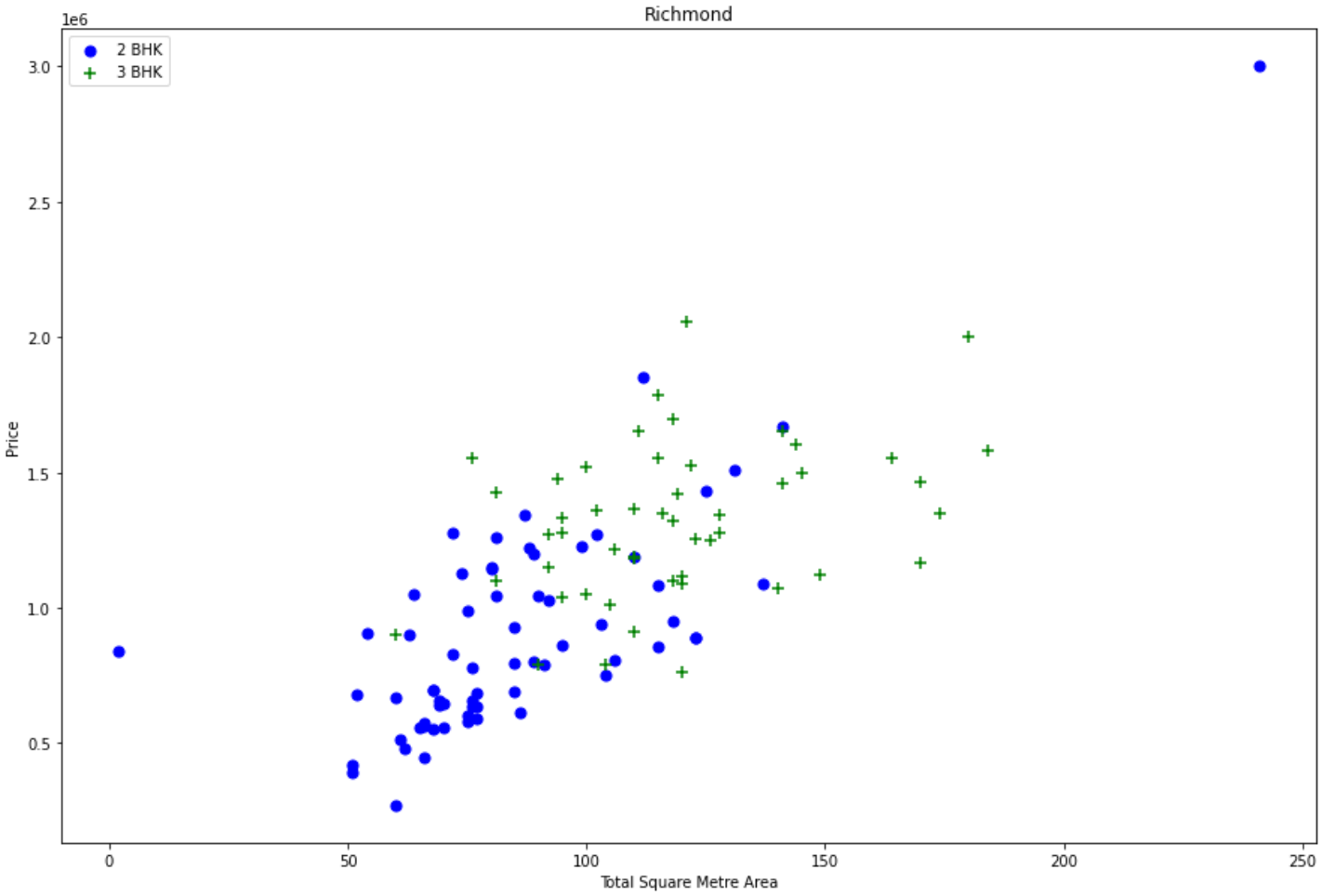
```
def plot_scatter_chart(df,Suburb):
    bhk2 = df2[(df2.Suburb==Suburb) & (df2.Bedroom2==2)]
    bhk3 = df2[(df2.Suburb==Suburb) & (df2.Bedroom2==3)]
    #matplotlib.rcParams['figure.figsize'] = (15,10)
    plt.rcParams['figure.figsize'] = (15,10)
    plt.scatter(bhk2.BuildingArea,bhk2.Price,color='blue',label='2 BHK', s=50)
    plt.scatter(bhk3.BuildingArea,bhk3.Price,marker='+', color='green',label='3 BHK', s=
50)
    plt.xlabel("Total Square Metre Area")
    plt.ylabel("Price")
    plt.title(Suburb)
    plt.legend()

plot_scatter_chart(df2,"Abbotsford")
```



In [ ]:

```
plot_scatter_chart(df2,"Richmond")
```

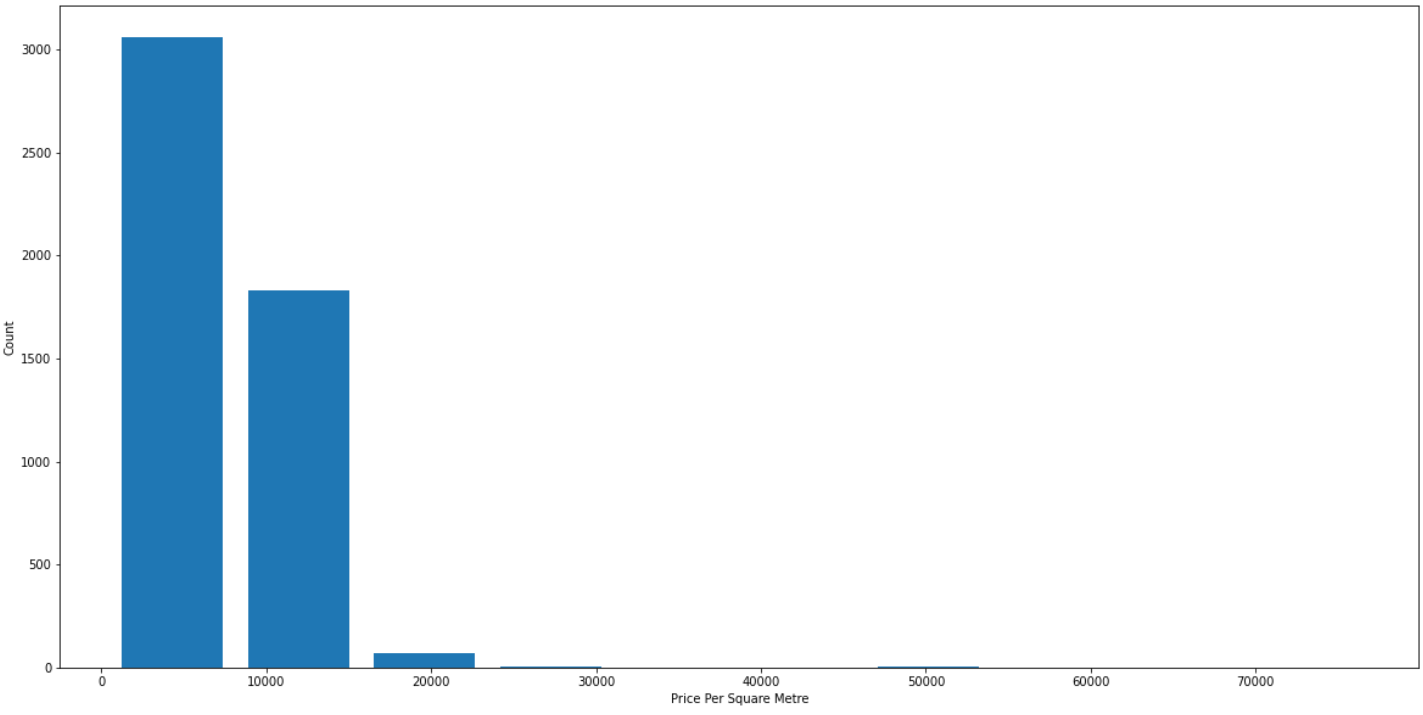


In [ ]:

```
import matplotlib
matplotlib.rcParams["figure.figsize"] = (20,10)
plt.hist(df3.price_per_sqm,rwidth=0.8)
plt.xlabel("Price Per Square Metre")
plt.ylabel("Count")
```

Out[ ]:

```
Text(0, 0.5, 'Count')
```

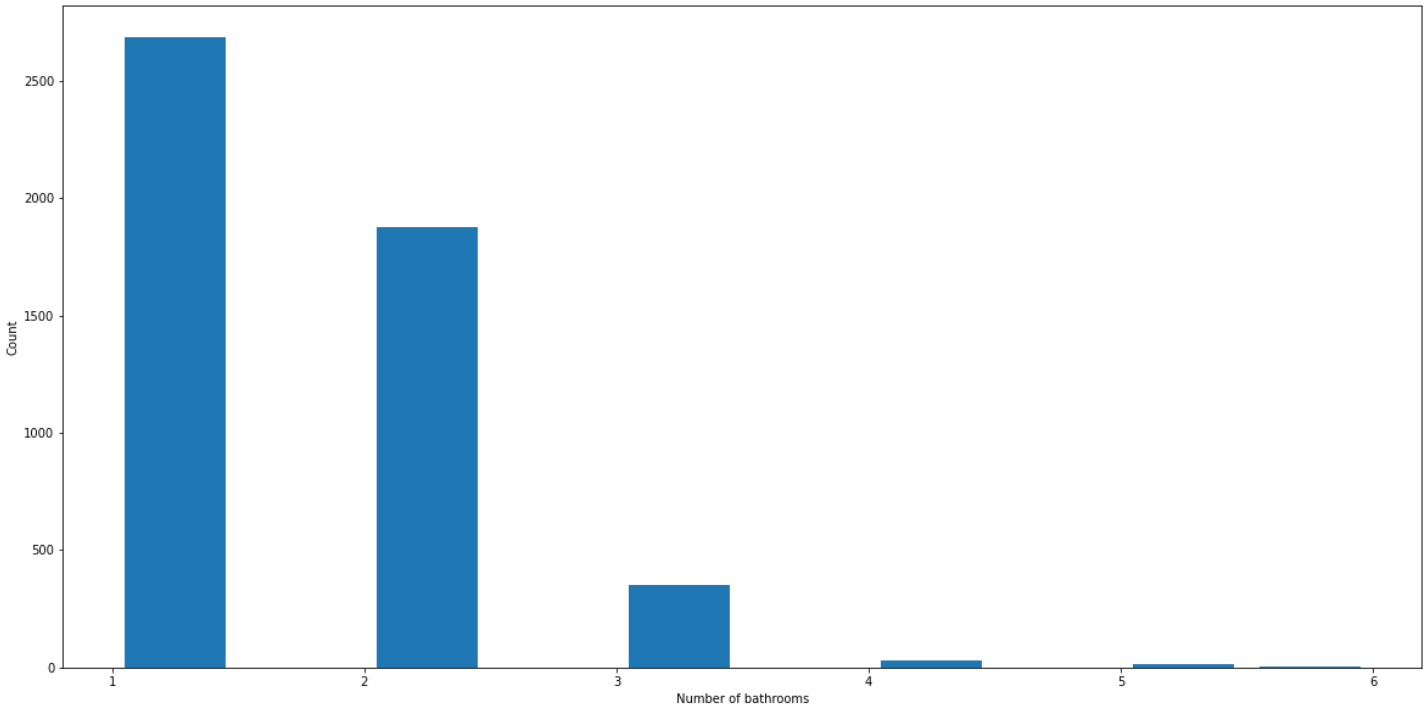


In [ ]:

```
plt.hist(df3.Bathroom,rwidth=0.8)
plt.xlabel("Number of bathrooms")
plt.ylabel("Count")
```

Out[ ]:

```
Text(0, 0.5, 'Count')
```



In [ ]:

```
df3.head()
```

Out[ ]:

	Unnamed: 0	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea	price_per_sqm
0	1	Abbotsford	1035000.0	2.0	1.0	0.0	79.0	13101.265823
1	2	Abbotsford	1465000.0	3.0	2.0	0.0	150.0	9766.666667
2	4	Abbotsford	1600000.0	3.0	1.0	2.0	142.0	11267.605634
3	6	Abbotsford	1876000.0	4.0	2.0	0.0	210.0	8933.333333
4	7	Abbotsford	1636000.0	2.0	1.0	2.0	107.0	15289.719626

In [ ]:

```
df3.to_csv('Melb_Mean.csv')
from google.colab import files
files.download("Melb_Mean.csv")
```

In [ ]:

```
df4 = df3.drop(['price_per_sqm','Unnamed: 0'], axis = 'columns')
df4.head()
```

Out[ ]:

	Suburb	Price	Bedroom2	Bathroom	Car	BuildingArea
0	Abbotsford	1035000.0	2.0	1.0	0.0	79.0
1	Abbotsford	1465000.0	3.0	2.0	0.0	150.0
2	Abbotsford	1600000.0	3.0	1.0	2.0	142.0
3	Abbotsford	1876000.0	4.0	2.0	0.0	210.0
4	Abbotsford	1636000.0	2.0	1.0	2.0	107.0

In [ ]:

```
dummies = pd.get_dummies(df4.Suburb)
dummies
```

Out[ ]:

	Abbotsford	Aberfeldie	Airport West	Albert Park	Albion	Alphington	Altona	Altona North	Armadale	Ascot Vale	Ashburton	Ashwood	Avoi He
0	1	0	0	0	0	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	0	0	0	0	0	0	
2	1	0	0	0	0	0	0	0	0	0	0	0	
3	1	0	0	0	0	0	0	0	0	0	0	0	
4	1	0	0	0	0	0	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
4959	0	0	0	0	0	0	0	0	0	0	0	0	
4960	0	0	0	0	0	0	0	0	0	0	0	0	
4961	0	0	0	0	0	0	0	0	0	0	0	0	
4962	0	0	0	0	0	0	0	0	0	0	0	0	
4963	0	0	0	0	0	0	0	0	0	0	0	0	

4964 rows × 183 columns

In [ ]:

```
dummies.iloc[:, :-1]
```

Out[ ]:

	Abbotsford	Aberfeldie	Airport West	Albert Park	Albion	Alphington	Altona	Altona North	Armadale	Ascot Vale	Ashburton	Ashwood	Avoi He
0	1	0	0	0	0	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	0	0	0	0	0	0	
2	1	0	0	0	0	0	0	0	0	0	0	0	
3	1	0	0	0	0	0	0	0	0	0	0	0	
4	1	0	0	0	0	0	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
4959	0	0	0	0	0	0	0	0	0	0	0	0	
4960	0	0	0	0	0	0	0	0	0	0	0	0	
4961	0	0	0	0	0	0	0	0	0	0	0	0	
4962	0	0	0	0	0	0	0	0	0	0	0	0	
4963	0	0	0	0	0	0	0	0	0	0	0	0	

4964 rows × 182 columns

In [ ]:

```
df5 = pd.concat([df4.drop('Suburb', axis = 'columns' ),dummies.iloc[:, :-1]] ,axis='colu
mns')
df5.head()
```

Out[ ]:

	Price	Bedroom2	Bathroom	Car	BuildingArea	Abbotsford	Aberfeldie	Airport	Albert	Albion	Alphington	Altona	Alt

	Price	Bedroom2	Bathroom	Car	BuildingArea	Abbotsford	Aberfeldie	Airport West	Albert Park	Albion	Alphington	Altona	N Al
0	1035000.0	2.0	1.0	0.0	79.0	1	0	0	0	0	0	0	
1	1465000.0	3.0	2.0	0.0	150.0	1	0	0	0	0	0	0	
2	1600000.0	3.0	1.0	2.0	142.0	1	0	0	0	0	0	0	
3	1876000.0	4.0	2.0	0.0	210.0	1	0	0	0	0	0	0	
4	1636000.0	2.0	1.0	2.0	107.0	1	0	0	0	0	0	0	

5 rows × 187 columns

In [ ]:

```
df5.shape
```

Out[ ]:

```
(4964, 187)
```

In [ ]:

```
x = df5.drop('Price', axis ='columns')
x
```

Out[ ]:

	Bedroom2	Bathroom	Car	BuildingArea	Abbotsford	Aberfeldie	Airport West	Albert Park	Albion	Alphington	Altona	Altona North	Ar
0	2.0	1.0	0.0	79.0	1	0	0	0	0	0	0	0	
1	3.0	2.0	0.0	150.0	1	0	0	0	0	0	0	0	
2	3.0	1.0	2.0	142.0	1	0	0	0	0	0	0	0	
3	4.0	2.0	0.0	210.0	1	0	0	0	0	0	0	0	
4	2.0	1.0	2.0	107.0	1	0	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
4959	3.0	1.0	0.0	137.0	0	0	0	0	0	0	0	0	
4960	3.0	1.0	2.0	89.0	0	0	0	0	0	0	0	0	
4961	3.0	1.0	1.0	128.0	0	0	0	0	0	0	0	0	
4962	3.0	2.0	2.0	125.0	0	0	0	0	0	0	0	0	
4963	4.0	1.0	1.0	112.0	0	0	0	0	0	0	0	0	

4964 rows × 186 columns

In [ ]:

```
y = df5.Price
y
```

Out[ ]:

```
0       1035000.0
1       1465000.0
2       1600000.0
3       1876000.0
4       1636000.0
          ...
4959    1100000.0
4960    1190000.0
4961    1360000.0
4962    1455000.0
4963    1285000.0
Name: Price, Length: 4964, dtype: float64
```

In [ ]:

```
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)
```

In [ ]:

```
from sklearn.linear_model import LinearRegression
lr = LinearRegression()
lr.fit(x_train,y_train)
lr.score(x_test,y_test)
```

Out[ ]:

```
0.694309592305612
```

In [ ]:

```
from sklearn.model_selection import ShuffleSplit
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)
```

Out[ ]:

```
array([0.69992748, 0.73190668, 0.71186212, 0.69650334, 0.68640585])
```

In [ ]:

```
from sklearn.ensemble import RandomForestRegressor
rf = RandomForestRegressor(n_estimators = 10, random_state = 10)
rf.fit(x, y)
rf.score(x_test, y_test)
```

Out[ ]:

```
0.954012581435162
```

In [ ]:

```
from sklearn.model_selection import ShuffleSplit
from sklearn.model_selection import cross_val_score

cv = ShuffleSplit(n_splits=5, test_size=0.2, random_state=10)

cross_val_score(RandomForestRegressor(), x, y, cv=cv)
```

Out[ ]:

```
array([0.73059661, 0.68718683, 0.70615935, 0.60092042, 0.73916941])
```

In [ ]:

```
"""from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import Lasso
from sklearn.ensemble import RandomForestRegressor
from sklearn.tree import DecisionTreeRegressor

def find_best_model_using_gridsearchcv(X,y):
    algos = {
        'linear_regression' : {
            'model': LinearRegression(),
            'params': {
                'normalize': [True, False]
            }
        },
        'lasso': {
            'model': Lasso(),
            'params': {
                'alpha': [1,2],
```

```
                'selection': ['random', 'cyclic']
            }
        },
        'decision_tree': {
            'model': DecisionTreeRegressor(),
            'params': {
                'criterion' : ['mse','friedman_mse', 'mae'],
                'splitter': ['best','random']
            }
        },
        'radnom_forest' : {
            'model': RandomForestRegressor(),
            'params': {
            'criterion' : ['mse', 'mae'],
            'n_estimators' : [10, 100, 50],
           }
        },
    }
    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=F
alse)
        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'])

find_best_model_using_gridsearchcv(x,y)"""
```

Out[ ]:

```
"from sklearn.model_selection import GridSearchCV\nfrom sklearn.linear_model import Lasso
\nfrom sklearn.ensemble import RandomForestRegressor\nfrom sklearn.tree import DecisionTr
eeRegressor\n\ndef find_best_model_using_gridsearchcv(X,y):\n    algos = {\n        'line
ar_regression' : {\n            'model': LinearRegression(),\n            'params': {\n
'normalize': [True, False]\n            }\n        },\n        'lasso': {\n            '
model': Lasso(),\n            'params': {\n                'alpha': [1,2],\n
'selection': ['random', 'cyclic']\n            }\n        },\n        'decision_tree': {
\n            'model': DecisionTreeRegressor(),\n            'params': {\n
'criterion' : ['mse','friedman_mse', 'mae'],\n                'splitter': ['best','random
']\n            }\n        },\n        'radnom_forest' : {\n            'model': RandomF
orestRegressor(),\n            'params': {\n            'criterion' : ['mse', 'mae'],\n
'n_estimators' : [10, 100, 50],\n           }\n        },\n    }\n    scores = []\n    c
v = ShuffleSplit(n_splits=5, test_size=0.2, random_state=0)\n    for algo_name, config in
algos.items():\n        gs =  GridSearchCV(config['model'], config['params'], cv=cv, retu
rn_train_score=False)\n        gs.fit(X,y)\n        scores.append({\n            'model':
algo_name,\n            'best_score': gs.best_score_,\n            'best_params': gs.best
_params_\n        })\n\n    return pd.DataFrame(scores,columns=['model','best_score','bes
t_params'])\n\nfind_best_model_using_gridsearchcv(x,y)"
```

In [ ]:

```
def predict_price(Suburb,Bedroom2,Bathroom,Car,BuildingArea):
    loc_index = np.where(x.columns==Suburb)[0][0]

    z = np.zeros(len(x.columns))
    z[0] = Bedroom2
    z[1] = Bathroom
    z[2] = Car
    z[3] = BuildingArea
    if loc_index >= 0:
        z[loc_index] = 1

    return lr.predict([z])[0]
```

In [ ]:

```
predict_price('Abbotsford',2, 1,0,79)
```

Out[ ]:

```
852190.8567475517
```

In [ ]:

```
df2.Car.unique()
```

Out[ ]:

```
array([0., 2., 1., 3.])
```

In [ ]:

```
import pickle
with open('HousingPrice.pickle','wb') as f:
    pickle.dump(lr,f)
```

In [ ]:

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