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1. Import the packages requiredimport

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

2. Load the dataset into the tool.

```
df=pd.read_csv('Housing.csv')
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 545 entries, 0 to 544
Data columns (total 12 columns):
 #   Column            Non-Null Count  Dtype ---
------            ---------------  -----
0   price             545 non-null    int64
1   area              545 non-null    int64
2   bedrooms          545 non-null    int64
3   bathrooms         545 non-null    int64  4   stories           545
    non-null    int64  5   mainroad          545 non-null    object
6   guestroom         545 non-null    object
7   basement          545 non-null    object 8
    hotwaterheating   545 non-null    object
 9   airconditioning   545 non-null    object
10  parking           545 non-null    int64
11  furnishingstatus  545 non-null    object
dtypes: int64(6), object(6) memory usage:
51.2+ KB df.head()
```

```
      price   area  bedrooms  bathrooms  stories mainroad guestroom
basement  \
0     13300000  7420         4          2        3      yes         no
no
1     12250000  8960         4          4        4      yes         no
no
2     12250000  9960         3          2        2      yes         no
yes
3     12215000  7500         4          2        2      yes         no
yes
```

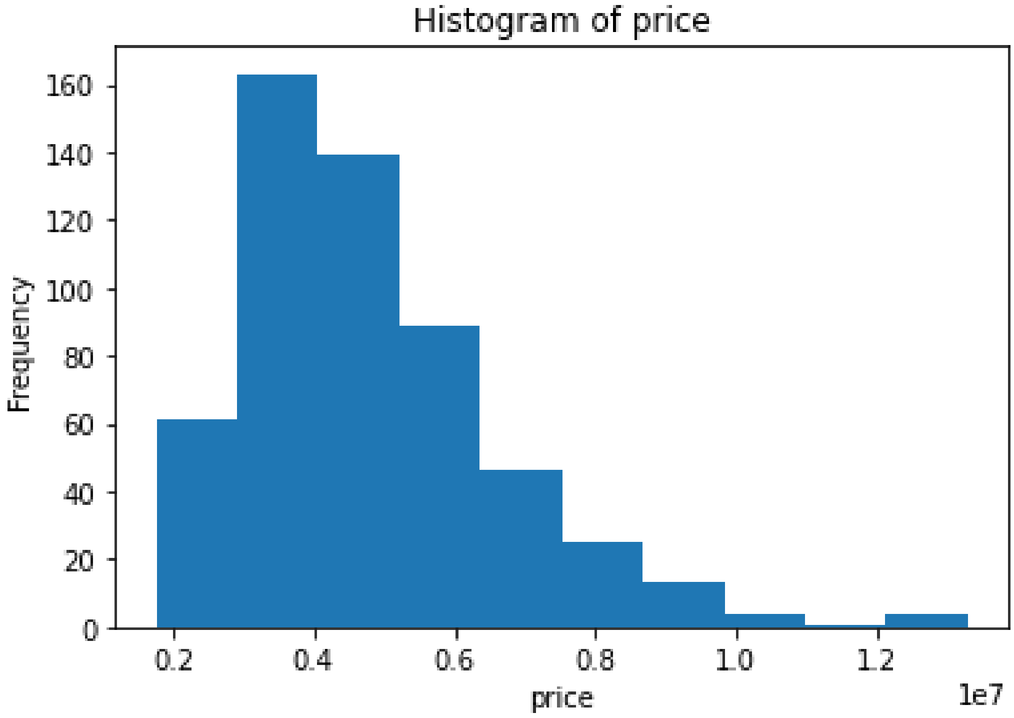
```
4     11410000   7420          4           1         2       yes        yes
yes

  hotwaterheating airconditioning  parking furnishingstatus  0
no               yes         2         furnished
1                no              yes         3         furnished
2                no               no         2    semi-furnished
3                no              yes         3         furnished
4                no              yes         2         furnished
```

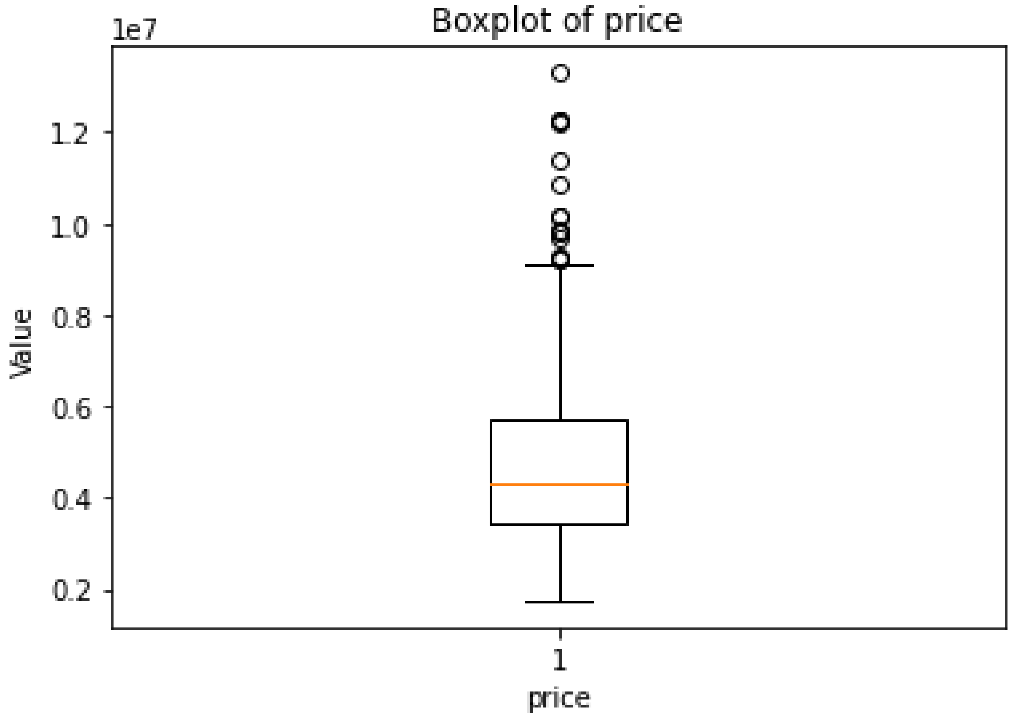
3. Perform Below Visualizations.

Univariate Analysis

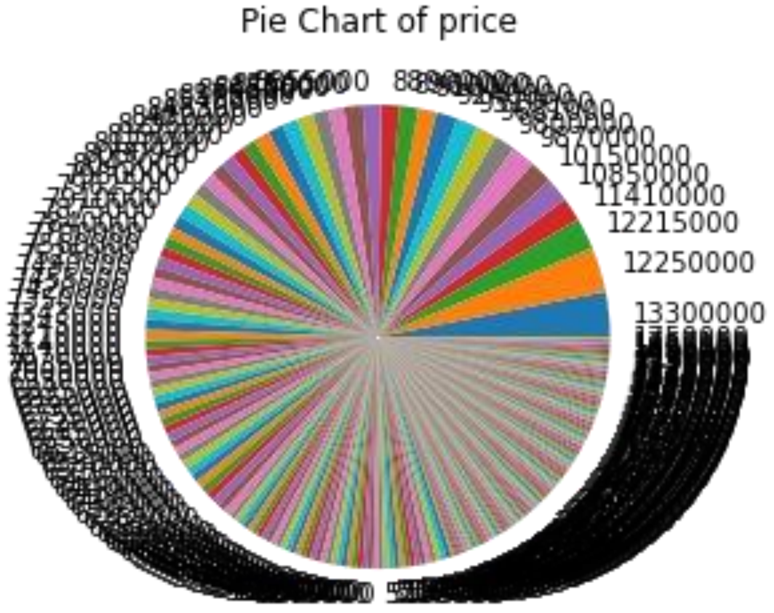
```
# Histogram
plt.hist(df['price'], bins=10)
plt.title('Histogram of price')
plt.xlabel('price')
plt.ylabel('Frequency')
plt.show()
```



```
# Boxplot
plt.boxplot(df['price'])
plt.title('Boxplot of price')
plt.xlabel('price')
plt.ylabel('Value')
plt.show()
```

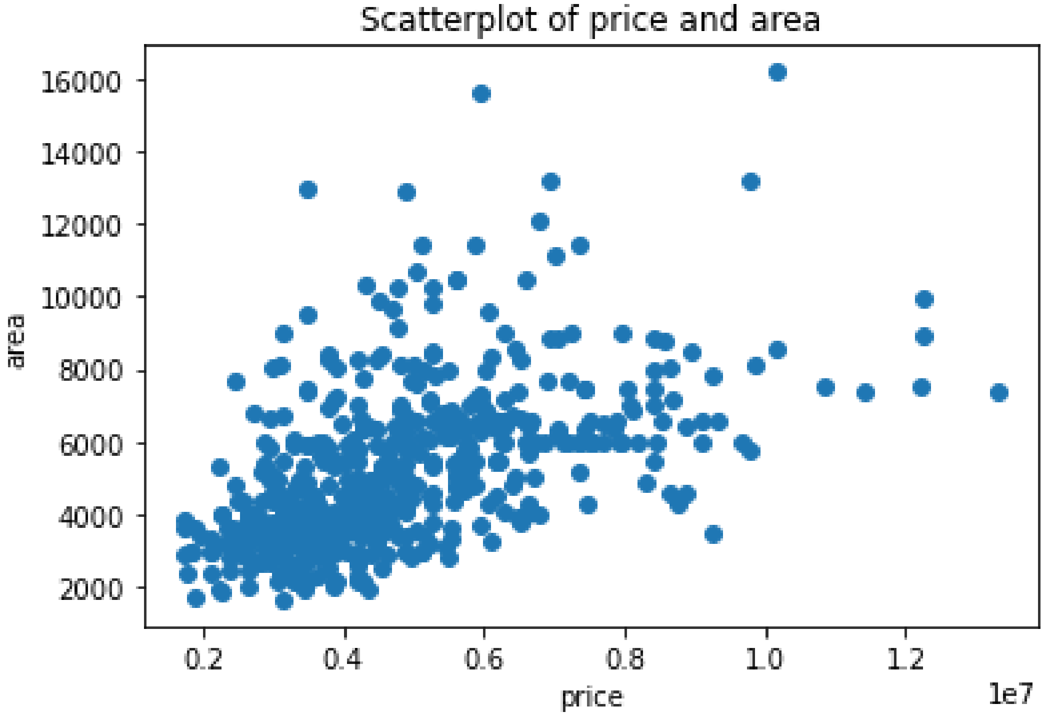


```
#Pie Chart
plt.pie(df['price'].value_counts(), labels=df['price'].unique())
plt.title('Pie Chart of price') plt.show()
```

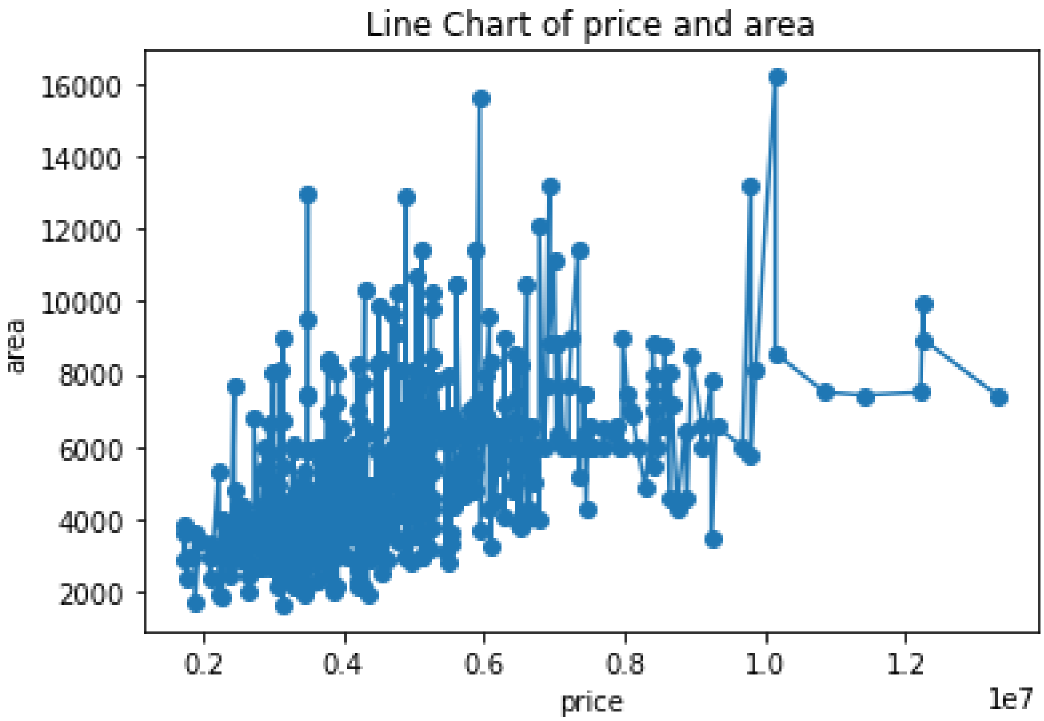


Bivariate analysis

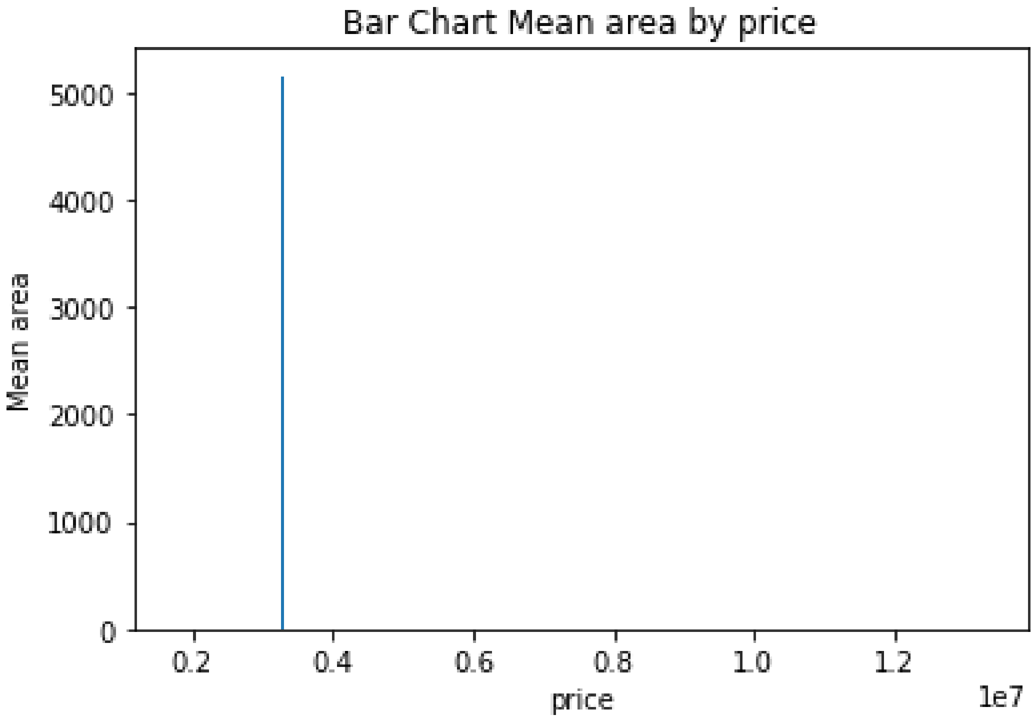
```
# Bivariate analysis # Scatterplot
plt.scatter(df['price'], df['area'])
plt.title('Scatterplot of price and area')
plt.xlabel('price') plt.ylabel('area')
plt.show()
```



```
# Line chart
plt.plot(df['price'], df['area'], 'o-')
plt.title('Line Chart of price and area')
plt.xlabel('price') plt.ylabel('area')
plt.show()
```

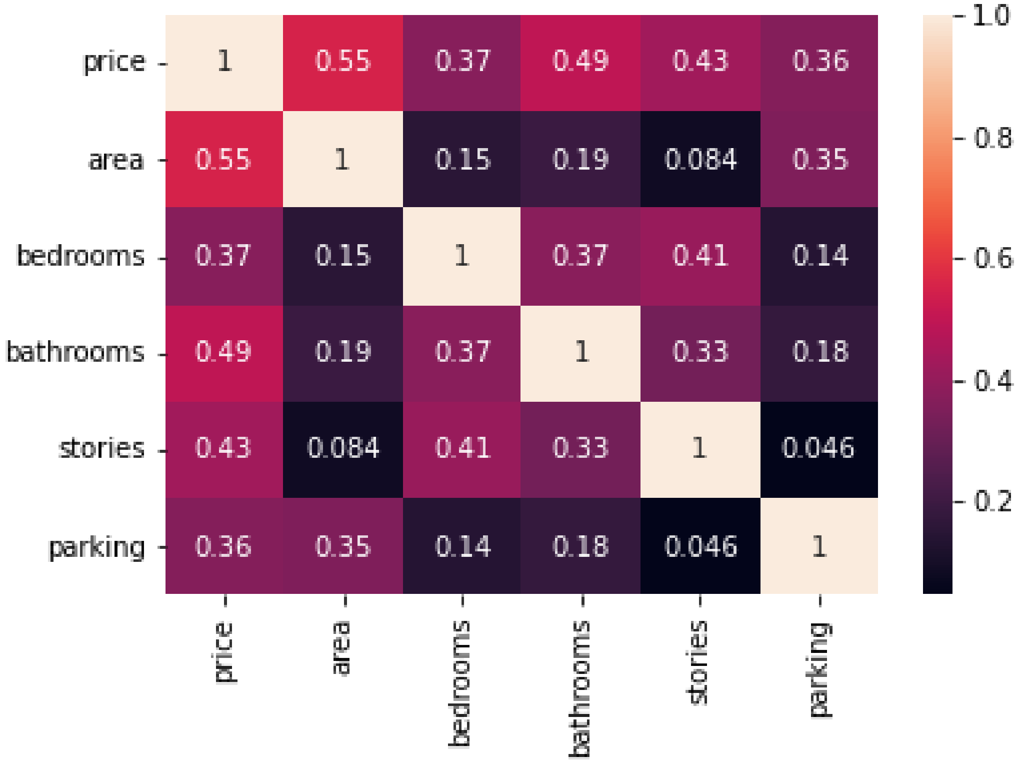


```
# Bar chart
plt.bar(df['price'].unique(), df['area'].mean(), align='center')
plt.title('Bar Chart Mean area by price') plt.xlabel('price')
plt.ylabel('Mean area') plt.show()
```

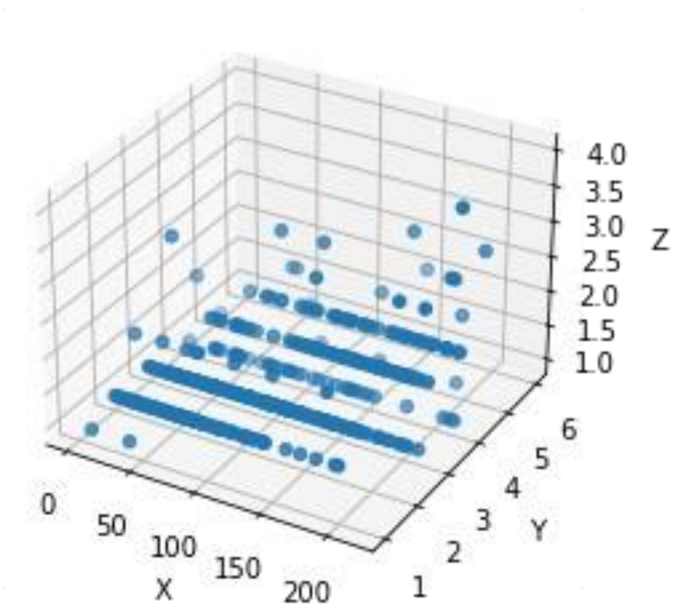


Multivariate analysis

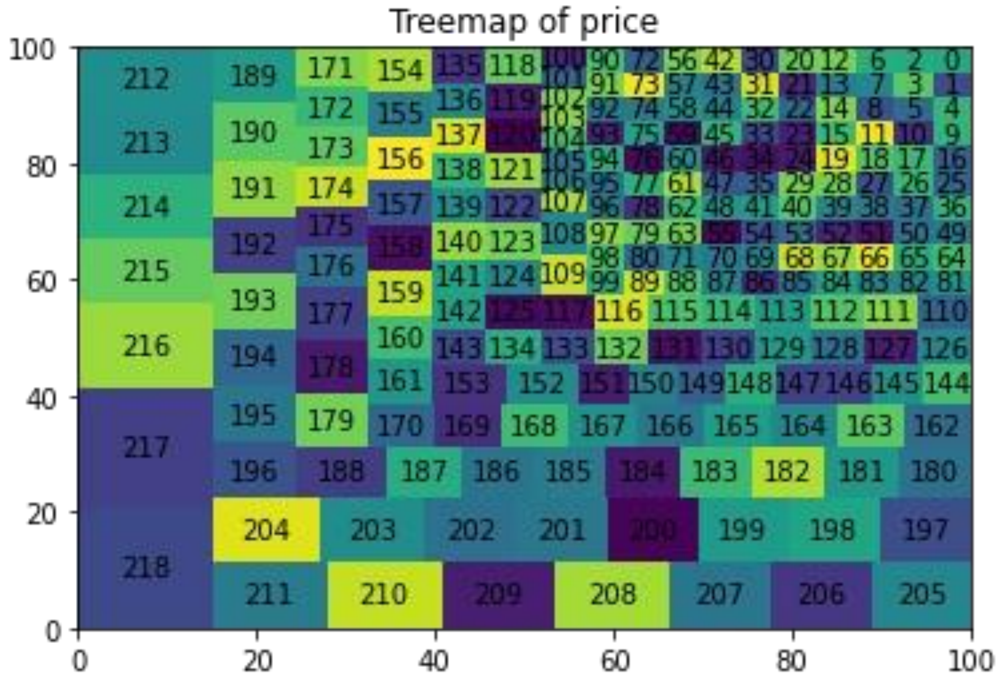
```
# Multivariate analysis
# Heatmap
df['price'] = df['price'].astype('category').cat.codes
sns.heatmap(df.corr(), annot=True) plt.show()
```



```
from mpl_toolkits.mplot3d import Axes3D
x = df['price'] y = df['bedrooms'] z =
df['bathrooms'] fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.scatter(x, y, z) ax.set_xlabel('X')
ax.set_ylabel('Y') ax.set_zlabel('Z')
plt.show()
```



```
import squarify
plt.figure()
squarify.plot(df['price'].value_counts(), label=df['price'].unique())
plt.title('Treemap of price')
plt.show()
```



4. Perform descriptive statistics on the dataset.

```
#4. Perform descriptive statistics on the dataset.
df.describe()
```

```
            price          area    bedrooms   bathrooms     stories  \
count  545.000000    545.000000  545.000000  545.000000  545.000000
mean    95.728440   5150.541284    2.965138    1.286239    1.805505
std     56.256108   2170.141023    0.738064    0.502470    0.867492
min      0.000000   1650.000000    1.000000    1.000000    1.000000
25%     51.000000  3600.000000    2.000000    1.000000    1.000000
50%     87.000000  4600.000000    3.000000    1.000000    2.000000
75%    137.000000  6360.000000    3.000000    2.000000    2.000000
max    218.000000  16200.000000    6.000000    4.000000    4.000000

         parking
count  545.000000
mean     0.693578  std
0.861586  min
0.000000  25%
0.000000
50%      0.000000  75%
1.000000  max
3.000000  df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 545 entries, 0 to 544
Data columns (total 12 columns):
 #   Column            Non-Null Count  Dtype ---
------              ---------------  -----
0   price              545 non-null    int16
1   area               545 non-null    int64
2   bedrooms           545 non-null    int64
3   bathrooms          545 non-null    int64  4   stories          545
    non-null    int64  5   mainroad         545 non-null    object
6   guestroom          545 non-null    object
7   basement           545 non-null    object 8
    hotwaterheating    545 non-null    object
 9   airconditioning   545 non-null    object
10  parking            545 non-null    int64
11  furnishingstatus   545 non-null    object
dtypes: int16(1), int64(5), object(6) memory
usage: 48.0+ KB
```

5. Check for Missing values and deal with them

```
df.isnull().sum()
price               0
area                0
bedrooms            0
bathrooms           0
stories             0
mainroad            0
```

```
guestroom           0
basement            0
hotwaterheating     0
airconditioning     0
parking             0
furnishingstatus    0
dtype: int64
```

6. Find the outliers and replace the outliers

```
target_column = 'price'
Q1 = df[target_column].quantile(0.25)
Q3 = df[target_column].quantile(0.75)
IQR = Q3 - Q1
```

```
IQR
```

```
86.0
```

```
lower_bound = Q1 - 1.5 * IQR
```

```
upper_bound = Q3 + 1.5 * IQR
```

```
lower_bound -78.0
```

```
upper_bound 266.0
```

```
outliers = df[(df[target_column] < lower_bound) | (df[target_column] >
upper_bound)]
```

```
median_value = df[target_column].median()
df.loc[(df[target_column] < lower_bound) | (df[target_column] >
```

```
upper_bound), target_column] = median_value median_value 87.0
```

```
df
```

```
     price  area  bedrooms  bathrooms  stories mainroad guestroom
basement  \
0     218  7420         4          2        3      yes        no
no
1     217  8960         4          4        4      yes        no
no
2     217  9960         3          2        2      yes        no
yes
3     216  7500         4          2        2      yes        no
yes
4     215  7420         4          1        2      yes       yes
yes
..      ...   ...       ...        ...      ...      ...       ...
...
540   2  3000          2          1        1      yes         no      yes
```

```
541   1  2400         3          1        1       no        no     no
542   0  3620         2          1        1      yes        no     no
543   0  2910         3          1        1       no        no     no
544   0  3850         3          1        2      yes        no     no

    hotwaterheating airconditioning  parking furnishingstatus  0
no             yes        2        furnished
1                no             yes        3        furnished
2                no              no        2   semi-furnished
3                no             yes        3        furnished
4                no             yes        2        furnished  ..
                 ...             ...      ...              ...
540              no              no        2      unfurnished
541              no              no        0   semi-furnished
542              no              no        0      unfurnished
543              no              no        0        furnished
544              no              no        0      unfurnished

[545 rows x 12 columns]
```

```
print(df)
```

```
     price  area  bedrooms  bathrooms  stories mainroad guestroom
basement  \
0     218  7420          4          2         3      yes        no
no
1     217  8960          4          4         4      yes        no
no
2     217  9960          3          2         2      yes        no
yes
3     216  7500          4          2         2      yes        no
yes
4     215  7420          4          1         2      yes       yes
yes
..      ...   ...        ...        ...       ...      ...       ...
...
540   2  3000         2          1        1      yes        no     yes
541   1  2400         3          1        1       no        no     no
542   0  3620         2          1        1      yes        no     no
543   0  2910         3          1        1       no        no     no
544   0  3850         3          1        2      yes        no     no

    hotwaterheating airconditioning  parking furnishingstatus  0
no             yes        2        furnished
1                no             yes        3        furnished
2                no              no        2   semi-furnished
3                no             yes        3        furnished
4                no             yes        2        furnished  ..
                 ...             ...      ...              ...
```

```
540              no              no         2      unfurnished
541              no              no         0   semi-furnished
542              no              no         0      unfurnished
543              no              no         0        furnished
544              no              no         0      unfurnished

[545 rows x 12 columns]
```

7. Check for Categorical columns and perform encoding.

```
#7. Check for Categorical columns and perform encoding.
from sklearn.preprocessing import LabelEncoder
df.dtypes
```

```
price                  int16
area                   int64
bedrooms               int64
bathrooms              int64
stories                int64
mainroad              object
guestroom             object
basement              object
hotwaterheating       object
airconditioning       object
parking                int64
furnishingstatus      object
dtype: object
```

```
categorical_columns = df.select_dtypes(include=['object']).columns
df_encoded = pd.get_dummies(df, columns=categorical_columns)
categorical_columns
```

```
Index(['mainroad', 'guestroom', 'basement', 'hotwaterheating',
       'airconditioning', 'furnishingstatus'],
dtype='object') print(df_encoded)
```

```
     price  area  bedrooms  bathrooms  stories  parking  mainroad_no
\
0      218  7420         4          2        3        2            0

1      217  8960         4          4        4        3            0

2      217  9960         3          2        2        2            0

3      216  7500         4          2        2        3            0
```

```
4      215  7420         4          1        2        2            0

       ..     ...   ...        ...        ...      ...      ...

       ...

540      2  3000         2          1        1        2            0

541      1  2400         3          1        1        0            1

542      0  3620         2          1        1        0            0

543      0  2910         3          1        1        0            1

         544      0  3850         3          1        2        0

         0


     mainroad_yes  guestroom_no  guestroom_yes  basement_no
basement_yes  \
0               1             1              0            1
0
1               1             1              0            1
0
2               1             1              0            0
1
3               1             1              0            0
1
4               1             0              1            0
1
..            ...           ...            ...          ...
...
540             1             1              0            0
1
541             0             1              0            1
                0
542             1             1              0            1
0
543             0             1              0            1
0
544             1             1              0            1
0

     hotwaterheating_no  hotwaterheating_yes  airconditioning_no  \
0                     1                    0                   0
1                     1                    0                   0
2                     1                    0                   1
```

```
3                      1                     0                    0
4                      1                     0                    0    ..
                       ...                   ...                  ...
540                    1                     0                    1
541                    1                     0                    1
542                    1                     0                    1
543                    1                     0                    1   544
                       1                     0                    1

     airconditioning_yes  furnishingstatus_furnished  \
0                       1                            1
1                       1                            1
2                       0                            0
3                       1                            1
4                       1                            1   ..
                        ...                          ...
540                     0                            0
541                     0                            0
542                     0                            0
543                     0                            1   544
                        0                            0

     furnishingstatus_semi-furnished  furnishingstatus_unfurnished  0
0                              0
1                                   0                              0
2                                   1                              0
3                                   0                              0
4                                   0                              0   ..
                                    ...                            ...
540                                 0                              1
541                                 1                              0
542                                 0                              1
543                                 0                              0
544                                 0                              1

[545 rows x 19 columns]
```

8. Split the data into dependent and independent variables.

```
#8. Split the data into dependent and independent variables.
dependent_variable = 'price'
independent_variables = df.drop(dependent_variable, axis=1)

dependent_variable = df[dependent_variable]

print(dependent_variable)
```

```
0      218
1      217
2      217
3      216
```

```
4      215       ...
540      2
541      1
542      0
543      0
544      0
Name: price, Length: 545, dtype: int16
```

```
independent_variables
```

```
     area  bedrooms  bathrooms  stories mainroad guestroom basement  \
0    7420         4          2        3      yes        no       no
1    8960         4          4        4      yes        no       no
2    9960         3          2        2      yes        no      yes
3    7500         4          2        2      yes        no      yes
4    7420         4          1        2      yes       yes      yes
     ..    ...       ...        ...      ...      ...       ...
     ...
540  3000         2          1        1      yes        no      yes
541  2400         3          1        1       no        no       no
542  3620         2          1        1      yes        no       no
543  2910         3          1        1       no        no       no
     544  3850         3          1        2      yes        no
     no

    hotwaterheating airconditioning  parking furnishingstatus  0
no             yes        2        furnished
1                no              yes        3         furnished
2                no               no        2    semi-furnished
3                no              yes        3         furnished
4                no              yes        2         furnished  ..
                 ...             ...      ...              ...
540              no               no        2       unfurnished
541              no               no        0    semi-furnished
542              no               no        0       unfurnished
543              no               no        0         furnished
544              no               no        0       unfurnished

[545 rows x 11 columns]
```

```
print(independent_variables)
```

```
     area  bedrooms  bathrooms  stories mainroad guestroom basement  \
0    7420         4          2        3      yes        no       no
1    8960         4          4        4      yes        no       no
2    9960         3          2        2      yes        no      yes
3    7500         4          2        2      yes        no      yes
4    7420         4          1        2      yes       yes      yes
     ..    ...       ...        ...      ...      ...       ...
     ...
```

```
540  3000          2           1         1      yes         no       yes
541  2400          3           1         1       no         no        no
542  3620          2           1         1      yes         no        no
543  2910          3           1         1       no         no        no
     544  3850          3           1         2      yes         no
     no

   hotwaterheating airconditioning  parking furnishingstatus  0
no              yes         2         furnished
1                 no              yes         3        furnished
2                 no               no         2   semi-furnished
3                 no              yes         3        furnished
4                 no              yes         2        furnished  ..
                 ...              ...       ...              ...
540               no               no         2      unfurnished
541               no               no         0   semi-furnished
542               no               no         0      unfurnished
543               no               no         0        furnished
544               no               no         0      unfurnished

[545 rows x 11 columns]
```

9. Scale the independent variables

```
#9. Scale the independent variables from
sklearn.preprocessing import StandardScaler
columns_to_scale = ['price', 'bedrooms', 'bathrooms', 'area',
'stories', 'parking']
scaler = StandardScaler()
df[columns_to_scale] = scaler.fit_transform(df[columns_to_scale])

df
```

```
        price      area  bedrooms  bathrooms   stories mainroad
guestroom  \
0    2.175477  1.046726  1.403419   1.421812  1.378217      yes
no
1    2.157685  1.757010  1.403419   5.405809  2.532024      yes
no
2    2.157685  2.218232  0.047278   1.421812  0.224410      yes
no
3    2.139893  1.083624  1.403419   1.421812  0.224410      yes
     no
4    2.122101  1.046726  1.403419  -0.570187  0.224410      yes
     yes
..        ...       ...       ...        ...       ...      ...
...
540 -1.667633 -0.991879 -1.308863  -0.570187 -0.929397      yes
```

```
no
541 -1.685425 -1.268613  0.047278  -0.570187 -0.929397       no
no
542 -1.703217 -0.705921 -1.308863  -0.570187 -0.929397      yes
no
543 -1.703217 -1.033389  0.047278  -0.570187 -0.929397       no
no
544 -1.703217 -0.599839  0.047278  -0.570187  0.224410      yes
    no

    basement hotwaterheating airconditioning   parking
furnishingstatus
0     no              no             yes  1.517692        furnished
1     no              no             yes  2.679409        furnished
2     yes              no              no  1.517692   semifurnished
3     yes              no             yes  2.679409        furnished
4     yes              no             yes  1.517692        furnished
..       ...             ...             ...       ...              ..
.
540   yes              no              no  1.517692      unfurnished
541   no              no              no -0.805741   semifurnished
542   no              no              no -0.805741      unfurnished
543   no              no              no -0.805741        furnished
544   no              no              no -0.805741      unfurnished

[545 rows x 12 columns]
```

```
print(df)
```

```
        price      area  bedrooms  bathrooms   stories mainroad
guestroom  \
0    2.175477  1.046726  1.403419   1.421812  1.378217      yes
no
1    2.157685  1.757010  1.403419   5.405809  2.532024      yes
     no
2    2.157685  2.218232  0.047278   1.421812  0.224410      yes
no
3    2.139893  1.083624  1.403419   1.421812  0.224410      yes
no
4    2.122101  1.046726  1.403419  -0.570187  0.224410      yes
     yes
..        ...       ...       ...        ...       ...      ...
...
540 -1.667633 -0.991879 -1.308863  -0.570187 -0.929397      yes
no
541 -1.685425 -1.268613  0.047278  -0.570187 -0.929397       no
no
542 -1.703217 -0.705921 -1.308863  -0.570187 -0.929397      yes
no
```

```
543 -1.703217 -1.033389  0.047278  -0.570187 -0.929397       no
no
544 -1.703217 -0.599839  0.047278  -0.570187  0.224410      yes
    no

   basement hotwaterheating airconditioning   parking
furnishingstatus
0     no                no              yes  1.517692        furnished
1     no                no              yes  2.679409        furnished
2     yes                no               no  1.517692   semifurnished
3     yes                no              yes  2.679409        furnished
4     yes                no              yes  1.517692        furnished
..        ...               ...              ...       ...              ..
.
540   yes                no               no  1.517692      unfurnished
541   no                no              no -0.805741   semifurnished
542   no                no              no -0.805741      unfurnished
543   no                no              no -0.805741        furnished
544   no                no              no -0.805741      unfurnished

[545 rows x 12 columns]
```

10. Split the data into training and testing

```
#10.Split the data into training and testing from
sklearn.model_selection import train_test_split
X = df.drop('price', axis=1)  y
= df['price']
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.25, random_state=42) X_train
```

```
         area  bedrooms  bathrooms   stories  mainroad  guestroom
basement  \
167 -0.253922 -1.308863   1.421812 -0.929397         1          0
0
368  0.225750 -1.308863  -0.570187 -0.929397         0          0
0
301 -0.752043  0.047278  -0.570187  0.224410         1          0
0
527 -1.528742 -1.308863  -0.570187 -0.929397         0          0
1
382 -0.922695  0.047278  -0.570187  0.224410         1          0
1
..        ...       ...        ...       ...       ...        ...
...
71   0.391790  1.403419   1.421812  2.532024         1          0
0
106  0.138117  1.403419   1.421812 -0.929397         1          0
1
270 -0.300045  0.047278   1.421812  1.378217         1          0
```

```
0
435 -0.512207 -1.308863  -0.570187 -0.929397         1          0
0
102  0.161178  0.047278   1.421812  2.532024         1          1
0

     hotwaterheating  airconditioning   parking  furnishingstatus  167
0               1  1.517692              1
368               0                0 -0.805741                 1
301               0                0 -0.805741                 1
527               0                0 -0.805741                 1
382               0                0 -0.805741                 0
..              ...              ...       ...               ...
71                0                1 -0.805741                 2
106               0                1 -0.805741                 1
270               1                0  0.355976                 0
435               0                0 -0.805741                 2
102               0                1  0.355976                 1

[408 rows x 11 columns]
X_test

         area  bedrooms  bathrooms   stories  mainroad  guestroom
basement  \
316  0.345668  1.403419   1.421812  0.224410         0          0
1
77   0.622401  0.047278   1.421812  1.378217         1          0
0
360 -0.512207 -1.308863  -0.570187 -0.929397         1          0
0
90  -0.069433  0.047278  -0.570187  0.224410         1          0
0
493 -0.549105  0.047278  -0.570187 -0.929397         1          0
0
..        ...       ...        ...       ...       ...        ...
...
172  1.498725  0.047278  -0.570187  0.224410         1          1
1
124  0.633932  0.047278   1.421812  2.532024         1          0
0
388 -0.692084  0.047278  -0.570187  0.224410         1          0
0
521 -0.699002 -1.308863  -0.570187 -0.929397         0          0
0
503 -0.530656  0.047278  -0.570187 -0.929397         1          0
0

     hotwaterheating  airconditioning   parking  furnishingstatus  316
0               0  0.355976              2
```

```
77                   0                1 -0.805741                  0
360                  0                0 -0.805741                  1
90                   0                1 -0.805741                  1
493                  0                0 -0.805741                  0
..                 ...              ...       ...                ...
172                  0                1  1.517692                  2
124                  0                0  0.355976                  0
388                  0                0 -0.805741                  2
521                  0                0 -0.805741                  2
503                  0                0 -0.805741                  1

[137 rows x 11 columns]
```

```
y_train
```

```
167    0.520805
368   -0.635687
301   -0.262051
527   -1.525296
382   -0.706855
...   71
1.285868 106
0.983401
270   -0.155298
435   -0.920362
102    1.001194
Name: price, Length: 408, dtype: float64
```

```
y_test
```

```
316   -0.386596
77     1.232492
360   -0.600102
90     1.125739
493   -1.276205
...         172
0.503013
124    0.876648
388   -0.742440
521   -1.454127
503   -1.329582
Name: price, Length: 137, dtype: float64
```

```python
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

```python
df['mainroad']=le.fit_transform(df['mainroad'])
df['guestroom']=le.fit_transform(df['guestroom'])
df['basement']=le.fit_transform(df['basement'])
df['hotwaterheating']=le.fit_transform(df['hotwaterheating'])
```

```
df['airconditioning']=le.fit_transform(df['airconditioning'])
df['furnishingstatus']=le.fit_transform(df['furnishingstatus'])
df.head()
```

```
      price      area  bedrooms  bathrooms   stories  mainroad
guestroom  \
0  2.175477  1.046726  1.403419   1.421812  1.378217         1
0
1  2.157685  1.757010  1.403419   5.405809  2.532024         1
0
2  2.157685  2.218232  0.047278   1.421812  0.224410         1
0
3  2.139893  1.083624  1.403419   1.421812  0.224410         1
0
4  2.122101  1.046726  1.403419  -0.570187  0.224410         1
1

   basement  hotwaterheating  airconditioning   parking
furnishingstatus
0          0                0                1  1.517692
0
1          0                0                1  2.679409
          0
2          1                0                0  1.517692
1
3          1                0                1  2.679409
0
4          1                0                1  1.517692
          0
```

11. Build the Model

```
#11. Build the Model
from sklearn.linear_model import LinearRegression
model=LinearRegression()
X_train, X_test, y_train, y_test = train_test_split(df, df['price'],
test_size=0.25) model.fit(X_train,y_train)
```

```
LinearRegression()
```

12. Train the model

```
#12. Train the model
X_train
```

```
        price      area  bedrooms  bathrooms   stories  mainroad
guestroom  \
473 -1.151660  1.337297 -1.308863  -0.570187 -0.929397         1
0
206  0.253922  0.299545 -1.308863  -0.570187 -0.929397         1
1
285 -0.244259  0.691585  0.047278  -0.570187  0.224410         1
1
212  0.236130 -0.798165  1.403419   1.421812  0.224410         1
0
100  1.018986  0.668524  0.047278   1.421812 -0.929397         1
0
..        ...       ...       ...        ...       ...       ...
...
450 -0.991530 -0.784329  0.047278  -0.570187  0.224410         1
0
42   1.606128  0.613177  0.047278   1.421812  2.532024         1
0
342 -0.493349  0.923119  0.047278  -0.570187  0.224410         1
0
527 -1.525296 -1.528742 -1.308863  -0.570187 -0.929397         0
0
469 -1.133868 -0.253922 -1.308863  -0.570187 -0.929397         1
0
     basement  hotwaterheating  airconditioning   parking
furnishingstatus
473         0                0                0 -0.805741
2
206         1                0                1 -0.805741
1
285         0                0                0 -0.805741
1
212         1                0                1  1.517692
1
100         1                0                1 -0.805741
2
..        ...              ...              ...       ...
...
450         1                0                0 -0.805741
1
42          0                0                1  1.517692
2
342         0                0                1 -0.805741
0
527         1                0                0 -0.805741
1
469         0                0                0 -0.805741
0
```

```
[408 rows x 12 columns]
```

```
y_train
```

```
473   -1.151660
206    0.253922
285   -0.244259
212    0.236130
100    1.018986
...    450    -
0.991530
42     1.606128
342   -0.493349
527   -1.525296
469   -1.133868
Name: price, Length: 408, dtype: float64
```

13. Test the model

```
#13. Test the model
score = model.score(X_test, y_test)
```

```
X_test
```

```
        price      area  bedrooms  bathrooms   stories  mainroad  
guestroom  \
171  0.503013  2.360750  0.047278  -0.570187 -0.929397         1          
0
247  0.022624  1.498725  1.403419  -0.570187  2.532024         1          
0
333 -0.457765 -0.991879  0.047278  -0.570187  0.224410         1          
0
357 -0.564518  0.820727  1.403419  -0.570187  0.224410         0          
0
105  0.983401 -0.300045  0.047278  -0.570187  2.532024         1          
0
..        ...       ...       ...        ...       ...       ...        
...
82   1.196908  2.467293  0.047278   1.421812 -0.929397         1          
0
494 -1.293997  0.760768 -1.308863  -0.570187 -0.929397         1          
0
125  0.858856  4.819529  0.047278  -0.570187 -0.929397         1          
0
377 -0.653479 -1.061062  0.047278   1.421812  0.224410         0          
0
393 -0.742440  1.048571  0.047278  -0.570187 -0.929397         0          
0
```

```
     basement  hotwaterheating  airconditioning   parking
furnishingstatus
171         0                0                0  0.355976
1
247         0                0                0  2.679409
2
333         0                0                0 -0.805741
1
357         0                0                0  0.355976
0
105         0                0                1 -0.805741
2
..        ...              ...              ...       ...
...
82          1                0                1  0.355976
0
494         0                0                0 -0.805741
2
125         0                0                1  1.517692
1
377         1                0                0 -0.805741
2
393         0                0                0 -0.805741
2

[137 rows x 12 columns]
y_test
```

```
171    0.503013
247    0.022624
333   -0.457765
357   -0.564518
105    0.983401
...          82
1.196908
494   -1.293997
125    0.858856
377   -0.653479
393   -0.742440
Name: price, Length: 137, dtype: float64
```

```
score 1.0
```

```
predictions = model.predict(X_test)
```

```
predictions
```

```
array([ 0.50301263,  0.02262382, -0.457765  , -0.56451807,
0.98340144,
        1.60612768,  1.30366065, -1.57867223,  1.92638689, -
```

```
0.47555718,
        0.94781709, -0.84919292, -0.08412925,  0.2005456 , -
0.26205104,
        0.50301263,  1.44599808, -0.74243985, -0.92036163, -
1.32958173,
        0.93002491, -0.58231025, -0.63568678, -0.0485449 , -
1.32958173,
       -1.13386777, -0.84919292, -0.43997282, -0.6178946 ,
2.15768521,
        0.25392213,  1.51716679, -1.25841302,  0.25392213, -
0.03075272,
        1.00119362, -0.51114153, -0.99153035,  1.23249194,
1.80184164,
       -0.42218064, -0.03075272, -1.20503648, -0.10192143, -
0.99153035,
       -0.6178946 , -0.10192143,  1.23249194, -0.0485449 , -
0.38659628,
       -1.20503648, -0.17309015,  1.76625728, -0.56451807, -
0.19088232,
        0.16496124, -0.70685549, -1.25841302, -0.97373817,
1.94417907,
       -0.19088232, -0.99153035, -0.65347896,  1.87301035, -
0.22646668,
        1.30366065,  0.37846738,  2.03313996,  1.74846511,
0.50301263,
       -1.40075045,  0.43184392, -0.24425886,  1.90859471, -
0.60010242,
        1.89080253, -1.63204876, -1.11607559,  0.11158471, -
0.13750579,
       -0.31542757,  0.69872659,  0.25392213,  0.41405174, -
0.26205104,
       -0.54672589, -1.63204876,  0.18275342,  0.50301263,
0.69872659,
        1.10794669, -0.52893371,  0.53859699,  1.14353105,
0.50301263,
        2.12210085, -0.49334935, -0.54672589,  1.07236233, -
0.10192143,
        0.00483164, -0.74243985,  1.5883355 , -1.64984094, -
0.83140074,
       -0.457765  ,  1.73067293, -1.20503648,  0.91223273,
0.69872659,
        1.16132322,  2.10430867,  0.02262382, -0.0485449 ,
0.64535005,
        0.04041599, -1.32958173, -0.74243985,  1.837426  , -
1.09828341,
       -1.06269906,  0.84106402, -1.13386777,  1.07236233, -
0.60010242,
        1.07236233, -1.20503648,  1.23249194,  1.96197125,
0.00483164,
       -1.32958173,  1.51716679,  1.19690758, -1.29399738,
0.85885619,
       -0.65347896, -0.74243985])
```

14.

Measure the performance using Metrics

```
#14. Measure the performance using Metrics from
sklearn.metrics import mean_squared_error,r2_score,
mean_absolute_error y_pred = model.predict(X_test)
error=y_test-y_pred error
```

```
171    4.440892e-16
247    3.469447e-17
333   -5.551115e-17
357   -4.440892e-16
105    1.110223e-15
...
82     4.440892e-16
494   -2.220446e-16
125    7.771561e-16
377   -8.881784e-16
393   -4.440892e-16
Name: price, Length: 137, dtype: float64
```

```
se=error*error se
```

```
171    1.972152e-31
247    1.203706e-33
333    3.081488e-33
357    1.972152e-31
105    1.232595e-30
...
82     1.972152e-31
494    4.930381e-32
125    6.039716e-31
377    7.888609e-31
393    1.972152e-31
Name: price, Length: 137, dtype: float64
```

```
mse=np.mean(se) mse
```

```
2.7925977603982354e-31
```

```
mse2=mean_squared_error(y_test,y_pred)
```

```
mse2
```

```
2.7925977603982354e-31

mae=mean_absolute_error(y_test,y_pred)

mae

4.4222786422255463e-16

rmse=np.sqrt(mse2)

rmse

5.284503534295569e-16

r2=r2_score(y_test,y_pred)

r2

1.0
```