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In [1]:
```
#import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
#import dataset
df=pd.read_csv(r"E:\154\10_USA_Housing - 10_USA_Housing.csv")
df
```

Out[2]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	Addr
0	79545.45857	5.682861	7.009188	4.09	23086.80050	1.059034e+06	208 Michael Ferry A 674\nLaurabury, 370
1	79248.64245	6.002900	6.730821	3.09	40173.07217	1.505891e+06	188 Johnson Vie Suite 079\nL Kathleen, C
2	61287.06718	5.865890	8.512727	5.13	36882.15940	1.058988e+06	9127 Elizab Stravenue\nDanielto WI 0648
3	63345.24005	7.188236	5.586729	3.26	34310.24283	1.260617e+06	USS Barnett\nFPO 448
4	59982.19723	5.040555	7.839388	4.23	26354.10947	6.309435e+05	USNS Raymond\nF AE 093
...	...	...	...	...	...	...	
4995	60567.94414	7.830362	6.137356	3.46	22837.36103	1.060194e+06	USNS Williams\nF AP 30153-76
4996	78491.27543	6.999135	6.576763	4.02	25616.11549	1.482618e+06	PSC 9258, B 8489\nAPO AA 429 33
4997	63390.68689	7.250591	4.805081	2.13	33266.14549	1.030730e+06	4215 Tracy Gar Suite 076\nJoshuala VA 0
4998	68001.33124	5.534388	7.130144	5.44	42625.62016	1.198657e+06	USS Wallace\nFPO 733
4999	65510.58180	5.992305	6.792336	4.07	46501.28380	1.298950e+06	37778 George Ridg Apt. 509\nEast Ho NV

5000 rows × 7 columns

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 7 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   Avg. Area Income             5000 non-null   float64
 1   Avg. Area House Age          5000 non-null   float64
 2   Avg. Area Number of Rooms    5000 non-null   float64
 3   Avg. Area Number of Bedrooms 5000 non-null   float64
 4   Area Population              5000 non-null   float64
 5   Price                        5000 non-null   float64
 6   Address                      5000 non-null   object 
dtypes: float64(6), object(1)
memory usage: 273.6+ KB
```

In [4]:
```
#to display top 5 rows
df.head()
```

Out[4]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	Address
0	79545.45857	5.682861	7.009188	4.09	23086.80050	1.059034e+06	208 Michael Ferry Apt. 674\nLaurabury, NE 3701...
1	79248.64245	6.002900	6.730821	3.09	40173.07217	1.505891e+06	188 Johnson Views Suite 079\nLake Kathleen, CA...
2	61287.06718	5.865890	8.512727	5.13	36882.15940	1.058988e+06	9127 Elizabeth Stravenue\nDanieltown, WI 06482...
3	63345.24005	7.188236	5.586729	3.26	34310.24283	1.260617e+06	USS Barnett\nFPO AP 44820
4	59982.19723	5.040555	7.839388	4.23	26354.10947	6.309435e+05	USNS Raymond\nFPO AE 09386

Data cleaning and Pre-Processing

In [5]:
```
#To find null values
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 7 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   Avg. Area Income             5000 non-null   float64
 1   Avg. Area House Age          5000 non-null   float64
 2   Avg. Area Number of Rooms    5000 non-null   float64
 3   Avg. Area Number of Bedrooms 5000 non-null   float64
 4   Area Population              5000 non-null   float64
 5   Price                        5000 non-null   float64
 6   Address                      5000 non-null   object 
dtypes: float64(6), object(1)
memory usage: 273.6+ KB
```

In [6]:
```
# To display summary of statistics
df.describe()
```

Out[6]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000	5.000000e+03
mean	68583.108984	5.977222	6.987792	3.981330	36163.516039	1.232073e+06
std	10657.991214	0.991456	1.005833	1.234137	9925.650114	3.531176e+05
min	17796.631190	2.644304	3.236194	2.000000	172.610686	1.593866e+04
25%	61480.562390	5.322283	6.299250	3.140000	29403.928700	9.975771e+05
50%	68804.286405	5.970429	7.002902	4.050000	36199.406690	1.232669e+06
75%	75783.338665	6.650808	7.665871	4.490000	42861.290770	1.471210e+06
max	107701.748400	9.519088	10.759588	6.500000	69621.713380	2.469066e+06

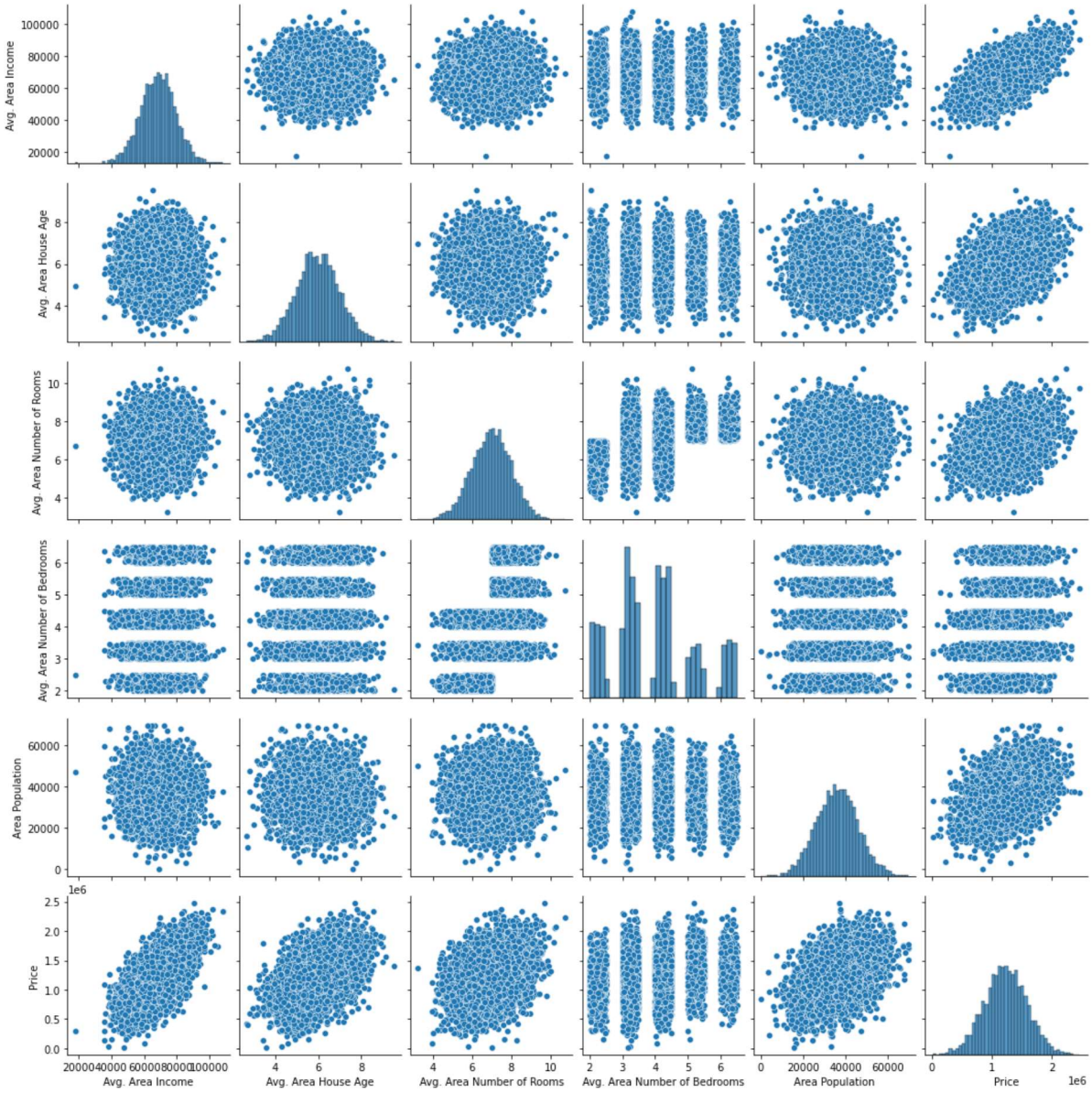
In [7]:
```
#To Display column heading
df.columns
```

Out[7]:
```
Index(['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Room
s',
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price', 'Addres
s'],
      dtype='object')
```

EDA and VISUALIZATION

In [8]:
```
sns.pairplot(df)
```

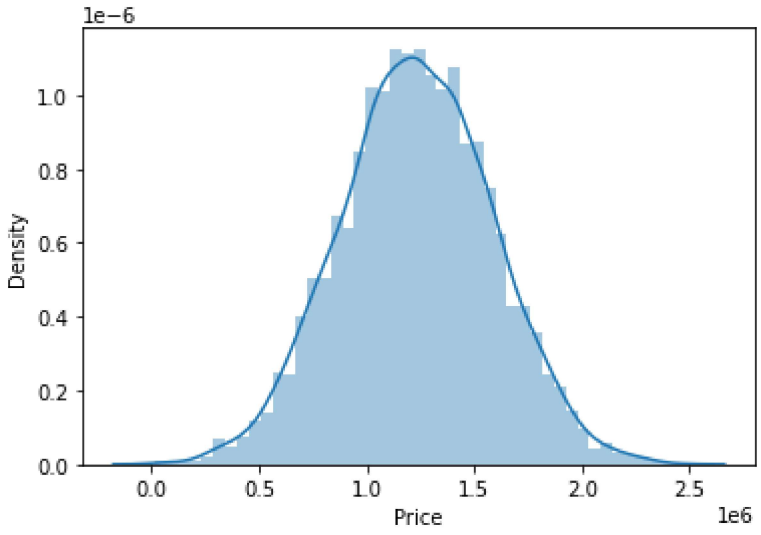
Out[8]:
```
<seaborn.axisgrid.PairGrid at 0x1acd0cefc40>
```



In [9]:
```
sns.distplot(df["Price"])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: Fut
ureWarning: `distplot` is a deprecated function and will be removed in a futu
re version. Please adapt your code to use either `displot` (a figure-level fu
nction with similar flexibility) or `histplot` (an axes-level function for hi
stograms).
  warnings.warn(msg, FutureWarning)
```

Out[9]: <AxesSubplot:xlabel='Price', ylabel='Density'>

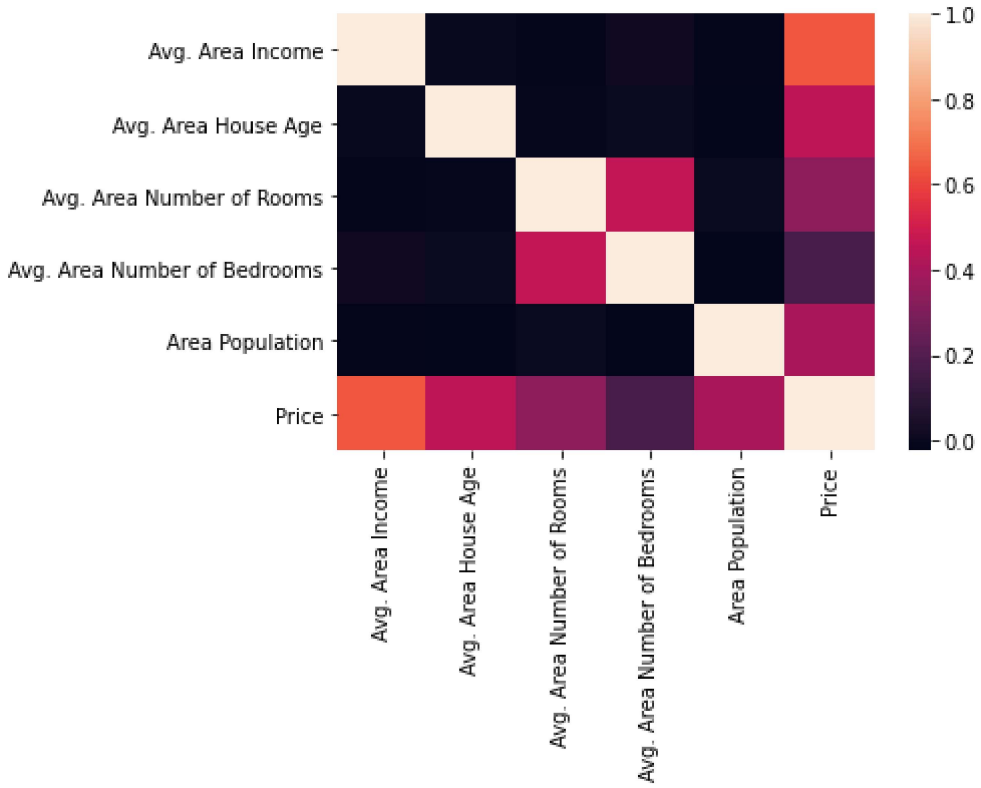


In [10]:
```
df1=df[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms'
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price']]
```

Plot Using Heat Map

In [11]:
```
sns.heatmap(df1.corr())
```

Out[11]: <AxesSubplot:>



To Train The Model-Model Building

we are going to train Linera Regression Model;We need to split out data into two variables x and y where x is independent variable(input) and y is dependent on x(output) we could ignore address column as it required for our model

In [12]:
```
x=df1[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms',
       'Avg. Area Number of Bedrooms', 'Area Population']]
y=df1['Price']
```

To Split my dataset into training and test data

In [13]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
```

In [14]:
```
from sklearn.linear_model import LinearRegression
lr= LinearRegression()
lr.fit(x_train,y_train)
```

Out[14]:
```
LinearRegression()
```

In [15]:
```
lr.intercept_
```

Out[15]:
```
-2648205.3435515715
```

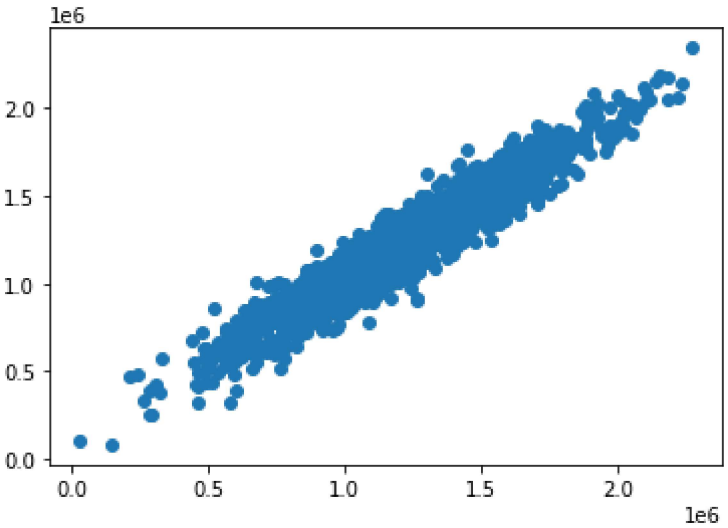
In [16]:
```
coeff = pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

Out[16]:

	Co-efficient
Avg. Area Income	21.674065
Avg. Area House Age	165706.378153
Avg. Area Number of Rooms	121299.644890
Avg. Area Number of Bedrooms	2262.722831
Area Population	15.138126

In [17]:
```
prediction = lr.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[17]:
```
<matplotlib.collections.PathCollection at 0x1acd4653520>
```



In [18]:
```
lr.score(x_test,y_test)
```

Out[18]:
```
0.9126049597187611
```

Accuracy

In [19]:
```
lr.score(x_train,y_train)
```

Out[19]:
```
0.9202195017891821
```

In [20]:
```
from sklearn.linear_model import Ridge,Lasso
```

In [21]:
```
rr=Ridge(alpha=10)
rr.fit(x_train,y_train)
```

Out[21]:
```
Ridge(alpha=10)
```

In [22]:
```
rr.score(x_test,y_test)
```

Out[22]:
```
0.9126166293362756
```

In [23]:
```
la =Lasso(alpha=10)
la.fit(x_train,y_train)
```

Out[23]:
```
Lasso(alpha=10)
```

In [24]:
```
la.score(x_test,y_test)
```

Out[24]:
```
0.9126056847941596
```

ElasticNet

In [25]:
```
from sklearn.linear_model import ElasticNet
en = ElasticNet()
en.fit(x_train,y_train)
```

Out[25]:
```
ElasticNet()
```

In [26]:
```
print(en.coef_)
```

```
[2.15649478e+01 1.09408779e+05 7.57183009e+04 1.46012608e+04
 1.50806846e+01]
```

In [27]:
```
print(en.intercept_)
```

```
-2033276.1225931898
```

In [28]:
```
print(en.predict(x_test))
```

```
[1237431.97430089 1128368.97264003 1097314.69413652 ... 1251933.34432809
  959036.88427282 1156622.81693341]
```

In [29]:
```
print(en.score(x_test,y_test))
```

```
0.8749338874736654
```

Evaluation Metrics

In [30]:
```
from sklearn import metrics
```

In [31]:
```
print("Mean Absolute Error",metrics.mean_absolute_error(y_test,prediction))
```

```
Mean Absolute Error 83127.53471994573
```

In [32]:
```
print("Mean Squared Error:",metrics.mean_squared_error(y_test,prediction))
```

```
Mean Squared Error: 10627265424.859337
```

In [33]:
```
print("Root Mean Absolute Error:",np.sqrt(metrics.mean_squared_error(y_test,pr
```

```
Root Mean Absolute Error: 103088.62897943369
```