LinearRegression

In [1]:

```
import numpy as np
import pandas as pd
```

data collection

In [2]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as pp
import seaborn as sb
```

In [3]:

```
df = pd.read_csv(r"C:\Users\user\Desktop\10_USA_Housing.csv")
df
```

Out[3]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael 674\nLaur
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 John: Suite (Kathl
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Stravenue\nD W
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raym
...	...	...	...	...	...	...	
4995	60567.944140	7.830362	6.137356	3.46	22837.361035	1.060194e+06	USNS Willia AP 3(
4996	78491.275435	6.999135	6.576763	4.02	25616.115489	1.482618e+06	PSC 8489\nAPO /
4997	63390.686886	7.250591	4.805081	2.13	33266.145490	1.030730e+06	4215 Tra(Suite 076\nJc
4998	68001.331235	5.534388	7.130144	5.44	42625.620156	1.198657e+06	USS Wallace
4999	65510.581804	5.992305	6.792336	4.07	46501.283803	1.298950e+06	37778 Geor Apt. 509\nI

5000 rows × 7 columns

first 10 rows

In [4]:

```
df.head(10)
```

Out[4]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	Ad
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael Fer 674\nLaurabu 3
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 Johnson Suite 079\ Kathleen
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Eliz Stravenue\nDanie WI 06
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett\nF
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raymond AE
5	80175.754159	4.988408	6.104512	4.04	26748.428425	1.068138e+06	06039 Jennifer I Apt. 443\nTra
6	64698.463428	6.025336	8.147760	3.41	60828.249085	1.502056e+06	4759 Daniel 442\nNguyenburg
7	78394.339278	6.989780	6.620478	2.42	36516.358972	1.573937e+06	972 Viaduct\nLake W TN 1777
8	59927.660813	5.362126	6.393121	2.30	29387.396003	7.988695e+05	USS Gilbert\nF
9	81885.927184	4.423672	8.167688	6.10	40149.965749	1.545155e+06	Unit 94 0958\nDPO AE

data cleaning

In [5]:

```
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]:

```
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%	61480.562388	5.322283	6.299250	3.140000	29403.928702	9.975771e+05
50%	68804.286404	5.970429	7.002902	4.050000	36199.406689	1.232669e+06
75%	75783.338666	6.650808	7.665871	4.490000	42861.290769	1.471210e+06
max	107701.748378	9.519088	10.759588	6.500000	69621.713378	2.469066e+06

In [7]:

```
df.columns
```

Out[7]:

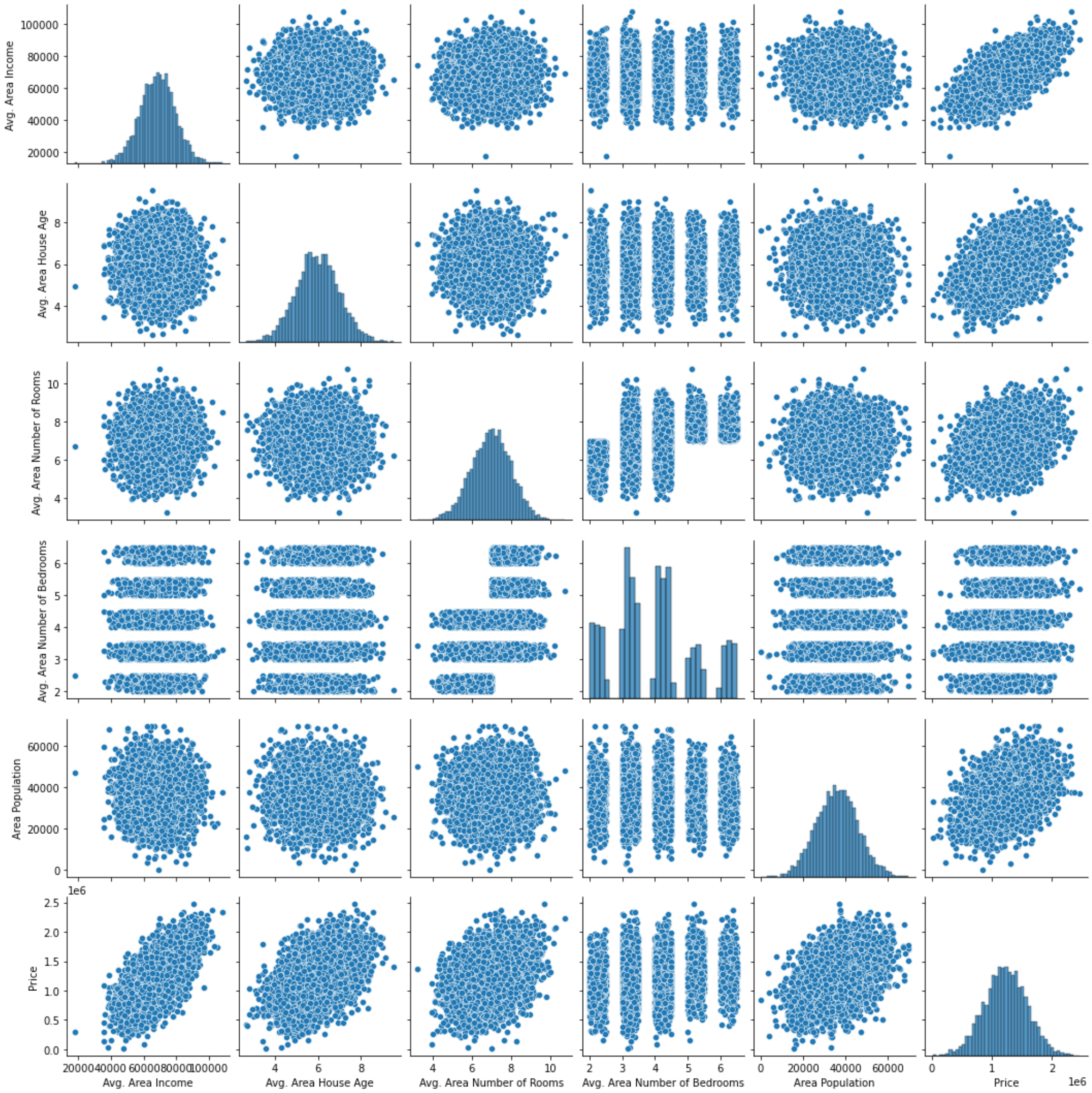
```
Index(['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Roo
ms',
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price', 'Addres
s'],
      dtype='object')
```

In [8]:

```
sb.pairplot(df)
```

Out[8]:

```
<seaborn.axisgrid.PairGrid at 0x252d4ab72e0>
```



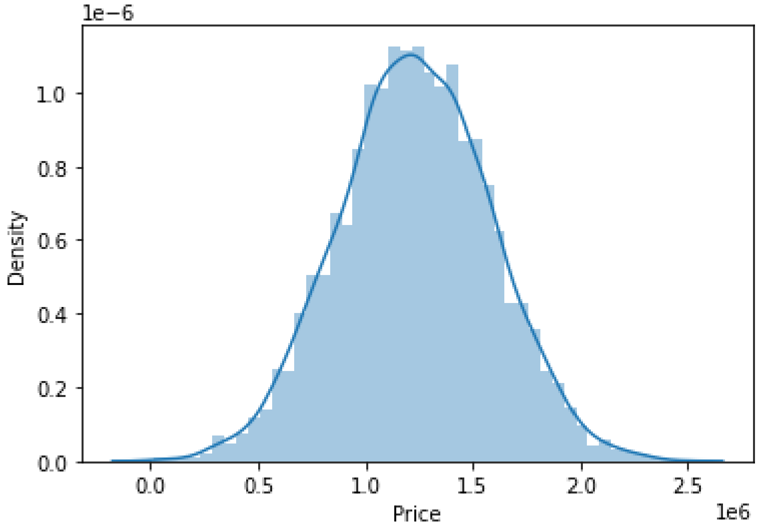
In [9]:

```
sb.distplot(df["Price"])
```

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

Out[9]:

```
<AxesSubplot:xlabel='Price', ylabel='Density'>
```



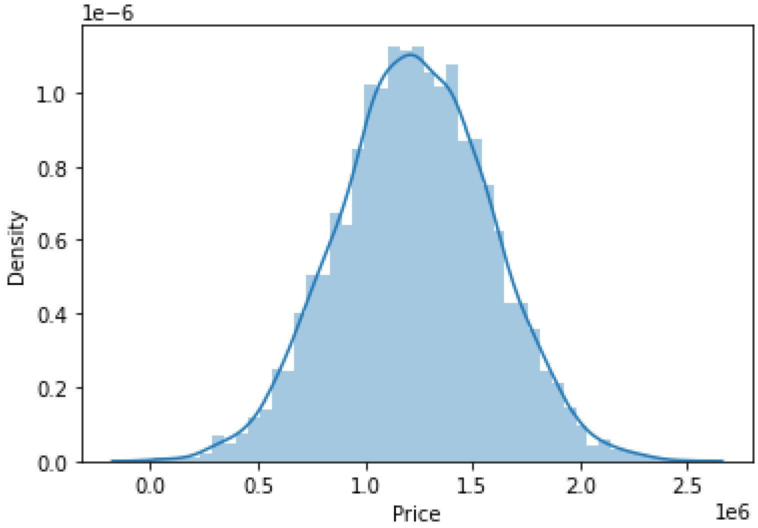
In [10]:

```
sb.distplot(df["Price"])
```

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

Out[10]:

```
<AxesSubplot:xlabel='Price', ylabel='Density'>
```



In [11]:

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

Out[11]:

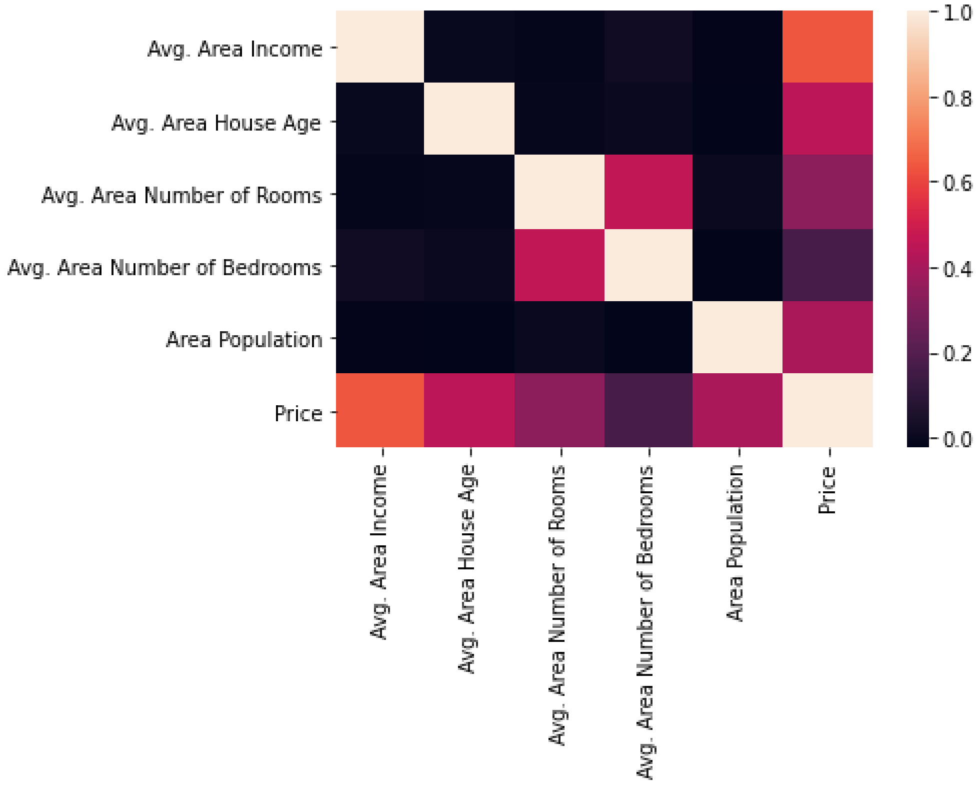
	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price	Address
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael Ferry Apt. 674\nLaurabury, NE 3701...
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 Johnson Views Suite 079\nLake Kathleen, CA...
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Elizabeth Stravenue\nDanieltown, WI 06482...
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett\nFPO AP 44820
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raymond\nFPO

In [12]:

```
sb.heatmap(df1.corr())
```

Out[12]:

```
<AxesSubplot:>
```



model building

In [13]:

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

In [14]:

```
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)
```

linear regression

In [15]:

```
from sklearn.linear_model import LinearRegression

lr = LinearRegression()
lr.fit(x_train,y_train)
```

Out[15]:

```
LinearRegression()
```

In [16]:

```
print(lr.intercept_)
```

```
6.984919309616089e-10
```

In [17]:

```
coef = pd.DataFrame(lr.coef_,x.columns,columns=['Co_efficient'])
coef
```

Out[17]:

	Co_efficient
Avg. Area Income	-3.704650e-15
Avg. Area House Age	-5.916626e-11
Avg. Area Number of Rooms	-8.441522e-11
Avg. Area Number of Bedrooms	4.169082e-12
Area Population	-1.357025e-14
Price	1.000000e+00

In [18]:

```
print(lr.score(x_test,y_test))
```

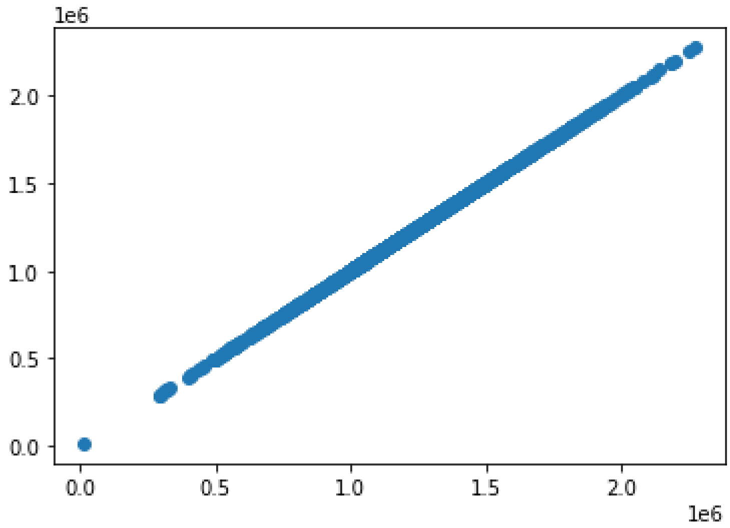
```
1.0
```

In [19]:

```
prediction = lr.predict(x_test)
pp.scatter(y_test,prediction)
```

Out[19]:

```
<matplotlib.collections.PathCollection at 0x252d94e20a0>
```



lasso and ridge regression

In [20]:

```
lr.score(x_test,y_test)
```

Out[20]:

```
1.0
```

In [21]:

```
lr.score(x_train,y_train)
```

Out[21]:

```
1.0
```

In [22]:

```
from sklearn.linear_model import Ridge,Lasso
```

In [23]:

```
r = Ridge(alpha=10)
r.fit(x_train,y_train)
r.score(x_test,y_test)
r.score(x_train,y_train)
```

Out[23]:

```
1.0
```

In [24]:

```
l = Lasso(alpha=10)
l.fit(x_train,y_train)
l.score(x_test,y_test)
l.score(x_train,y_train)
```

Out[24]:

```
0.9999999999929275
```

elasticnet

In [25]:

```
from sklearn.linear_model import ElasticNet
e = ElasticNet()
e.fit(x_train,y_train)
```

Out[25]:

```
ElasticNet()
```

In [26]:

```
print(e.coef_)
```

```
[3.85562165e-05 0.00000000e+00 0.00000000e+00 0.00000000e+00
 2.68661480e-05 9.99998956e-01]
```

In [27]:

```
print(e.intercept_)
```

```
-2.328094639116898
```

In [33]:

```
predictions = e.predict(x_test)
predictions
```

Out[33]:

```
array([1591187.81321373, 1161232.55294351, 1273120.17499616, ...,
       1358647.25257467,  813415.02999894, 1555490.30952982])
```

In [41]:

```
print(e.score(x_test,y_test))
```

```
0.999999999999154
```

In [35]:

```
from sklearn import metrics
```

mean absolute error

In [36]:

```
print("Mean Absolute Error:",metrics.mean_absolute_error(y_test,predictions))
```

```
Mean Absolute Error: 0.2532628133917945
```

mean squared error

In [39]:

```
print("Mean Squared Error:", metrics.mean_squared_error(y_test,predictions))
```

```
Mean Squared Error: 0.0998632431597178
```

root mean squared error

In [40]:

```
print("Root Mean Squared Error",np.sqrt(metrics.mean_squared_error(y_test,predictions)))
```

```
Root Mean Squared Error 0.31601146048793516
```

In [ ]:

```

```