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

In [2]:
```python
df=pd.read_csv("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	Ad
0	79545.458574	5.682861	7.009188	4.09	23086.800503	1.059034e+06	208 Michael Ferr 674\nLaurabur 3
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06	188 Johnson \ Suite 079\r Kathleen,
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06	9127 Eliz Stravenue\nDaniel WI 06
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06	USS Barnett\nFP 4
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05	USNS Raymond\ AE (
...	...	...	...	...	...	...	
4995	60567.944140	7.830362	6.137356	3.46	22837.361035	1.060194e+06	USNS Williams\ AP 30153
4996	78491.275435	6.999135	6.576763	4.02	25616.115489	1.482618e+06	PSC 9258 8489\nAPO AA 4
4997	63390.686886	7.250591	4.805081	2.13	33266.145490	1.030730e+06	4215 Tracy G Suite 076\nJoshua V
4998	68001.331235	5.534388	7.130144	5.44	42625.620156	1.198657e+06	USS Wallace\nFP 7
4999	65510.581804	5.992305	6.792336	4.07	46501.283803	1.298950e+06	37778 George R Apt. 509\nEast N

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
```

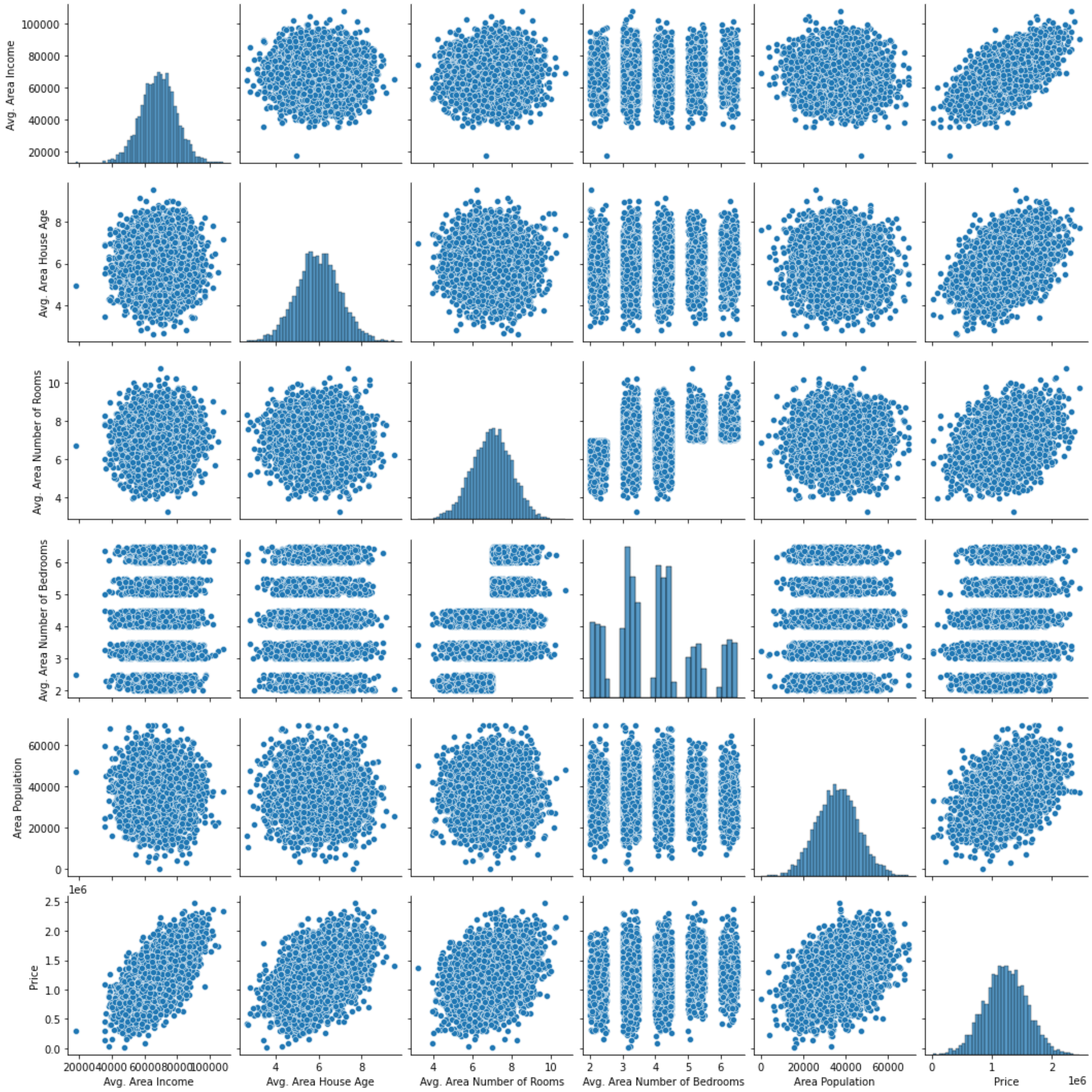
In [4]:
```
df.describe()
```

Out[4]:

	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

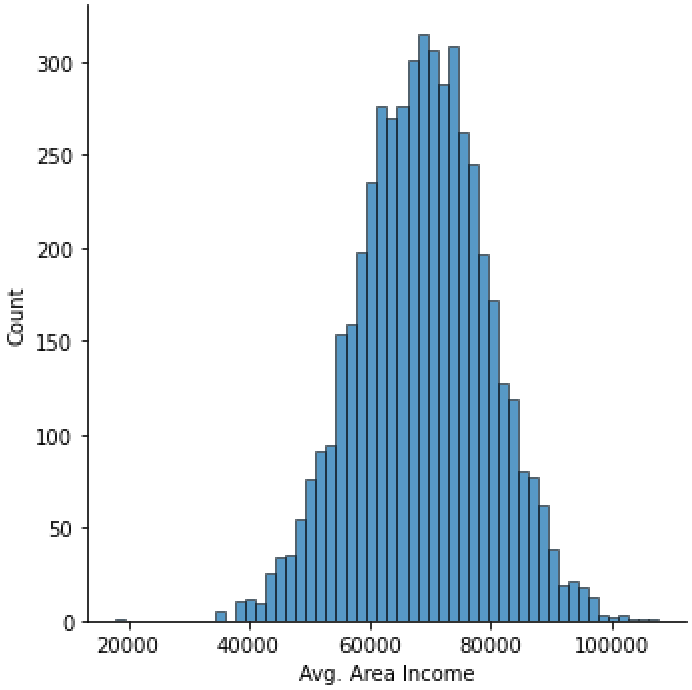
In [5]:
```
sns.pairplot(df)
```

Out[5]:
```
<seaborn.axisgrid.PairGrid at 0x18b48206760>
```



In [6]:
```
sns.displot(df['Avg. Area Income'])
```

Out[6]:
```
<seaborn.axisgrid.FacetGrid at 0x18b4ceca6a0>
```



In [7]:
```
df1=df.drop(['Address'],axis=1)
df1
```

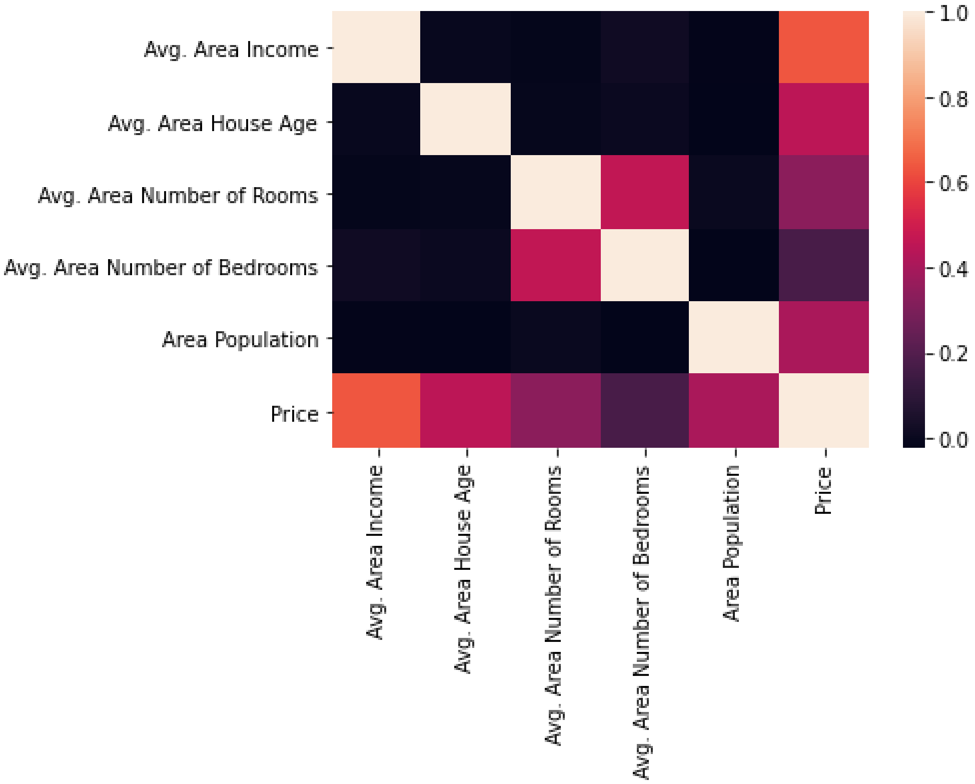
Out[7]:

	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
1	79248.642455	6.002900	6.730821	3.09	40173.072174	1.505891e+06
2	61287.067179	5.865890	8.512727	5.13	36882.159400	1.058988e+06
3	63345.240046	7.188236	5.586729	3.26	34310.242831	1.260617e+06
4	59982.197226	5.040555	7.839388	4.23	26354.109472	6.309435e+05
...	...	...	...	...	...	...
4995	60567.944140	7.830362	6.137356	3.46	22837.361035	1.060194e+06
4996	78491.275435	6.999135	6.576763	4.02	25616.115489	1.482618e+06
4997	63390.686886	7.250591	4.805081	2.13	33266.145490	1.030730e+06
4998	68001.331235	5.534388	7.130144	5.44	42625.620156	1.198657e+06
4999	65510.581804	5.992305	6.792336	4.07	46501.283803	1.298950e+06

5000 rows × 6 columns

In [8]:
```
sns.heatmap(df1.corr())
```

Out[8]:
```
<AxesSubplot:>
```



In [9]:
```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

In [10]:
```
y=df['Avg. Area Income']
x=df1.drop(['Avg. Area Income','Price'],axis=1)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
print(x_train)
```

```
      Avg. Area House Age  Avg. Area Number of Rooms  \
1213             5.675774                   7.217068
2186             5.689944                   5.761823
2972             7.084664                   6.584017
2299             5.830240                   7.930393
4462             5.232204                   5.458380
...                   ...                        ...
4379             6.313972                   5.519717
494              5.930502                   6.974340
496              6.987280                   3.236194
888              7.827795                   7.267250
3727             5.543498                   6.172884

      Avg. Area Number of Bedrooms  Area Population
1213                          5.11     30773.258989
2186                          2.37     31879.323843
2972                          3.13     42939.274240
2299                          5.19      9579.071782
4462                          2.01     54737.926636
...                            ...              ...
4379                          2.39     33579.913298
494                           4.47     28851.601404
496                           3.42     50233.790310
888                           4.38     24199.052753
3727                          2.25     32850.762037

[3500 rows x 4 columns]
```

In [11]:
```
model=LinearRegression()
model.fit(x_train,y_train)
model.intercept_
```

Out[11]:
```
70501.15927059163
```

In [12]:
```
coeff=pd.DataFrame(model.coef_,x.columns,columns=["Coefficient"])
coeff
```

Out[12]:

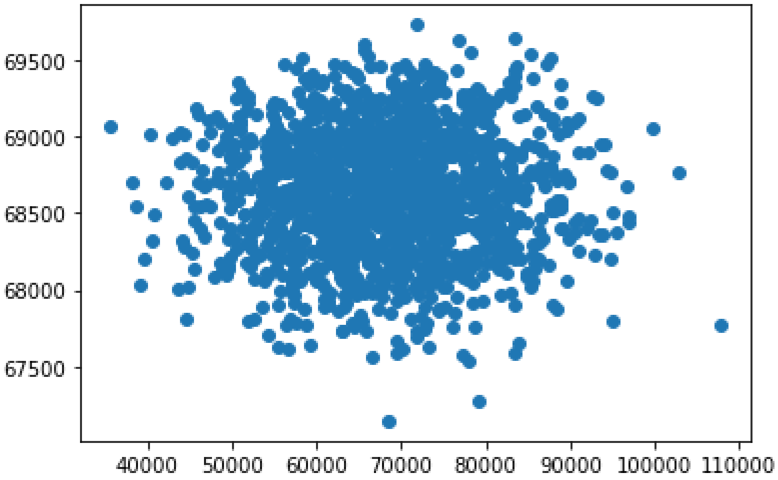
	Coefficient
Avg. Area House Age	-133.790199
Avg. Area Number of Rooms	-308.405210
Avg. Area Number of Bedrooms	316.128556
Area Population	-0.004836

In [13]:

```
prediction=model.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[13]:

```
<matplotlib.collections.PathCollection at 0x18b50855b20>
```



In [14]:

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

Out[14]:

```
-0.00031033545078851255
```

In [15]:

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

In [16]:

```
rr = Ridge(alpha=10)
rr.fit(x_train,y_train)
```

Out[16]:

```
Ridge(alpha=10)
```

In [17]:

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

Out[17]:

```
-0.00030355637971712923
```

In [18]:

```
la = Lasso(alpha=10)
la.fit(x_train,y_train)
```

Out[18]:

```
Lasso(alpha=10)
```

In [19]:

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

Out[19]:

```
-0.00020112218876611188
```

In [20]:

```python
from sklearn.linear_model import ElasticNet
en=ElasticNet()
en.fit(x_train,y_train)
print(en.coef_)
print(en.intercept_)
print(en.predict(x_test))
print(en.score(x_test,y_test))
from sklearn import metrics
print("Mean Absolute Error:",metrics.mean_absolute_error(y_test,prediction))
print("Mean Squared Error:",metrics.mean_squared_error(y_test,prediction))
print("Root Mean Squared Error:",np.sqrt(metrics.mean_squared_error(y_test,pred
```

```
[-8.47991004e+01 -1.58656620e+02  1.95218817e+02 -4.84553561e-03]
69644.25907581404
[68276.14125042 68772.41724707 68654.44749494 ... 68564.61550946
 68440.31239906 69104.06136707]
0.00016501745274866142
Mean Absolute Error: 8463.243205483113
Mean Squared Error: 112651739.45437533
Root Mean Squared Error: 10613.752373895639
```