In [6]:
```
pip install numpy
```

```
Requirement already satisfied: numpy in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-pac
kages (1.24.3)
Note: you may need to restart the kernel to use updated packages.
```

In [7]:
```
pip install pandas
```

```
Requirement already satisfied: pandas in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-pa
ckages (2.0.2)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\sasidhar royal\appdata\local\programs\python\pytho
n311\lib\site-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from pandas) (2023.3)
Requirement already satisfied: tzdata>=2022.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from pandas) (2023.3)
Requirement already satisfied: numpy>=1.21.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from pandas) (1.24.3)
Requirement already satisfied: six>=1.5 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-
packages (from python-dateutil>=2.8.2->pandas) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

In [8]:
```
import numpy as np
import pandas as pd
```

In [9]:
```
pip install Seaborn
```

```
Requirement already satisfied: Seaborn in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-p
ackages (0.12.2)
Requirement already satisfied: numpy!=1.24.0,>=1.17 in c:\users\sasidhar royal\appdata\local\programs\python\python3
11\lib\site-packages (from Seaborn) (1.24.3)
Requirement already satisfied: pandas>=0.25 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from Seaborn) (2.0.2)
Requirement already satisfied: matplotlib!=3.6.1,>=3.1 in c:\users\sasidhar royal\appdata\local\programs\python\pyth
on311\lib\site-packages (from Seaborn) (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\l
ib\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (1.0.7)
Requirement already satisfied: cycler>=0.10 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311
\lib\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (4.39.4)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311
\lib\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (1.4.4)
Requirement already satisfied: packaging>=20.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311\li
b\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (23.1)
Requirement already satisfied: pillow>=6.2.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (9.5.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\l
ib\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\sasidhar royal\appdata\local\programs\python\python3
11\lib\site-packages (from matplotlib!=3.6.1,>=3.1->Seaborn) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from pandas>=0.25->Seaborn) (2023.3)
Requirement already satisfied: tzdata>=2022.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from pandas>=0.25->Seaborn) (2023.3)
Requirement already satisfied: six>=1.5 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-
packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.1->Seaborn) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

In [10]:
```
pip install matplotlib
```

```
Requirement already satisfied: matplotlib in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\sit
e-packages (3.7.1)Note: you may need to restart the kernel to use updated packages.

Requirement already satisfied: contourpy>=1.0.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\l
ib\site-packages (from matplotlib) (1.0.7)
Requirement already satisfied: cycler>=0.10 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311
\lib\site-packages (from matplotlib) (4.39.4)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311
\lib\site-packages (from matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.20 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\si
te-packages (from matplotlib) (1.24.3)
Requirement already satisfied: packaging>=20.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311\li
b\site-packages (from matplotlib) (23.1)
Requirement already satisfied: pillow>=6.2.0 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from matplotlib) (9.5.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\l
ib\site-packages (from matplotlib) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\sasidhar royal\appdata\local\programs\python\python3
11\lib\site-packages (from matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-
packages (from python-dateutil>=2.7->matplotlib) (1.16.0)
```

In [11]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [12]:
```
df=pd.read_csv(r"C:\Users\venky\Downloads\USA_Housing.csv")
df
```

Out[12]:

	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 AE 09386
...	...	...	...	...	...	...	...
4995	60567.944140	7.830362	6.137356	3.46	22837.361035	1.060194e+06	USNS Williams\nFPO AP 30153-7653
4996	78491.275435	6.999135	6.576763	4.02	25616.115489	1.482618e+06	PSC 9258, Box 8489\nAPO AA 42991-3352
4997	63390.686886	7.250591	4.805081	2.13	33266.145490	1.030730e+06	4215 Tracy Garden Suite 076\nJoshualand, VA 01...
4998	68001.331235	5.534388	7.130144	5.44	42625.620156	1.198657e+06	USS Wallace\nFPO AE 73316
4999	65510.581804	5.992305	6.792336	4.07	46501.283803	1.298950e+06	37778 George Ridges Apt. 509\nEast Holly, NV 2...

5000 rows × 7 columns

In [13]:
```
df.head()
```

Out[13]:

	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 AE 09386

In [14]:
```
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 [15]:
```
df.describe()
```

Out[15]:

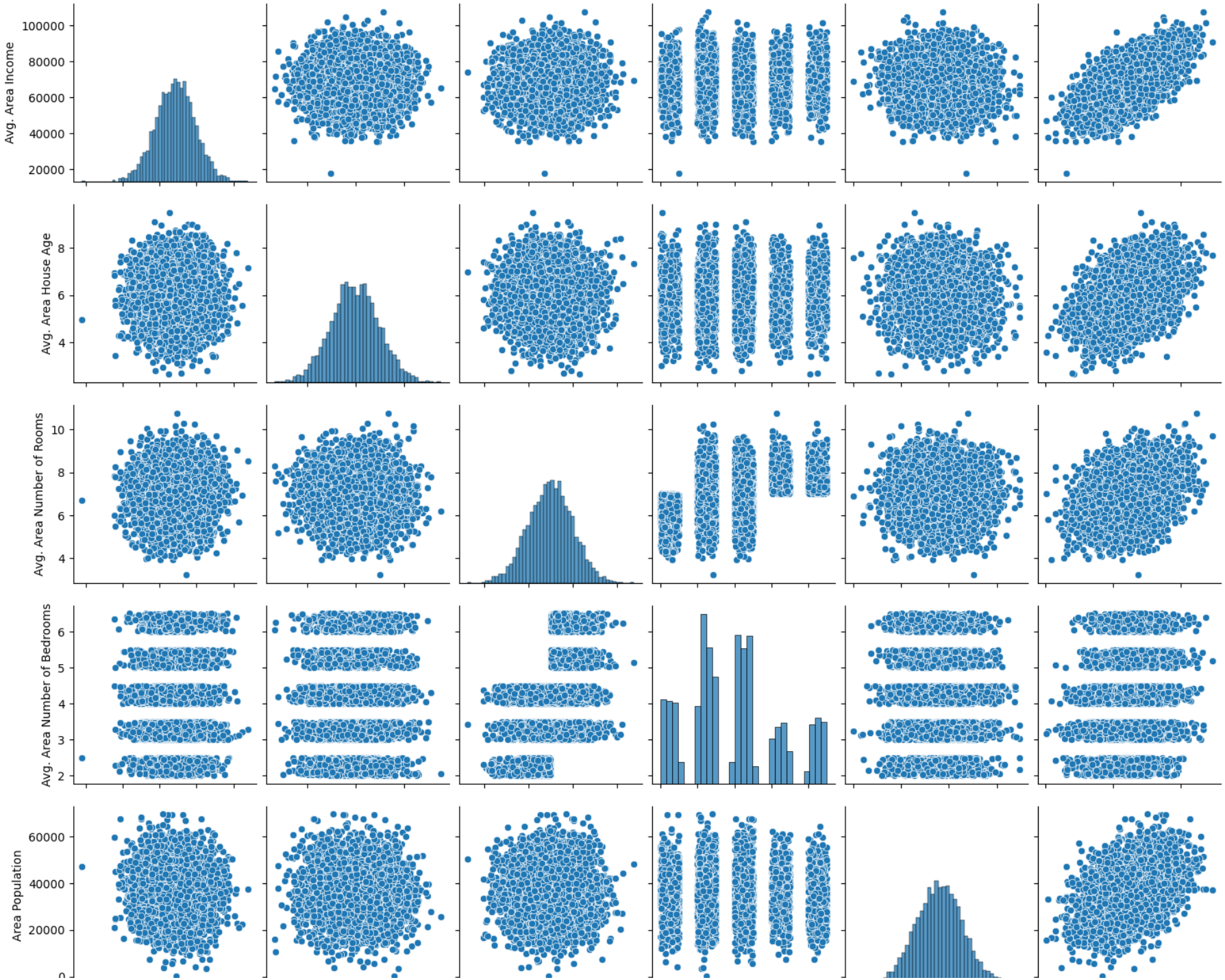
	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000	5.000000e+03
mean	68583.108984	5.977222	6.987792	3.981330	36163.516039	1.232073e+06
std	10657.991214	0.991456	1.005833	1.234137	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

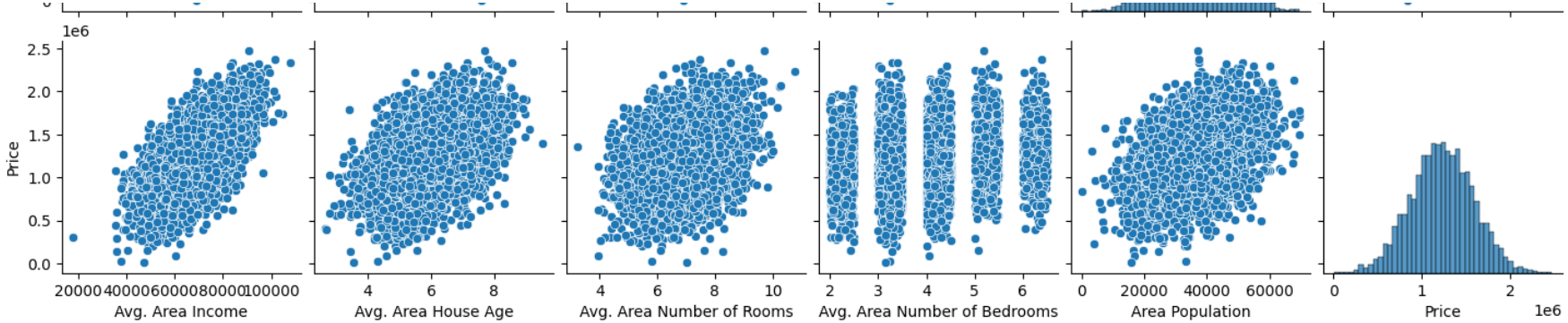
In [16]:
```
df.columns
```

Out[16]:
```
Index(['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms',
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price', 'Address'],
      dtype='object')
```

In [17]:
```
sns.pairplot(df)
```

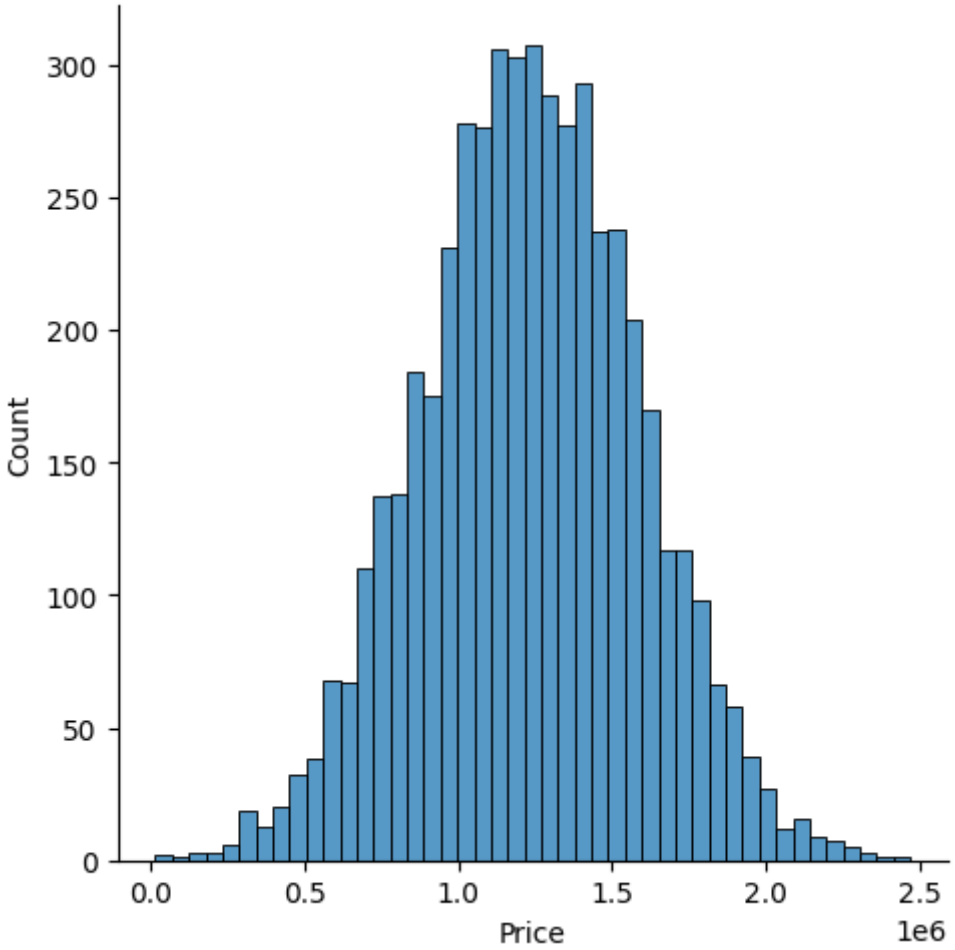
Out[17]:
```
<seaborn.axisgrid.PairGrid at 0x20c8f86f010>
```


Avg. Area Income
Avg. Area House Age
Avg. Area Number of Rooms
Avg. Area Number of Bedrooms
Area Population


1e6
2.5
2.0
1.5
1.0
0.5
0.0
Price
20000 40000 60000 80000 100000
Avg. Area Income
4 6 8
Avg. Area House Age
4 6 8 10
Avg. Area Number of Rooms
2 3 4 5 6
Avg. Area Number of Bedrooms
0 20000 40000 60000
Area Population
0 1 2
1e6
Price

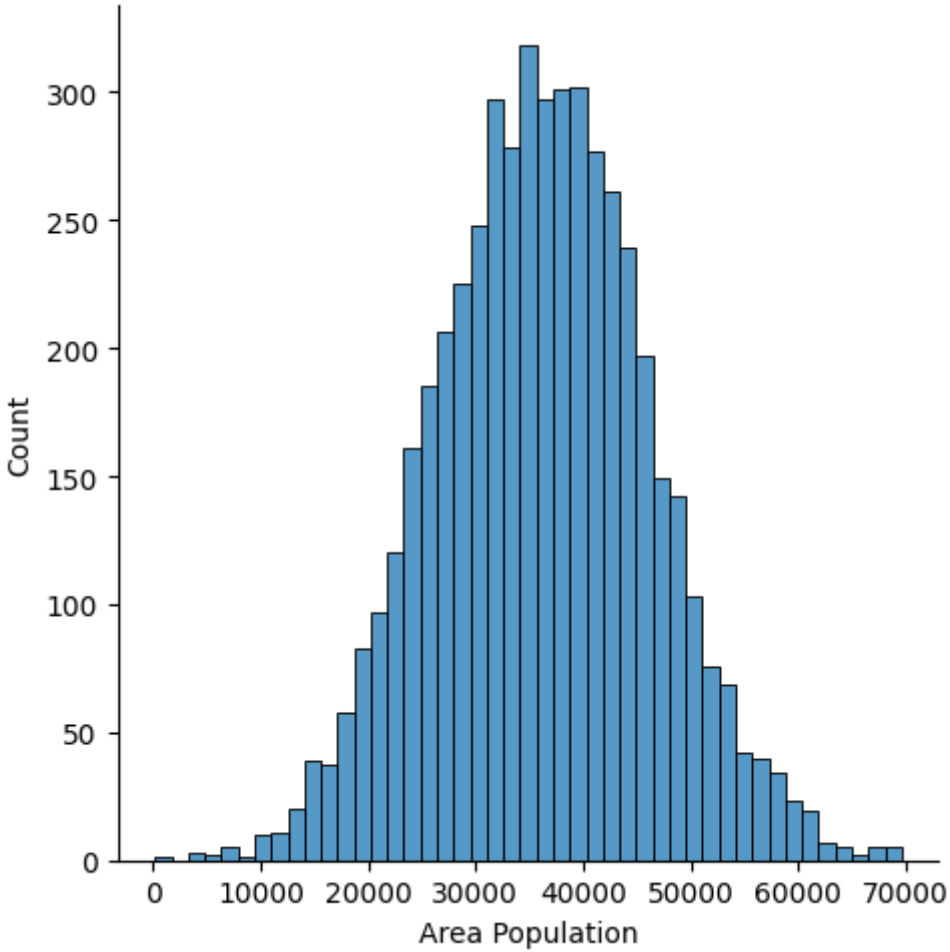
In [18]:
```
sns.displot(df['Price'])
```

Out[18]:
```
<seaborn.axisgrid.FacetGrid at 0x20c92b26010>
```



In [19]:
```
sns.displot(df['Area Population'])
```

Out[19]:
```
<seaborn.axisgrid.FacetGrid at 0x20c9413bf10>
```



In [20]:
```
Housedf=df[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms',
       'Avg. Area Number of Bedrooms', 'Area Population', 'Price']]
```

In [21]:
```
sns.heatmap(Housedf.corr())
```

Out[21]: <Axes: >

In [22]:
```
x=Housedf[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms',
       'Avg. Area Number of Bedrooms', 'Area Population']]
y=df['Price']
```

In [23]:
```
pip install sklearn
```

```
Collecting sklearn
  Using cached sklearn-0.0.post5.tar.gz (3.7 kB)
  Installing build dependencies: started
  Installing build dependencies: finished with status 'done'
  Getting requirements to build wheel: started
  Getting requirements to build wheel: finished with status 'done'
  Preparing metadata (pyproject.toml): started
  Preparing metadata (pyproject.toml): finished with status 'done'
Building wheels for collected packages: sklearn
  Building wheel for sklearn (pyproject.toml): started
  Building wheel for sklearn (pyproject.toml): finished with status 'done'
  Created wheel for sklearn: filename=sklearn-0.0.post5-py3-none-any.whl size=2968 sha256=2c22b3da1dd41fa627c7653747
57df2ed2b971c32a9ef8a9f0aaf5c34fed72e4
  Stored in directory: c:\users\sasidhar royal\appdata\local\pip\cache\wheels\5f\28\a6\4e4fc2959e4ed9b33bf517703534f
d8b19b76a842f74c9ed4c
Successfully built sklearn
Installing collected packages: sklearn
Successfully installed sklearn-0.0.post5
Note: you may need to restart the kernel to use updated packages.
```

In [24]:
```
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,random_state=101)
```

In [25]:
```
pip install scikitlearn
```

```
Note: you may need to restart the kernel to use updated packages.

ERROR: Could not find a version that satisfies the requirement scikitlearn (from versions: none)
ERROR: No matching distribution found for scikitlearn
```

In [26]:
```
pip install --upgrade pip
```

```
Requirement already satisfied: pip in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\site-packa
ges (23.1.2)
Note: you may need to restart the kernel to use updated packages.
```

In [27]:
```
pip install scikit-learn
```

```
Requirement already satisfied: scikit-learn in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (1.2.2)
Requirement already satisfied: numpy>=1.17.3 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from scikit-learn) (1.24.3)
Requirement already satisfied: scipy>=1.3.2 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib\s
ite-packages (from scikit-learn) (1.10.1)
Requirement already satisfied: joblib>=1.1.1 in c:\users\sasidhar royal\appdata\local\programs\python\python311\lib
\site-packages (from scikit-learn) (1.2.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\sasidhar royal\appdata\local\programs\python\python3
11\lib\site-packages (from scikit-learn) (3.1.0)
Note: you may need to restart the kernel to use updated packages.
```

In [28]:
```
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,random_state=101)
```

In [29]:
```
from sklearn.model_selection import train_test_split


```

In [30]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=101)
```

In [32]:
```
from sklearn.linear_model import LinearRegression
lm=LinearRegression()
lm.fit(x_train,y_train)
print(lm.intercept_)
```

```
-2641372.6673013885
```

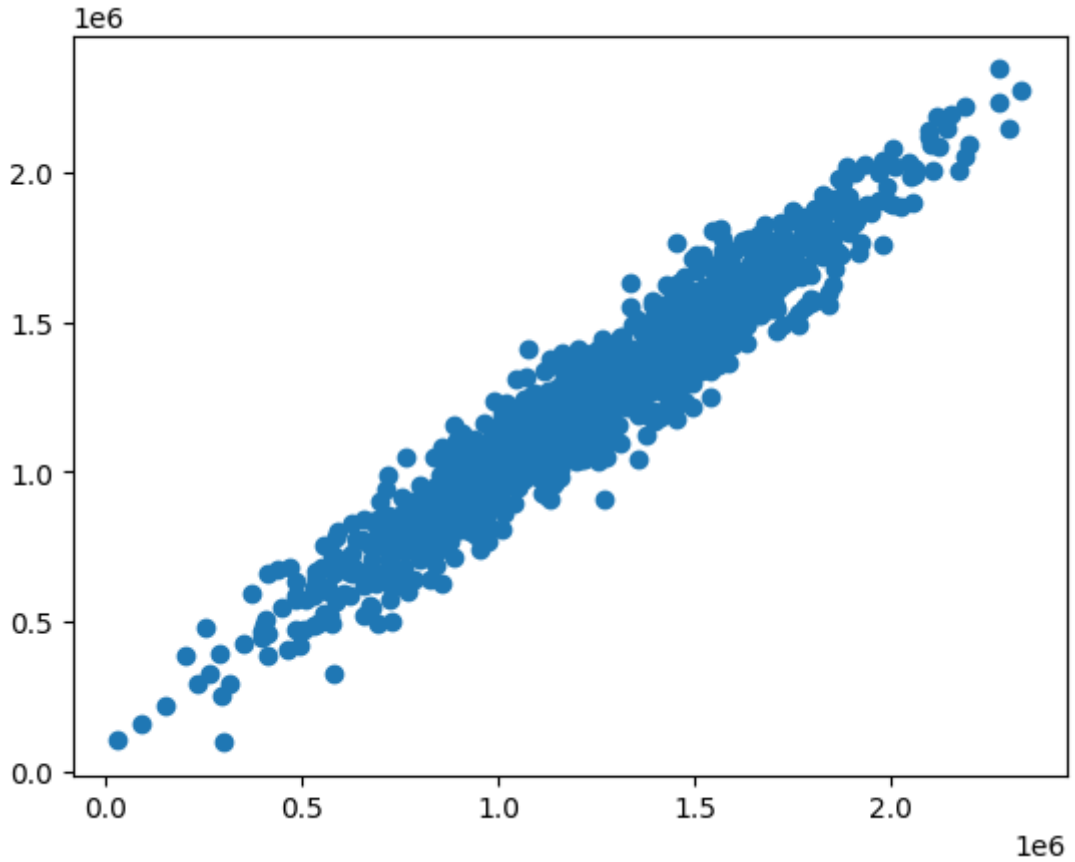
In [33]:
```
coeff_df=pd.DataFrame(lm.coef_,x.columns,columns=['coefficient'])
coeff_df
```

Out[33]:

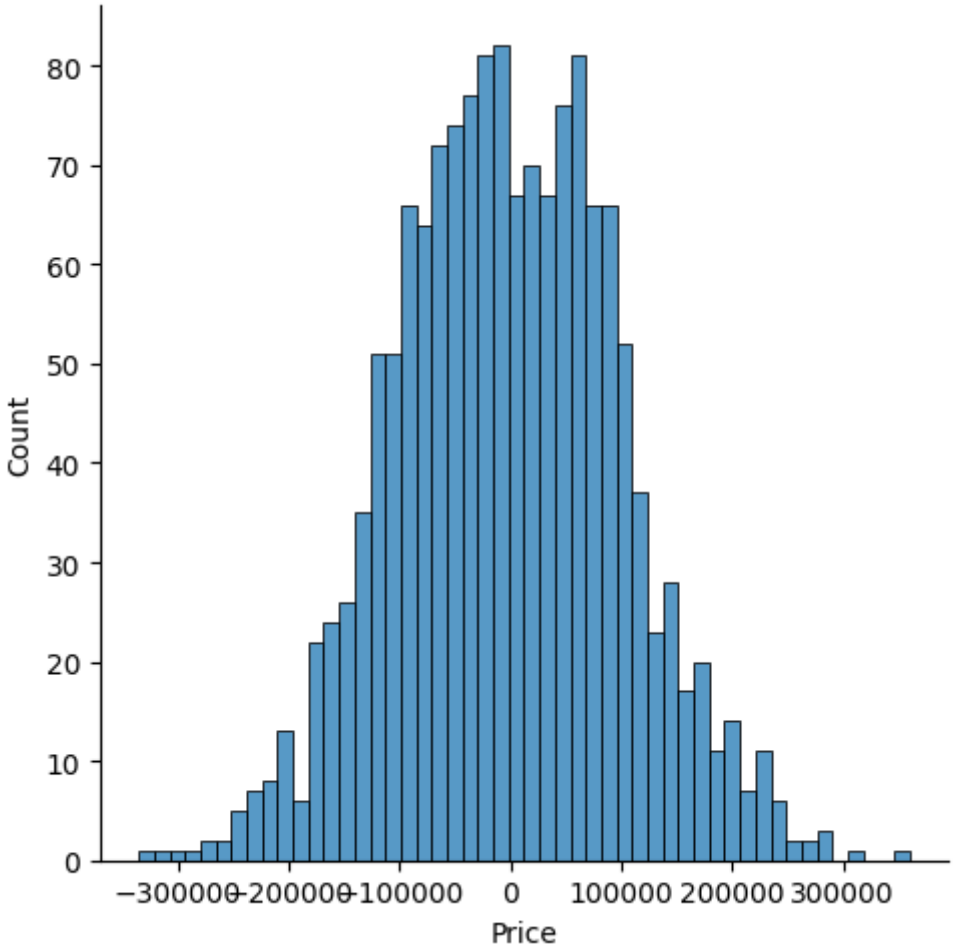
	coefficient
Avg. Area Income	21.617635
Avg. Area House Age	165221.119872
Avg. Area Number of Rooms	121405.376596
Avg. Area Number of Bedrooms	1318.718783
Area Population	15.225196

In [34]:
```
predictions=lm.predict(x_test)
plt.scatter(y_test,predictions)
```

Out[34]:
```
<matplotlib.collections.PathCollection at 0x20c94a65a50>
```



In [36]:
```
sns.displot((y_test-predictions),bins=50);
```



In [37]:
```
from sklearn import metrics
```

In [40]:
```
print('MAE:',metrics.mean_absolute_error(y_test,predictions))
print('MSE:',metrics.mean_squared_error(y_test,predictions))
print('RMSE:',np.sqrt(metrics.mean_squared_error(y_test,predictions)))
```

```
MAE: 81257.55795855928
MSE: 10169125565.897568
RMSE: 100842.0823163503
```

In [ ]:
```

```