Linear Regression Machine Learning Project for House Price Prediction

Import Libraries

In [36]:

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

%matplotlib inline
```

Importing Data and Checking out.

In [37]:

```
HouseDF = pd.read_csv(r"D:\Softwares\MS Office 2013\admin\Anuj\D_S\Linear\Project\USA_Housing.csv"
```

In [38]:

```
HouseDF.head()
```

Out[38]:

	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 [39]:

```
HouseDF.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 [40]:

```
HouseDF.describe()
```

Out[40]:

	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 [41]:

```
HouseDF.columns
```

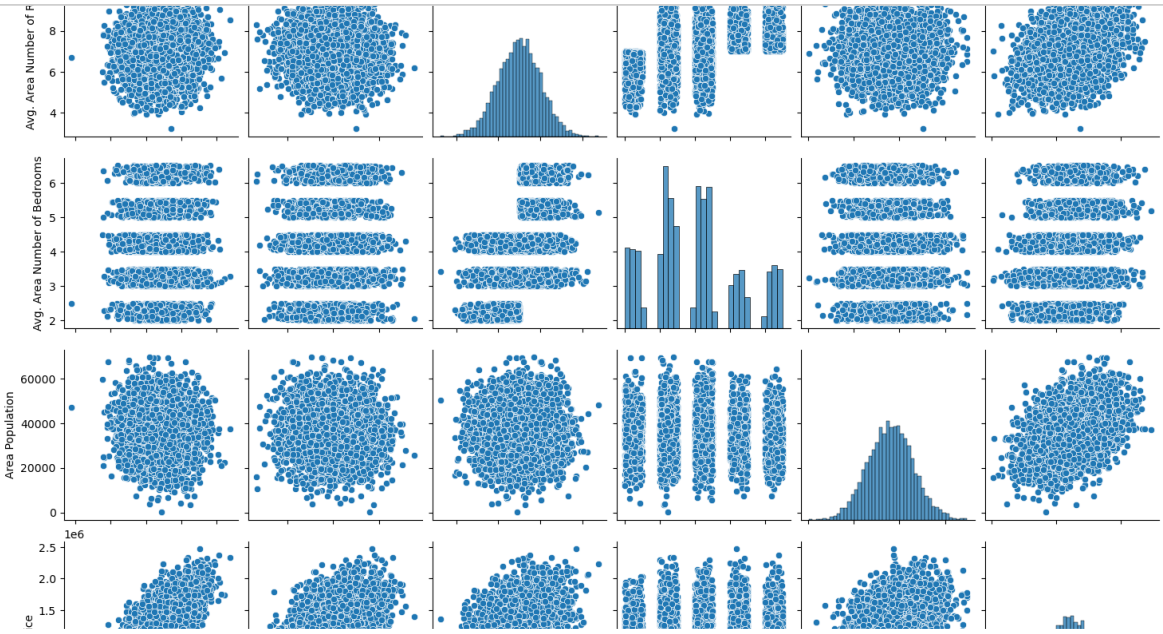
Out[41]:

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

Exploratory Data Analysis for House Price Prediction

In [42]:

```
sns.pairplot(HouseDF)
```



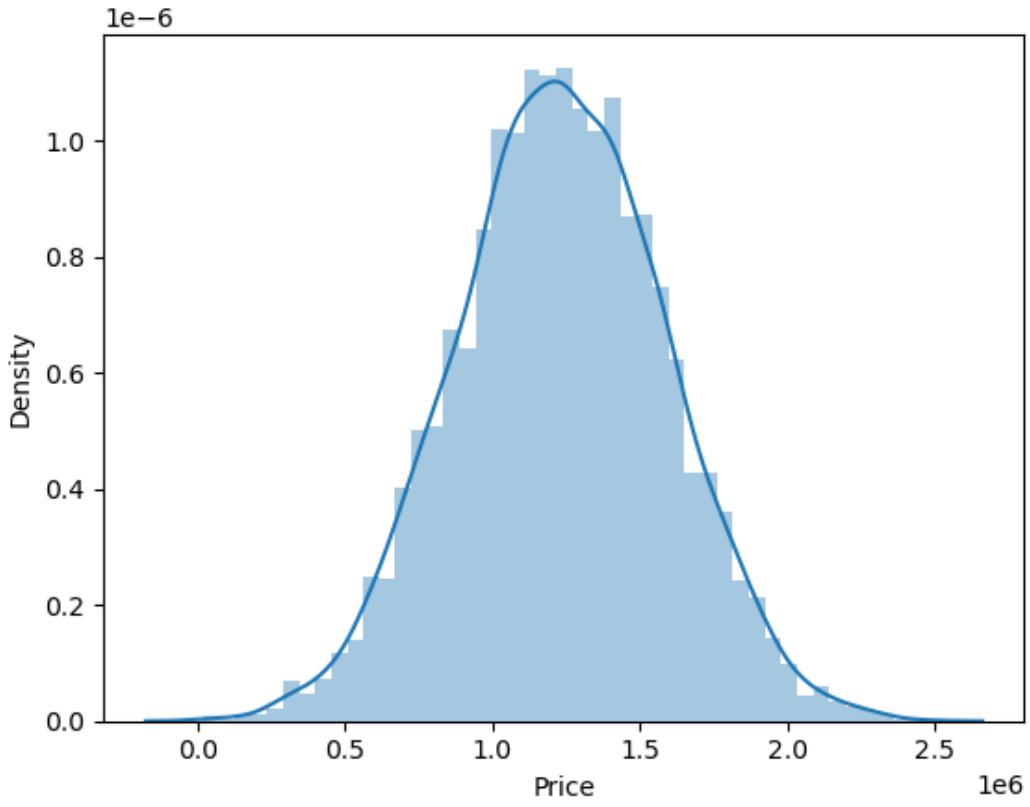
In [43]:

```
sns.distplot(HouseDF['Price'])
```

```
C:\Users\baps\AppData\Local\Temp\ipykernel_15644\4158129596.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751 (https://gist.githu
b.com/mwaskom/de44147ed2974457ad6372750bbe5751)

  sns.distplot(HouseDF['Price'])
```

Out[43]:

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



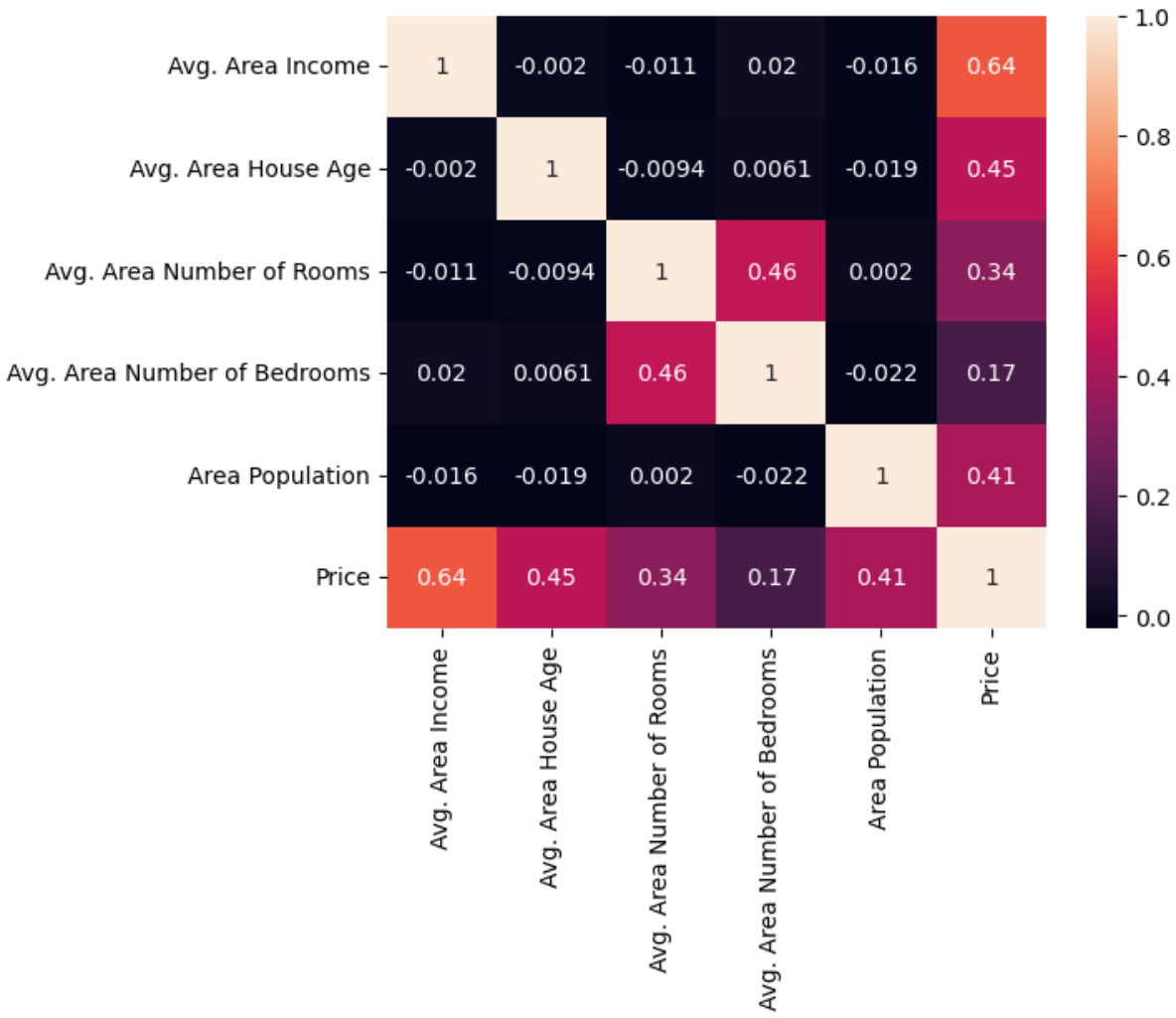
In [44]:

```
sns.heatmap(HouseDF.corr(), annot=True)
```

```
C:\Users\baps\AppData\Local\Temp\ipykernel_15644\3588014427.py:1: FutureWarning: The
default value of numeric_only in DataFrame.corr is deprecated. In a future version,
it will default to False. Select only valid columns or specify the value of numeric_
only to silence this warning.
  sns.heatmap(HouseDF.corr(), annot=True)
```

Out[44]:

```
<Axes: >
```



Training a Linear Regression Model

X and y List

In [45]:

```
X = HouseDF[['Avg. Area Income', 'Avg. Area House Age', 'Avg. Area Number of Rooms',
             'Avg. Area Number of Bedrooms', 'Area Population']]

y = HouseDF['Price']
```

Split Data into Train, Test

In [46]:

```
from sklearn.model_selection import train_test_split
```

In [47]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.4, random_state=101)
```

Creating and Training the LinearRegression Model

In [48]:

```
from sklearn.linear_model import LinearRegression
```

In [49]:

```
lm = LinearRegression()
```

In [58]:

```
lm.fit(X_train,y_train)
```

Out[58]:

▸ LinearRegression

LinearRegression Model Evaluation

In [60]:

```
print(lm.intercept_)
```

```
-2640159.7968525267
```

In [61]:

```
coeff_df = pd.DataFrame(lm.coef_,X.columns, columns = ['Coefficient'])
coeff_df
```

Out[61]:

	Coefficient
Avg. Area Income	21.528276
Avg. Area House Age	164883.282027
Avg. Area Number of Rooms	122368.678027
Avg. Area Number of Bedrooms	2233.801864
Area Population	15.150420

Predictions from our Linear Regression Model

In [62]:

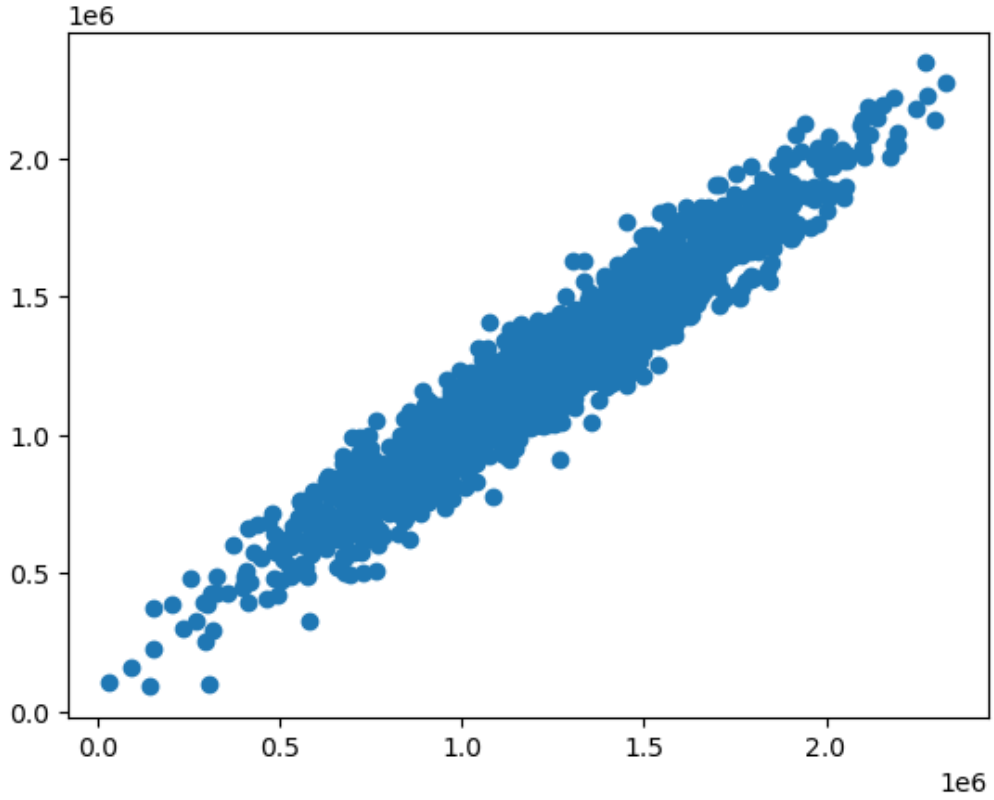
```
predictions = lm.predict(X_test)
```

In [63]:

```
plt.scatter(y_test,predictions)
```

Out[63]:

```
<matplotlib.collections.PathCollection at 0x2c4e982b910>
```



In the above scatter plot, we see data is in line shape, which means our model has done good predictions.

In [65]:

```
sns.distplot((y_test-predictions),bins=50);
```

```
C:\Users\baps\AppData\Local\Temp\ipykernel_15644\1326397652.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

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b.com/mwaskom/de44147ed2974457ad6372750bbe5751)

  sns.distplot((y_test-predictions),bins=50);
```

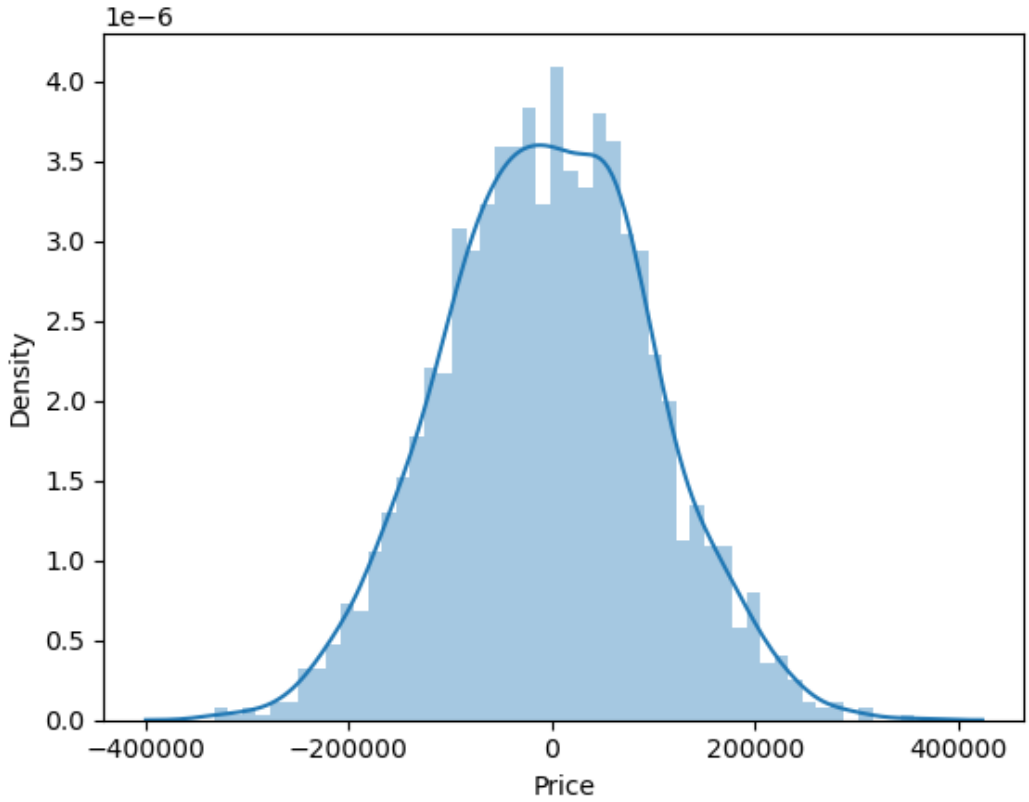

In the above histogram plot, we see data is in bell shape (Normally Distributed), which means our model has done good predictions.

Regression Evaluation Metrics

In [66]:

```
from sklearn import metrics
```

In [69]:

```
print('MAE',metrics.mean_absolute_error(y_test,predictions))
print('MSE',metrics.mean_squared_error(y_test,predictions))
print('RSME',np.sqrt(metrics.mean_squared_error(y_test,predictions)))
```

```
MAE 82288.22251914947
MSE 10460958907.209059
RSME 102278.82922290936
```

In [ ]:

In [ ]:

In [ ]: