

# Machine Learning

```
In [69]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

```
In [4]: df=pd.read_csv('USA_Housing.csv')
```

```
In [5]: df.head()
```

Out[5]:

	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

```
In [7]: df.describe()
```

Out[7]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population	Price
<b>count</b>	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000	5.000000e+03
<b>mean</b>	68583.108984	5.977222	6.987792	3.981330	36163.516039	1.232073e+06
<b>std</b>	10657.991214	0.991456	1.005833	1.234137	9925.650114	3.531176e+05
<b>min</b>	17796.631190	2.644304	3.236194	2.000000	172.610686	1.593866e+04
<b>25%</b>	61480.562388	5.322283	6.299250	3.140000	29403.928702	9.975771e+05
<b>50%</b>	68804.286404	5.970429	7.002902	4.050000	36199.406689	1.232669e+06
<b>75%</b>	75783.338666	6.650808	7.665871	4.490000	42861.290769	1.471210e+06
<b>max</b>	107701.748378	9.519088	10.759588	6.500000	69621.713378	2.469066e+06

In [15]: `X=df[['Avg. Area Income','Avg. Area House Age','Avg. Area Number of Rooms','Avg. Ar`

In [22]: `Y=df[['Price']]`

In [18]: `X`

Out[18]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population
<b>0</b>	79545.458574	5.682861	7.009188	4.09	23086.800503
<b>1</b>	79248.642455	6.002900	6.730821	3.09	40173.072174
<b>2</b>	61287.067179	5.865890	8.512727	5.13	36882.159400
<b>3</b>	63345.240046	7.188236	5.586729	3.26	34310.242831
<b>4</b>	59982.197226	5.040555	7.839388	4.23	26354.109472
...	...	...	...	...	...
<b>4995</b>	60567.944140	7.830362	6.137356	3.46	22837.361035
<b>4996</b>	78491.275435	6.999135	6.576763	4.02	25616.115489
<b>4997</b>	63390.686886	7.250591	4.805081	2.13	33266.145490
<b>4998</b>	68001.331235	5.534388	7.130144	5.44	42625.620156
<b>4999</b>	65510.581804	5.992305	6.792336	4.07	46501.283803

5000 rows × 5 columns

In [23]: `Y`

Out[23]:

	Price
<b>0</b>	1.059034e+06
<b>1</b>	1.505891e+06
<b>2</b>	1.058988e+06
<b>3</b>	1.260617e+06
<b>4</b>	6.309435e+05
...	...
<b>4995</b>	1.060194e+06
<b>4996</b>	1.482618e+06
<b>4997</b>	1.030730e+06
<b>4998</b>	1.198657e+06
<b>4999</b>	1.298950e+06

5000 rows × 1 columns

## Train Test SPLIT

In [34]: `X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.1,random_state=42)`

In [35]: `X_train`

Out[35]:

	Avg. Area Income	Avg. Area House Age	Avg. Area Number of Rooms	Avg. Area Number of Bedrooms	Area Population
3716	65903.250658	6.616682	7.062269	3.17	45208.387659
3779	50502.094188	7.407850	6.666403	3.17	37593.862491
135	74411.059892	5.534628	7.210123	6.44	43537.502946
4480	71481.034926	5.188492	7.152361	4.32	45246.174103
1437	70795.298849	6.210045	7.582602	3.35	29887.451681
...	...	...	...	...	...
4426	76223.561256	6.371627	5.342217	2.42	30165.337445
466	56685.014442	6.958045	7.502115	3.38	43322.166854
3092	66195.337714	6.507971	6.611861	3.14	37288.923574
3772	58694.515017	7.394768	9.269453	4.32	49960.977236
860	61162.580254	5.896316	7.880521	6.04	36033.701431

4500 rows × 5 columns

In [39]: `Lr_model=LinearRegression()`

In [41]: `Lr_model`

Out[41]: `LinearRegression` ⓘ ⓘ  
`LinearRegression()`

In [43]: `Lr_model.fit(X_train,Y_train)`

Out[43]: `LinearRegression` ⓘ ⓘ  
`LinearRegression()`

## Prediction

In [46]: `y_prediction=Lr_model.predict(X_test)`

In [47]: `y_prediction`

```
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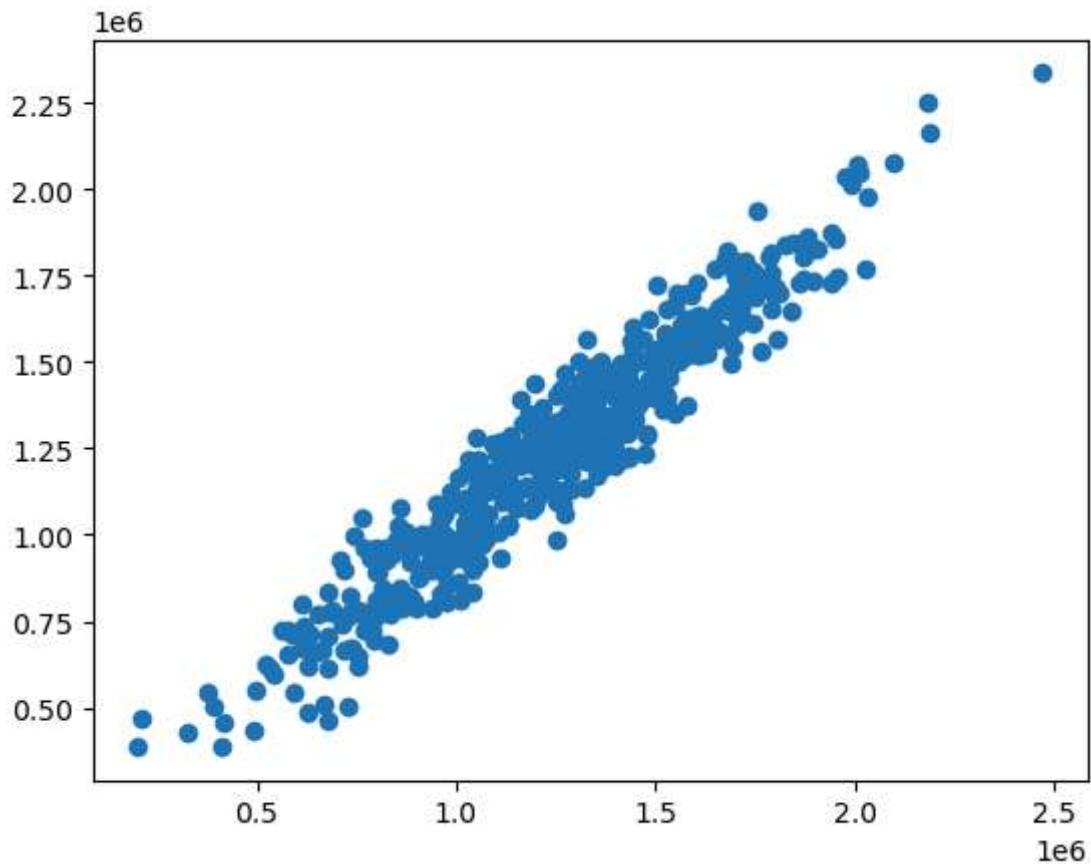
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[1308995.70105445],  
[1140857.17124747],  
[1205828.01606861],  
[1281859.53422703],  
[1173468.91332256],  
[1568903.74157123],  
[1323289.49950604],  
[1167054.41413003],  
[ 788990.3023967 ],  
[1144611.79982848],  
[ 649143.86179285],  
[1071274.70793727],  
[1427160.02044344]))
```

In [48]: `plt.scatter(Y_test,y_prediction)`

Out[48]: <matplotlib.collections.PathCollection at 0x1e8d1cbd3a0>



```
In [57]: from sklearn.metrics import mean_absolute_error, mean_squared_error
```

```
In [53]: mae1=mean_absolute_error(Y_test,y_prediction)
```

```
In [55]: mae1
```

```
Out[55]: 82006.41194222336
```

```
In [60]: mse1=mean_squared_error(Y_test,y_prediction)
```

```
In [61]: mse1
```

```
Out[61]: 10324589581.306831
```

```
In [63]: rmse=np.sqrt(mse1)
```

```
In [64]: rmse
```

```
Out[64]: 101609.98760607558
```

## Logistics Regression

```
In [ ]:
```