Here we will practice Standardization

```
#import the data

import pandas as pd
import requests
from io import StringIO

url = "https://raw.githubusercontent.com/campusx-official/100-days-of-machine-learning/refs/heads/main/day24-standardization
headers = {"User-Agent": "Mozilla/5.0 (Macintosh; Intel Mac OS X 10.14; rv:66.0) Gecko/20100101 Firefox/66.0"}
req = requests.get(url, headers=headers)
data = StringIO(req.text)

data = pd.read_csv(data)
```

```
data
```

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

400 rows × 5 columns

Next steps: Generate code with data | New interactive sheet

```
#choose only columns which are required
df = data.iloc[:,2:]
```

```
df.sample(5)
```

	Age	EstimatedSalary	Purchased
283	52	21000	1
209	46	22000	0
8	25	33000	0
95	35	44000	0
253	37	146000	1

```
#train_test_split
from sklearn.model_selection import train_test_split
x_train , x_test ,y_train , y_test = train_test_split(df.drop('Purchased',axis=1) ,df['Purchased'],test_size=0.3 , random_s
x_train.shape , x_test.shape
```

```
((280, 2), (120, 2))
```

```
#perform standardization
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
scaler.fit(x_train)
x_train_scaled = scaler.transform(x_train)
x_test_scaled = scaler.transform(x_test)
```

```
scaler.mean_
```

```
array([3.78642857e+01, 6.98071429e+04])
```

```
#this is the x_train after standardization , which is in numpy array
x_train_scaled
```

```
       [ 0.11134522,  1.04666291],
       [-0.08473441, -0.37037036],
       [-1.1631724 ,  0.06341534],
       [-0.28081405, -1.35361793],
       [ 1.58194247,  1.104501  ],
       [-0.77101313, -1.52713221],
       [ 0.11134522,  1.8563962 ],
       [-0.86905295, -0.775237  ],
       [-0.47689368, -0.775237  ],
       [-0.28081405, -0.91983223],
       [ 0.30742485, -0.71739891],
       [ 0.30742485,  0.06341534],
       [ 0.11134522,  1.8563962 ],
       [-1.06513258,  1.94315334],
       [-1.65337148, -1.55605125],
       [-1.1631724 , -1.09334651],
       [-0.67297331, -0.11009894],
       [ 0.11134522,  0.09233438],
       [ 0.30742485,  0.26584866],
       [ 0.89566375, -0.57280368],
       [ 0.30742485, -1.1511846 ],
       [-0.08473441,  0.67071531],
       [ 2.17018137, -0.68847986],
       [-1.26121221, -1.38253697],
       [-0.96709276, -0.94875128],
       [ 0.0133054 , -0.42820845],
       [-0.18277423, -0.45712749],
       [-1.7514113 , -0.97767033],
       [ 1.7780221 ,  0.98882482],
       [ 0.20938504, -0.37037036],
       [ 0.40546467,  1.104501  ],
       [-1.7514113 , -1.35361793],
       [ 0.20938504, -0.13901799],
       [ 0.89566375, -1.44037507],
       [-1.94749093,  0.46828198],
       [-0.28081405,  0.26584866],
       [ 1.87606192, -1.06442747],
       [-0.37885386,  0.06341534],
       [ 1.09174339, -0.89091319],
       [-1.06513258, -1.12226556],
       [-1.84945111,  0.00557724],
       [ 0.11134522,  0.26584866],
       [-1.1631724 ,  0.32368675],
       [-1.26121221,  0.29476771],
       [-0.96709276,  0.43936294],
       [ 1.67998229, -0.89091319],
       [ 1.1897832 ,  0.52612008],
       [ 1.09174339,  0.52612008],
       [ 1.38586284,  2.31910094],
       [-0.28081405, -0.13901799],
       [ 0.40546467, -0.45712749],
       [-0.37885386, -0.775237  ],
       [-0.08473441, -0.51496559],
       [ 0.99370357, -1.1511846 ],
       [-0.86905295, -0.775237  ],
       [-0.18277423, -0.51496559],
       [-1.06513258, -0.45712749],
       [-1.1631724 ,  1.39369146]])
```

```
#this is the x_test after standardization , which is in numpy array
x_test_scaled
```

```
array([[-0.77101313,  0.49720103],
       [ 0.0133054 , -0.57280368],
       [-0.28081405,  0.15017248],
       [-0.77101313,  0.26584866],
       [-0.28081405, -0.57280368],
       [-1.06513258, -1.44037507],
       [-0.67297331, -1.5849703 ],
       [-0.18277423,  2.14558666],
       [-1.94749093, -0.05226085],
       [ 0.89566375, -0.775237  ],
       [-0.77101313, -0.60172273],
       [-0.96709276, -0.42820845],
       [-0.08473441, -0.42820845],
       [ 0.11134522,  0.20801057],
       [-1.7514113 ,  0.46828198],
       [-0.5749335 ,  1.36477242],
       [-0.08473441,  0.20801057],
       [-1.84945111,  0.43936294],
       [ 1.67998229,  1.74072002],
       [-0.28081405, -1.38253697],
       [-0.28081405, -0.65956082],
```

```
       [ 0.89566375,  2.14558666],
       [ 0.30742485, -0.54388463],
       [ 0.89566375,  1.01774386],
       [-1.45729185, -1.2090227 ],
       [ 1.09174339,  2.05882953],
       [-0.96709276,  0.49720103],
       [-0.86905295,  0.29476771],
       [-0.08473441, -0.22577513],
       [-0.5749335 ,  0.46828198],
       [-1.65337148,  0.52612008],
       [-0.08473441,  0.26584866],
       [ 1.87606192, -0.28361322],
       [-0.08473441, -0.48604654],
       [-1.35925203, -0.34145131],
       [-1.94749093, -0.51496559],
       [-1.55533166,  0.32368675],
       [-0.37885386, -0.775237  ],
       [-0.67297331, -1.03550842],
       [ 1.09174339, -0.97767033],
       [-1.06513258,  0.52612008],
       [ 0.30742485, -0.51496559],
       [-1.06513258,  0.41044389],
       [-0.28081405, -1.44037507],
       [ 0.50350449,  1.22017719],
       [-1.06513258, -0.34145131],
       [-0.08473441,  0.29476771],
       [ 1.38586284,  0.58395817],
       [-1.1631724 , -1.1511846 ],
       [ 1.09174339,  0.46828198],
       [ 1.87606192,  1.50936765],
       [-0.37885386, -1.29577984],
       [-0.28081405, -0.37037036],
       [-0.37885386,  1.30693432],
       [ 2.07214155,  0.52612008],
       [ 0.69958412, -1.09334651],
       [-0.86905295,  0.38152485],
       [-1.1631724 ,  0.29476771]]
```

```
#now convert those numpy array into a proper daraframe
x_test_scaled = pd.DataFrame(x_test_scaled , columns=x_test.columns)
x_train_scaled = pd.DataFrame(x_train_scaled , columns=x_test.columns)
```

```
x_test_scaled
```

	Age	EstimatedSalary
0	-0.771013	0.497201
1	0.013305	-0.572804
2	-0.280814	0.150172
3	-0.771013	0.265849
4	-0.280814	-0.572804
...	...	...
115	1.091743	-0.139018
116	0.699584	1.769639
117	-0.672973	0.555039
118	0.797624	0.352606
119	0.895664	-0.543885

120 rows × 2 columns

Next steps: Generate code with x_test_scaled | New interactive sheet

```
x_train_scaled
```

	Age	EstimatedSalary
0	-1.163172	-1.584970
1	2.170181	0.930987
2	0.013305	1.220177
3	0.209385	1.075582
4	0.405465	-0.486047
...	...	...
275	0.993704	-1.151185
276	-0.869053	-0.775237
277	-0.182774	-0.514966
278	-1.065133	-0.457127
279	-1.163172	1.393691

280 rows × 2 columns

Next steps: Generate code with x_train_scaled | New interactive sheet

```
#now in last observe that the mean is 0 & SD is 1 .
import numpy as np
np.round(x_train_scaled.describe(),1)
```

	Age	EstimatedSalary
count	280.0	280.0
mean	0.0	0.0
std	1.0	1.0
min	-1.9	-1.6
25%	-0.8	-0.8
50%	-0.1	0.0
75%	0.8	0.5
max	2.2	2.3

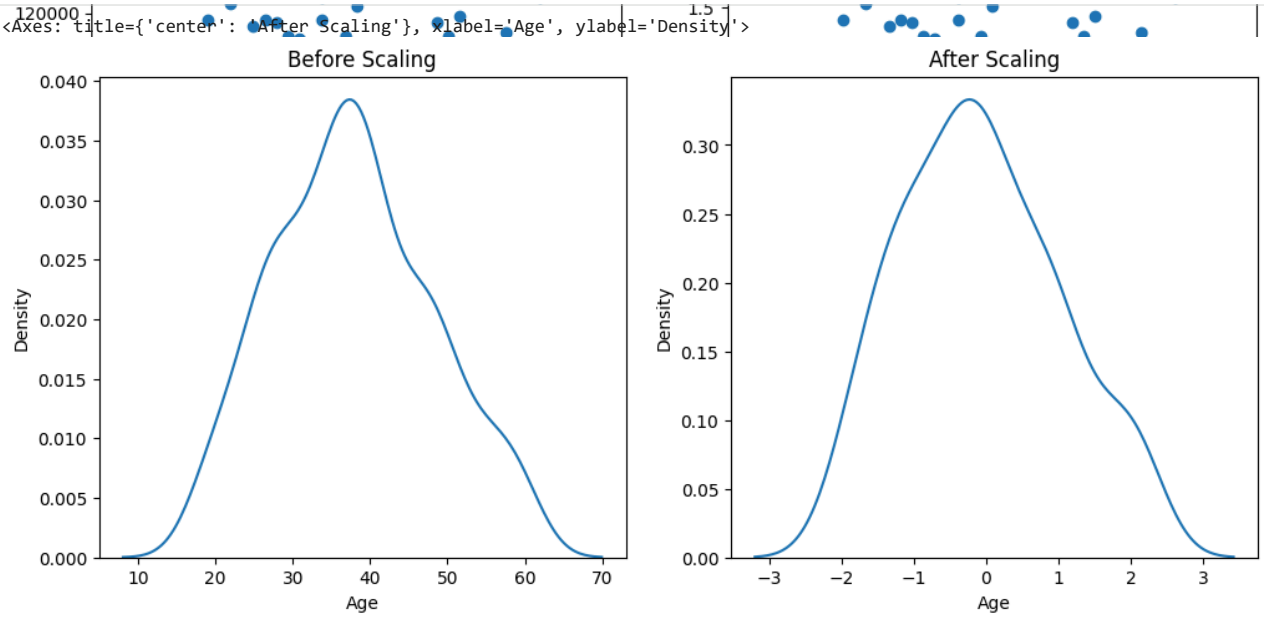
```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
#we will see effect of standardization through graph
fig ,(ax1 , ax2) = plt.subplots(ncols = 2 , figsize = (12,5))
ax1.scatter(x_train['Age'], x_train['EstimatedSalary'])
ax1.set_title("Before Scaling")
ax2.scatter(x_train_scaled['Age'],x_train_scaled['EstimatedSalary'])
ax2.set_title("After Scaling")
```

```
Text(0.5, 1.0, 'After Scaling')
```

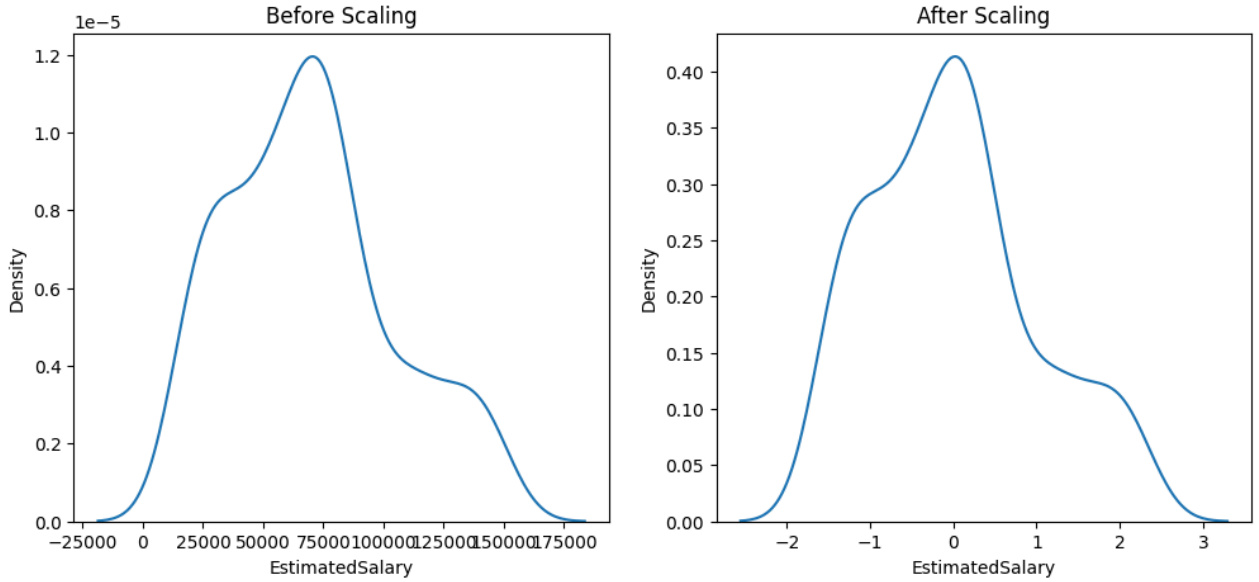
```
fig , (ax1 , ax2) = plt.subplots(ncols=2 , figsize = (12,5))
ax1.set_title("Before Scaling")
sns.kdeplot(x_train['Age'],ax=ax1)
ax2.set_title("After Scaling")
sns.kdeplot(x_test_scaled['Age'],ax=ax2)
```

```
<Axes: title={'center': 'After Scaling'}, xlabel='Age', ylabel='Density'>
```




```
fig ,(ax1,ax2) = plt.subplots(ncols=2 , figsize =(12,5))
ax1.set_title("Before Scaling")
sns.kdeplot(x_train['EstimatedSalary'],ax=ax1)
ax2.set_title("After Scaling")
sns.kdeplot(x_train_scaled['EstimatedSalary'],ax=ax2)
```

```
<Axes: title={'center': 'After Scaling'}, xlabel='EstimatedSalary', ylabel='Density'>
```



Close

```
the only thing is changed is the feature scaling ,  the distribu
```

the only thing is changed is the feature scaling , the distribution remain same