2.0- Feature Scaling- standardization

January 2, 2024

0.1 Standardization

[1]:
```
import seaborn as sns
```

[2]:
```
df=sns.load_dataset('tips')
```

[3]:
```
df.head()
```

[3]:

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

[4]:
```
total_bill=list(df['total_bill'])
```

[5]:
```
total_bill
```

[5]:
```
[16.99,
 10.34,
 21.01,
 23.68,
 24.59,
 25.29,
 8.77,
 26.88,
 15.04,
 14.78,
 10.27,
 35.26,
 15.42,
 18.43,
 14.83,
 21.58,
 10.33,
 16.29,
 16.97,
```

20.65,
17.92,
20.29,
15.77,
39.42,
19.82,
17.81,
13.37,
12.69,
21.7,
19.65,
9.55,
18.35,
15.06,
20.69,
17.78,
24.06,
16.31,
16.93,
18.69,
31.27,
16.04,
17.46,
13.94,
9.68,
30.4,
18.29,
22.23,
32.4,
28.55,
18.04,
12.54,
10.29,
34.81,
9.94,
25.56,
19.49,
38.01,
26.41,
11.24,
48.27,
20.29,
13.81,
11.02,
18.29,
17.59,
20.08,

16.45,
3.07,
20.23,
15.01,
12.02,
17.07,
26.86,
25.28,
14.73,
10.51,
17.92,
27.2,
22.76,
17.29,
19.44,
16.66,
10.07,
32.68,
15.98,
34.83,
13.03,
18.28,
24.71,
21.16,
28.97,
22.49,
5.75,
16.32,
22.75,
40.17,
27.28,
12.03,
21.01,
12.46,
11.35,
15.38,
44.3,
22.42,
20.92,
15.36,
20.49,
25.21,
18.24,
14.31,
14.0,
7.25,
38.07,

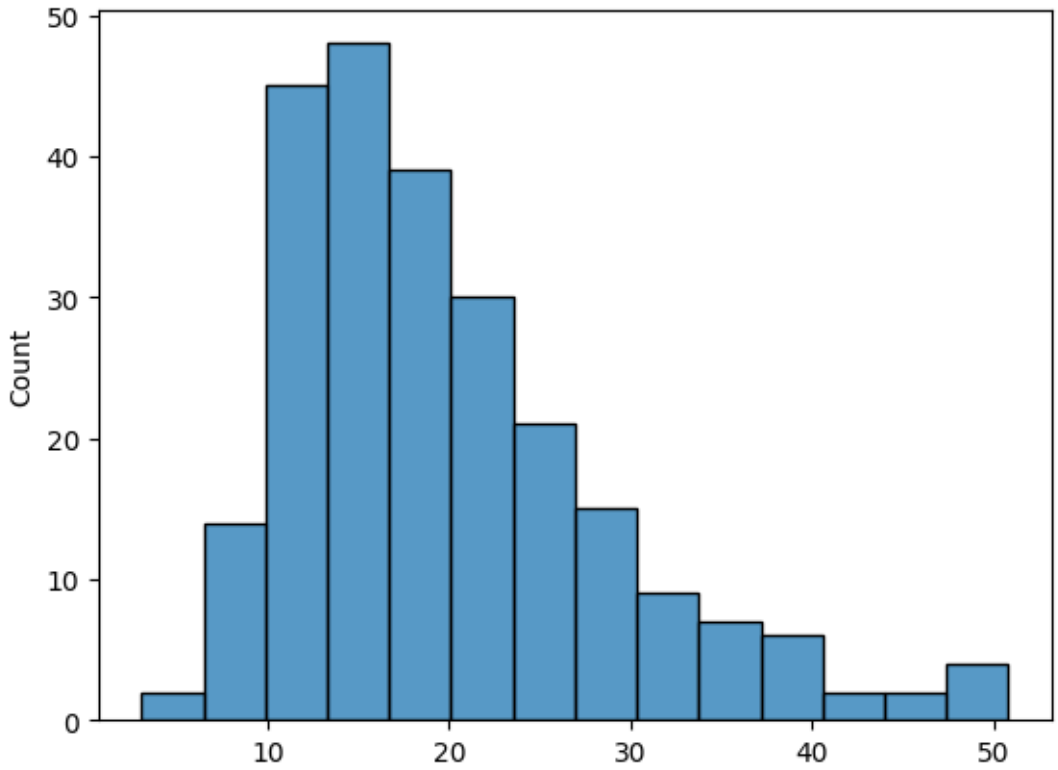
```
23.95,
25.71,
17.31,
29.93,
10.65,
12.43,
24.08,
11.69,
13.42,
14.26,
15.95,
12.48,
29.8,
8.52,
14.52,
11.38,
22.82,
19.08,
20.27,
11.17,
12.26,
18.26,
8.51,
10.33,
14.15,
16.0,
13.16,
17.47,
34.3,
41.19,
27.05,
16.43,
8.35,
18.64,
11.87,
9.78,
7.51,
14.07,
13.13,
17.26,
24.55,
19.77,
29.85,
48.17,
25.0,
13.39,
16.49,
```

21.5,
12.66,
16.21,
13.81,
17.51,
24.52,
20.76,
31.71,
10.59,
10.63,
50.81,
15.81,
7.25,
31.85,
16.82,
32.9,
17.89,
14.48,
9.6,
34.63,
34.65,
23.33,
45.35,
23.17,
40.55,
20.69,
20.9,
30.46,
18.15,
23.1,
15.69,
19.81,
28.44,
15.48,
16.58,
7.56,
10.34,
43.11,
13.0,
13.51,
18.71,
12.74,
13.0,
16.4,
20.53,
16.47,
26.59,

```
38.73,
24.27,
12.76,
30.06,
25.89,
48.33,
13.27,
28.17,
12.9,
28.15,
11.59,
7.74,
30.14,
12.16,
13.42,
8.58,
15.98,
13.42,
16.27,
10.09,
20.45,
13.28,
22.12,
24.01,
15.69,
11.61,
10.77,
15.53,
10.07,
12.6,
32.83,
35.83,
29.03,
27.18,
22.67,
17.82,
18.78]
```

[6]:
```
sns.histplot(total_bill)
```

[6]:
```
<Axes: ylabel='Count'>
```



[7]:
```
import numpy as np
mean=np.mean(total_bill)
std=np.std(total_bill)
```

[8]:
```
mean,std
```

[8]: (19.78594262295082, 8.884150577771132)

[9]:
```
normalized_data=[]
for i in total_bill:
    z_score=(i-mean)/std ## z_score
    normalized_data.append(z_score)

print(normalized_data)
```

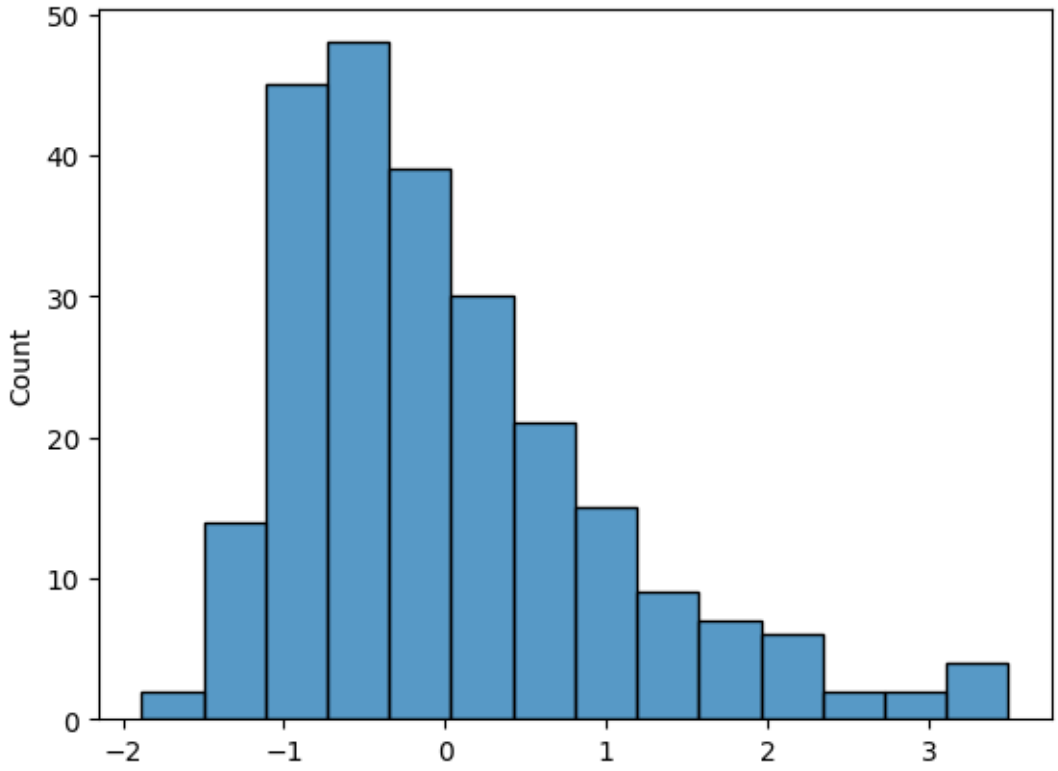
```
[-0.3147113050904943, -1.0632353132988692, 0.13777989987156145,
0.43831510316725475, 0.540744704290506, 0.6195367051545455, -1.2399545152367863,
0.7985071071171495, -0.5342033074974614, -0.5634689078183903,
-1.0711145133852733, 1.7417599174609364, -0.49143050702841123,
-0.15262490331304146, -0.557840907756673, 0.2019391005751361,
-1.0643609133112126, -0.3935033059545337, -0.31696250511518104,
0.09725829942719795, -0.2100305039425557, 0.05673669898283484,
```

-0.45203450659639155, 2.2100095225958003, 0.003833498402694168,
-0.2224121040783337, -0.7221785095588127, -0.7987193103981653,
0.21544630072325727, -0.015301701807144186, -1.1521577142739994,
-0.16162970341178864, -0.5319521074727743, 0.10176069947657193,
-0.22578890411536368, 0.4810879036363046, -0.3912521059298469,
-0.32146490516455467, -0.12335930299211233, 1.2926455125359115,
-0.4216433062631192, -0.2618081045103532, -0.6580193088552376,
-1.137524914113535, 1.1947183114620337, -0.16838330348584943,
0.2751031013774587, 1.419838313930718, 0.986482309178501, -0.19652330379443494,
-0.8156033105833167, -1.0688633133605865, 1.691107916905483,
-1.1082593137926062, 0.6499279054878179, -0.03331130200463894,
2.051299920855377, 0.7456039065370088, -0.9619313121879614, 3.206165533519728,
0.05673669898283484, -0.672652109015702, -0.9866945124595167,
-0.16838330348584943, -0.24717530434988882, 0.0330990987236229,
-0.37549370575703894, -1.8815465222725365, 0.049983098908774455,
-0.5375801075344916, -0.8741345112251745, -0.3057065049917467,
0.7962559070924626, 0.6184111051422023, -0.5690969078801073, -1.044100113089031,
-0.2100305039425557, 0.834526307512139, 0.3347599020316602, -0.2809433047201916,
-0.03893930206635573, -0.351856105497827, -1.0936265136321417,
1.451355114276334, -0.4283969063371796, 1.6933591169301694, -0.760448909978489,
-0.16950890349819261, 0.5542519044386273, 0.1546639000567126,
1.0337575096969245, 0.3043687016983874, -1.5798857189644997,
-0.3901265059175033, 0.3336343020193166, 2.294429523521557, 0.8435311076108866,
-0.8730089112128311, 0.13777989987156145, -0.8246081106820639,
-0.9495497120521837, -0.4959329070777848, 2.759302328619389,
0.29648950161198384, 0.12764949976047066, -0.49818410710247185,
0.07924869922970319, 0.6105319050557984, -0.1740113035475666,
-0.616372108398531, -0.6512657087811771, -1.4110457171129864, 2.058053520929438,
0.46870630350052706, 0.6668119056729693, -0.27869210469550476,
1.141815110881893, -1.0283417129162231, -0.8279849107190942, 0.4833391036609914,
-0.9112793116325074, -0.7165505094970955, -0.6220001084602481,
-0.43177370637421, -0.822356910657377, 1.1271823107214287, -1.268094515545372,
-0.5927345081393192, -0.9461729120151534, 0.34151350210572057,
-0.07946090251071923, 0.05448549895814805, -0.9698105122743653,
-0.8471201109289324, -0.1717601035228794, -1.2692201155577154,
-1.0643609133112126, -0.6343817085960257, -0.4261457063124928,
-0.7458161098180245, -0.26068250449801, 1.6337023162759678, 2.4092407247805854,
0.8176423073269878, -0.3777449057817257, -1.2872297157552102,
-0.12898730305382952, -0.8910185114103258, -1.126268913990101,
-1.3817801167920576, -0.6433865086947731, -0.7491929098550546,
-0.2843201047572215, 0.5362423042411325, -0.0017945016590230187,
1.1328103107831458, 3.194909533396294, 0.5868943047965863, -0.7199273095341256,
-0.3709913057076653, 0.1929343004763889, -0.8020961104351955,
-0.40250810605328086, -0.672652109015702, -0.25618010444863604,
0.5328655042041021, 0.10963989956297591, 1.3421719130790222,
-1.0350953129902838, -1.03059291294091, 3.492067936654957, -0.44753210654701775,
-1.4110457171129864, 1.3579303132518301, -0.3338465053003322, 1.476118314547889,
-0.2134073039795861, -0.5972369081886928, -1.1465297142122826,

```
1.6708471166833014, 1.6730983167079878, 0.39891910273523484, 2.877490329915449,
0.3809095025377405, 2.3372023239906063, 0.10176069947657193,
0.12539829973578348, 1.2014719115360946, -0.18414170365865737,
0.3730303024513365, -0.46103930669513893, 0.0027078983903505707,
0.9741007090427235, -0.4846769069543507, -0.3608609055965746,
-1.3761521167303405, -1.0632353132988692, 2.6253559271505225,
-0.7638257100155192, -0.7064201093860047, -0.12110810296742554,
-0.7930913103364481, -0.7638257100155192, -0.3811217058187561,
0.08375109927907717, -0.3732425057323521, 0.7658647067591904,
2.1323431217441033, 0.5047255038955165, -0.7908401103117614, 1.1564479110423573,
0.6870727058951509, 3.212919133593788, -0.7334345096822469, 0.9437095087094511,
-0.7750817101389533, 0.9414583086847639, -0.9225353117559416,
-1.3558913165081588, 1.165452711141105, -0.8583761110523666,
-0.7165505094970955, -1.2613409154713113, -0.4283969063371796,
-0.7165505094970955, -0.39575450597922046, -1.0913753136074549,
0.0747462991803296, -0.7323089096699035, 0.26272150124168114,
0.47545990357458784, -0.46103930669513893, -0.9202841117312548,
-1.0148345127681022, -0.4790489068926337, -1.0936265136321417,
-0.8088497105092561, 1.468239114461485, 1.8059191181645116, 1.0405111097709854,
0.8322751074874521, 0.3246295019205694, -0.2212865040659901,
-0.11322890288102155]
```

[10]:
```
sns.histplot(normalized_data)
```

[10]:
```
<Axes: ylabel='Count'>
```



[ ]:
```
from sklearn.preprocessing import StandardScaler
```

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

[ ]:
```
   total_bill   tip     sex smoker  day    time  size
0       16.99  1.01  Female     No  Sun  Dinner     2
1       10.34  1.66    Male     No  Sun  Dinner     3
2       21.01  3.50    Male     No  Sun  Dinner     3
3       23.68  3.31    Male     No  Sun  Dinner     2
4       24.59  3.61  Female     No  Sun  Dinner     4
```

[ ]:
```
scaler=StandardScaler()
```

[ ]:
```
scaler
```

[ ]:
```
StandardScaler()
```

[ ]:
```
scaler.fit(df[['total_bill','tip']])
```

[ ]:
```
StandardScaler()
```

[ ]:
```
import pandas as pd
pd.DataFrame(scaler.
 ↪transform(df[['total_bill','tip']]),columns=['total_bill','tips'])
```

[ ]:
```
     total_bill      tips
0     -0.314711 -1.439947
1     -1.063235 -0.969205
2      0.137780  0.363356
3      0.438315  0.225754
4      0.540745  0.443020
..          …       …
239    1.040511  2.115963
240    0.832275 -0.722971
241    0.324630 -0.722971
242   -0.221287 -0.904026
243   -0.113229  0.001247

[244 rows x 2 columns]
```

[ ]:
```

```