LAB-TASK

May 28, 2024

0.1 PROBELM 1

```python
import numpy as np
import pandas as pd
path="/media/shafeenkhan/DOCUMENTS/My-all-programs--/Semester-4/Aritificial
 ↪Intelligence/LAB-02/LAB-TASK/dataset.csv"
df=pd.read_csv(path)
df=pd.DataFrame(df)
df
```

```
[ ]:      source  target   age  connections
   0        1       2  18.0          6.0
   1        1       3  18.0          6.0
   2        1       5  18.0          6.0
   3        2       4  10.0          6.0
   4        3       5  11.0          4.0
   5        4       5  10.0          5.0
   6        5       1  15.0          9.0
   7        5       2  15.0          9.0
   8        5       6  15.0          9.0
   9        6       2  11.0          4.0
   10       7       9  24.0         10.0
   11       7      11  24.0         10.0
   12       7      12  24.0         10.0
   13       7      13  24.0         10.0
   14       7      14  24.0         10.0
   15       7       2  24.0         10.0
   16       8       6  12.0          3.0
   17       8       7  12.0          3.0
   18       9       5  10.0          3.0
   19      10       4  11.0          2.0
   20      11      23  19.0          6.0
   21      11      22  19.0          6.0
   22      11      20  19.0          6.0
   23      11       4  19.0          6.0
   24      12       9  26.0         10.0
   25      12      14  26.0         10.0
   26      12      15  26.0         10.0
```

```
27    12    20  26.0         10.0
28    12    21  26.0         10.0
29    12    25  26.0         10.0
30    12     4  26.0         10.0
31    13     3  13.0          2.0
32    14     2  12.0          4.0
33    15     5  10.0          2.0
34    16    21  21.0          7.0
35    16    19  21.0          7.0
36    16    18  21.0          7.0
37    16     7  21.0          7.0
38    16     8  21.0          7.0
39    16    12  21.0          7.0
40    17     1  20.0          5.0
41    17     3  20.0          5.0
42    17     6  20.0          5.0
43    17     7  20.0          5.0
44    18    10  12.0          2.0
45    19    11  11.0          3.0
46    20    12  13.0          3.0
47    21    14  11.0          3.0
48    22    23  12.0          2.0
49    23    24  23.0          7.0
50    23    25  23.0          7.0
51    23    19  23.0          7.0
52    23    16  23.0          7.0
53    23    17  23.0          7.0
54    24     1  12.0          3.0
55    24     5  12.0          3.0
56    25     7  11.0          3.0
57    26     7   NaN          NaN
58    27    17   NaN          NaN
```

```python
import networkx as nx
df.isnull().sum()
mean=df.mean()
mean
df.replace(np.nan,mean,inplace=True)
df
```

```
     source  target         age  connections
0         1       2  18.000000     6.000000
1         1       3  18.000000     6.000000
2         1       5  18.000000     6.000000
3         2       4  10.000000     6.000000
4         3       5  11.000000     4.000000
5         4       5  10.000000     5.000000
```

6	5	1	15.000000	9.000000
7	5	2	15.000000	9.000000
8	5	6	15.000000	9.000000
9	6	2	11.000000	4.000000
10	7	9	24.000000	10.000000
11	7	11	24.000000	10.000000
12	7	12	24.000000	10.000000
13	7	13	24.000000	10.000000
14	7	14	24.000000	10.000000
15	7	2	24.000000	10.000000
16	8	6	12.000000	3.000000
17	8	7	12.000000	3.000000
18	9	5	10.000000	3.000000
19	10	4	11.000000	2.000000
20	11	23	19.000000	6.000000
21	11	22	19.000000	6.000000
22	11	20	19.000000	6.000000
23	11	4	19.000000	6.000000
24	12	9	26.000000	10.000000
25	12	14	26.000000	10.000000
26	12	15	26.000000	10.000000
27	12	20	26.000000	10.000000
28	12	21	26.000000	10.000000
29	12	25	26.000000	10.000000
30	12	4	26.000000	10.000000
31	13	3	13.000000	2.000000
32	14	2	12.000000	4.000000
33	15	5	10.000000	2.000000
34	16	21	21.000000	7.000000
35	16	19	21.000000	7.000000
36	16	18	21.000000	7.000000
37	16	7	21.000000	7.000000
38	16	8	21.000000	7.000000
39	16	12	21.000000	7.000000
40	17	1	20.000000	5.000000
41	17	3	20.000000	5.000000
42	17	6	20.000000	5.000000
43	17	7	20.000000	5.000000
44	18	10	12.000000	2.000000
45	19	11	11.000000	3.000000
46	20	12	13.000000	3.000000
47	21	14	11.000000	3.000000
48	22	23	12.000000	2.000000
49	23	24	23.000000	7.000000
50	23	25	23.000000	7.000000
51	23	19	23.000000	7.000000
52	23	16	23.000000	7.000000

```
53        23      17  23.000000      7.000000
54        24       1  12.000000      3.000000
55        24       5  12.000000      3.000000
56        25       7  11.000000      3.000000
57        26       7  18.210526      6.245614
58        27      17  18.210526      6.245614
```

```python
source_lst=df[["source"]]
target_lst=df[["target"]]
# print(source_lst)
# print(target_lst)
G = nx.from_pandas_edgelist(df)
# print(G.nodes)
# print(G.edges)
options = {
    "font_size": 10,
    "node_size": 500,
    "node_color": "white",
    "edgecolors": "blue",
    "linewidths":4,
    "width": 4,
}
nx.draw(G,**options)
```
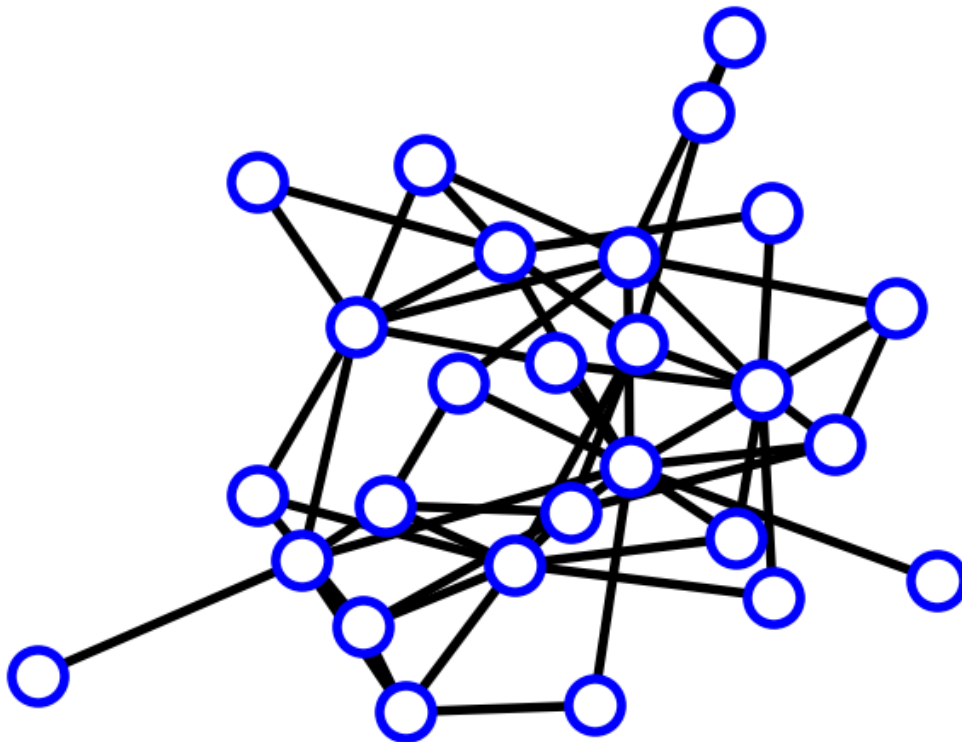
```python
import matplotlib.pyplot as plt
age_lst=df[["age"]]
# print(age_lst)
connectin_lst=df[["connections"]]
plt.hist(age_lst,bins=10)
```

```
(array([10.,  9.,  0.,  3.,  0.,  9., 10.,  0., 11.,  7.]),
 array([10. , 11.6, 13.2, 14.8, 16.4, 18. , 19.6, 21.2, 22.8, 24.4, 26. ]),
 <BarContainer object of 10 artists>)
```
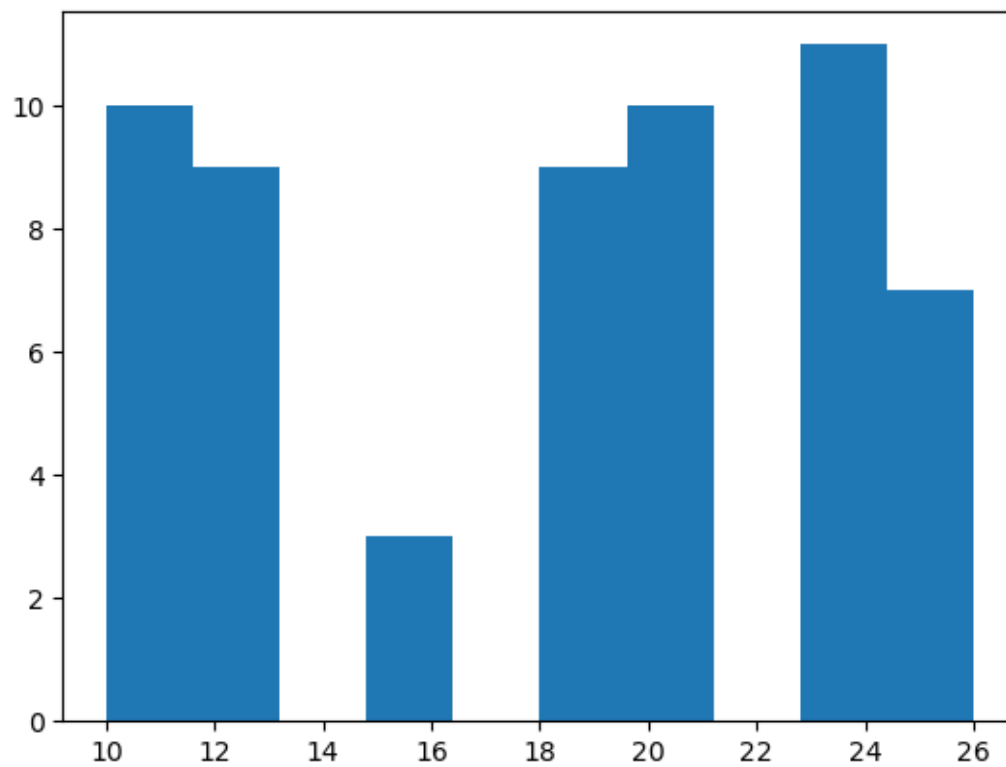


```python
plt.hist(connectin_lst,bins=10)
```

```
(array([ 5.,  9.,  3.,  5.,  0., 10., 11.,  0.,  3., 13.]),
 array([ 2. ,  2.8,  3.6,  4.4,  5.2,  6. ,  6.8,  7.6,  8.4,  9.2, 10. ]),
 <BarContainer object of 10 artists>)
```
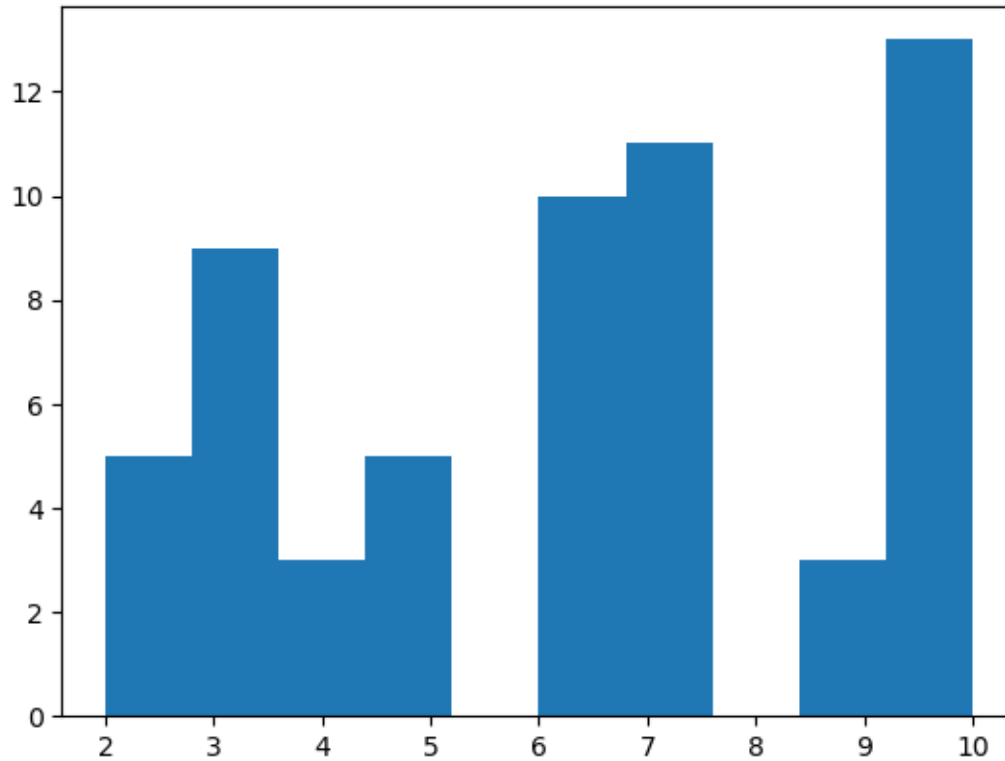
0.2 PROBLEM 2

```
random_numbers = np.random.normal(loc=0,size=1000)
random_numbers
```

```
array([-3.27848092e-01, -1.14757485e+00, -3.13794756e-02, -5.01764951e-01,
        4.91219697e-02, -1.27191088e+00,  5.90370781e-01,  8.48966634e-01,
        3.50182877e-02,  6.27270276e-01, -2.55587218e-01, -4.75183029e-01,
       -2.06762354e-02, -5.45020462e-01,  1.28036271e+00, -5.39414230e-02,
        4.23579019e-01,  2.51900773e-01, -1.13344124e+00,  8.07823476e-01,
        1.56782890e+00, -6.25757296e-01, -2.23919784e+00,  5.02754317e-01,
       -1.56990545e+00,  4.66050518e-01, -1.19647491e+00, -9.49533677e-01,
        5.51082668e-01,  5.12954900e-01,  4.77387777e-01, -1.83312545e+00,
        1.18724314e+00,  8.81298830e-01, -1.49401114e-01,  9.99105518e-02,
        1.56959373e-01, -6.79225514e-01,  6.35515993e-01,  6.82688510e-01,
       -1.37750618e+00, -8.85153014e-01, -1.05328377e+00, -7.70145327e-01,
        5.95263712e-01, -3.57009309e-01, -4.91265837e-01,  3.53518670e-01,
       -5.53960685e-01,  1.88200704e+00,  3.73965516e-01,  2.93955540e+00,
       -8.72921008e-01,  5.18146359e-01, -2.13153486e-01, -9.23652238e-01,
       -1.02977051e-01,  1.14308826e-01, -1.27670012e+00, -3.50909579e-01,
       -5.58815155e-02, -4.38837595e-01,  6.94940926e-02,  2.84407332e-01,
        1.29795815e+00, -3.04758965e-01,  5.33851961e-01, -1.35707605e+00,
```

```
-2.95631468e-01,  4.43137494e-01,  2.12669921e+00,  2.61579521e-01,
-1.81861247e+00, -9.00543828e-01, -1.11198089e+00,  1.81011098e+00,
 8.77138373e-01, -7.58416886e-01, -7.24268971e-01,  3.13141590e-02,
 7.92505264e-01,  2.76541186e+00,  3.45042682e-01,  1.18552053e+00,
 2.63273760e-01, -3.12620001e-01, -1.46775095e+00,  6.15790126e-01,
-1.69985156e+00, -1.19004646e+00,  7.35888769e-01, -7.54584659e-01,
-4.97998888e-01, -1.30355630e+00, -2.09669554e+00, -6.39519657e-01,
-5.11029159e-01, -1.94138340e-01, -1.91617803e+00,  5.13109573e-01,
 2.00743696e-01, -5.75402028e-01,  2.15479809e-01,  1.52286925e-01,
-9.15595912e-02,  1.27455651e+00,  8.76873528e-01,  2.66728959e-01,
-9.58895167e-01,  1.32436970e+00, -1.42212861e+00,  4.27034445e-01,
 2.39706558e-01, -8.72377340e-01,  4.26700326e-01,  2.28789788e-01,
-6.72623224e-01,  1.04644099e+00, -4.02034882e-01,  2.75737213e+00,
-1.02303583e+00, -5.69662906e-01, -7.20400505e-01, -7.37016281e-02,
 1.93936751e+00, -3.65422964e-01,  8.25094935e-01,  1.59158610e+00,
-7.85855177e-02,  3.95245994e-02, -4.34128153e-01,  6.69182879e-01,
-5.02512580e-01,  1.69113510e-01,  1.25358023e+00, -1.32562292e-01,
 1.14644315e+00, -1.53477555e+00,  1.66546520e+00, -6.24142952e-01,
 3.16857231e-01, -2.05827894e+00, -9.34349045e-01,  1.48697015e-01,
 6.14287326e-01,  5.11347712e-01, -1.75371716e+00,  3.93005123e-02,
 2.34876567e-01, -1.14496478e-01,  1.16243846e+00, -1.47444876e+00,
 1.16363760e+00,  8.48060237e-01,  1.61132964e+00,  7.17819030e-02,
 9.16474323e-01,  1.22939439e+00,  4.95242393e-01, -1.42414054e-01,
-9.88915096e-02, -1.99291051e+00, -7.10149418e-01,  5.24712364e-01,
 9.97641537e-01, -5.17175303e-01,  1.54717083e+00, -1.92010113e+00,
-1.39290348e+00, -4.36112454e-01, -2.49220088e+00,  8.80310254e-01,
 3.05070167e+00, -1.01934469e+00,  2.32188770e-01,  1.27307563e+00,
 1.65377434e-01, -1.65885568e+00, -1.78853525e-01, -1.75715585e+00,
 2.08866071e-01, -1.63861944e+00,  6.24065282e-01, -8.33490796e-01,
-2.94148608e-01,  3.42432062e-01,  1.31352897e+00,  9.76952069e-01,
-6.82568445e-01,  1.72609376e+00, -6.07557200e-01,  1.24150861e+00,
-9.61977415e-01, -3.00370173e-01, -8.72827579e-01, -1.93275579e-01,
-1.26618801e+00,  2.05379846e-01,  2.86397084e-01,  2.59838604e-01,
-7.58520823e-01, -9.32079548e-01,  5.73671077e-01,  1.00653487e+00,
-2.48517317e-01, -1.23351999e-01, -5.59051524e-02, -6.54945045e-01,
-5.98615913e-01,  4.12034226e-01,  2.87750688e-01,  5.84159614e-01,
-6.57537520e-01,  1.04434965e+00,  6.61424338e-02, -1.70370714e+00,
-6.85402276e-01,  1.37409518e+00,  2.75660581e-01,  6.05264300e-01,
-2.38155742e-02, -7.28332281e-01, -5.79665658e-01, -6.26509227e-02,
-7.74928319e-01,  2.12924172e-01, -1.36109899e+00,  3.73096785e-01,
 1.65417680e+00,  8.11637030e-01, -1.51310702e-01,  1.32455994e+00,
 1.87012557e-01,  3.61566631e-01, -2.35875210e-01,  4.14339362e-01,
 1.09222950e+00, -1.10340284e+00,  6.40022746e-01, -1.66080978e+00,
 1.27873200e+00,  5.09488255e-03,  1.16479131e+00,  6.96739968e-01,
-1.04001512e+00,  1.56042409e-02,  1.09357395e+00, -4.43655927e-01,
-1.68375631e+00, -5.25790261e-01,  6.62694368e-02,  2.02504841e-01,
 1.10379657e+00, -1.39513257e-01, -1.52357779e-01,  3.46328962e+00,
```

```
-1.01224301e-02,   2.93326622e-01,   1.02031659e+00,   7.20084149e-01,
-9.49209043e-01,  -7.58534776e-01,  -2.02945511e-01,  -4.30354791e-02,
 8.51748456e-01,  -2.60083427e-02,   1.13334636e+00,   4.52852533e-01,
-1.53504050e+00,   9.94273094e-02,   2.35408337e-01,  -2.39852292e-01,
-7.86899940e-01,   7.44804185e-02,   2.34858528e+00,   3.04401260e-01,
-2.17099343e+00,   8.03700516e-01,   5.38476450e-01,   1.06426219e+00,
-1.31692932e+00,   1.49651561e+00,  -2.88544648e+00,   2.39494185e-01,
-5.91596514e-01,  -5.26734749e-01,  -1.43165402e+00,   9.59922057e-01,
 6.84144286e-02,   1.15229814e+00,  -9.83350856e-01,   1.76253740e-01,
-1.09116600e+00,   2.10684478e-01,  -1.65759605e+00,  -1.27793602e+00,
 1.59547673e+00,   4.21678096e-01,   8.89387347e-01,   4.86325572e-01,
 5.86509612e-01,   4.98612948e-01,   5.15617207e-01,  -1.24386057e+00,
-2.03852840e-01,   2.01144482e-01,  -2.52468085e-01,  -6.17211847e-01,
 1.58242560e+00,  -1.17626493e+00,   1.44923048e+00,   2.13371855e-01,
 1.08007116e+00,  -4.46275565e-01,   8.22816151e-01,  -2.02407121e-01,
 1.43273914e+00,  -1.08444477e+00,   5.10886565e-01,  -1.36204780e-01,
 4.22252884e-02,  -1.50237364e+00,  -1.26797455e+00,   9.48085173e-01,
 1.79645429e-01,   5.04969175e-01,  -5.11586883e-01,   1.21436711e+00,
-3.58162847e-01,  -1.40590203e-02,   1.10460651e+00,  -3.33258237e-02,
-1.58114083e+00,   2.75225124e-03,   5.79043995e-01,   5.13206943e-01,
 7.71336905e-01,   2.51322738e-02,   2.36712113e-03,   1.62640027e-01,
-1.06199285e+00,  -6.96907372e-02,  -1.99673967e-01,   5.16245456e-01,
 1.74533673e+00,  -3.99650488e-01,   2.04963761e+00,   5.74014300e-01,
 2.60866081e-03,   9.59563621e-01,   2.64728316e+00,   1.96512960e+00,
-9.99799040e-01,   5.88788096e-01,  -1.15252090e-01,   1.39100041e+00,
 6.88877248e-01,  -6.03856955e-01,   6.47500892e-01,  -5.85178925e-02,
-2.03176761e+00,   7.18292270e-01,   1.20770957e+00,  -8.33909013e-01,
 1.23579560e+00,   2.61393279e-01,  -2.49501949e-01,  -9.74889778e-01,
 1.25488369e+00,   2.02190619e-01,  -4.69048713e-01,   1.00763820e+00,
-1.70095212e+00,  -9.80826538e-01,   9.30461806e-01,  -1.72012982e+00,
-8.45967576e-01,  -1.29021747e+00,   1.50104470e+00,  -4.46611016e-01,
 1.00216469e+00,   3.34399466e+00,   2.66617150e-01,  -1.62167304e-01,
-3.20637566e-01,   4.64171726e-01,  -8.72417542e-01,   1.39801804e+00,
-1.17286779e+00,   1.11956434e+00,   1.55108412e-01,   3.26011705e-01,
 9.30510464e-01,  -1.56333531e-01,   7.58222488e-01,   4.18004087e-01,
 2.06750202e+00,   9.57515497e-01,  -1.46551788e+00,   3.39741187e-01,
 1.27776712e+00,  -3.36632373e-01,  -1.03417792e+00,   1.83109415e+00,
 1.41593413e+00,  -3.73286308e-01,  -2.93066888e-01,   1.29843343e-01,
 2.36073042e-01,  -7.97770311e-01,  -1.34798836e-01,   3.78216731e-02,
 1.13869937e+00,  -1.46651698e+00,   1.02927476e+00,  -4.94567805e-01,
-4.01730636e-01,   2.00173481e+00,  -3.05721104e-01,  -5.11428629e-01,
 8.75381527e-01,   3.82842700e-01,   1.10691446e+00,  -4.28492849e-01,
 1.05010225e+00,  -1.15085658e+00,   1.36532474e-01,  -5.26697991e-01,
-1.37673409e+00,  -2.34956435e-01,  -7.91583869e-01,   6.82562978e-01,
 4.24566446e-01,   5.86958147e-01,   1.59477752e+00,  -8.58110085e-02,
 1.16747160e+00,   3.71233104e-01,  -2.22167947e+00,  -3.39925966e-01,
 2.72850388e-01,   2.75702437e+00,   7.78682589e-02,  -8.89871230e-01,
```

```
-3.28468149e-01,   8.88110317e-01,  -1.02261057e+00,   6.25261386e-01,
 5.24439463e-02,   1.02505300e-01,  -1.13866361e+00,  -5.12947983e-01,
 1.25773516e+00,   7.45433786e-01,  -6.37778074e-01,  -4.54388374e-01,
 3.84129540e-01,  -1.62026298e+00,   4.28693564e-01,  -2.60713661e-01,
-9.46690055e-01,   5.52331821e-01,  -2.57779131e-01,   1.29103854e+00,
 5.51310255e-01,  -1.82919386e-01,  -9.73582944e-01,   5.65365014e-01,
 1.74506613e+00,  -6.69539436e-02,   4.40323472e-01,   1.49003136e-01,
-1.20620082e+00,  -4.47205780e-01,  -7.85533755e-01,  -6.01989678e-01,
-3.57616230e-01,   1.39214472e+00,   1.67179365e-01,   1.24755014e-01,
-7.74723705e-01,   1.03075092e+00,   4.74030825e-01,  -4.85186742e-01,
-4.86610321e-01,  -2.76784524e-01,  -7.43587555e-02,   3.56523020e-01,
-2.52904099e-01,  -1.27691142e+00,  -8.49739038e-02,   7.71822762e-01,
 1.52598610e+00,   5.71565081e-02,   5.01025135e-01,  -8.07798694e-02,
-1.29643838e+00,   3.81122774e-01,   8.05586862e-02,   6.72431108e-01,
 5.61724627e-01,   1.56785610e+00,   5.41703126e-02,  -6.75100253e-01,
-1.23628262e+00,   1.06265635e+00,   1.29830974e+00,   3.92792383e-01,
-1.64453171e+00,  -1.79942644e+00,   1.44238472e+00,   1.50414479e+00,
 4.01756718e-01,  -1.55805115e+00,   3.34697475e-01,   2.05570279e-01,
 1.94367355e-01,  -2.54204668e-01,   1.11151222e+00,   6.57820663e-01,
 5.51686792e-01,   2.85372158e-01,   5.47316669e-02,  -1.12263051e+00,
 1.31074862e+00,   1.54692953e+00,  -4.35223512e-01,   6.90108881e-01,
-6.90132480e-01,  -2.71630721e-01,  -1.27151810e+00,   8.55338091e-01,
 7.36660797e-01,   7.68687802e-01,   1.30385204e-01,   8.94073502e-01,
 9.03689824e-01,  -7.26732921e-01,  -2.60872588e-01,  -2.73516227e+00,
 3.49452177e-01,  -8.27269737e-01,   2.37035744e-02,   7.60939464e-01,
 1.11648957e+00,   4.07141059e-01,  -2.28444423e+00,  -9.46481145e-01,
-3.11051620e-01,   2.42755680e-01,   1.09737866e-02,   2.03755532e+00,
-6.35235815e-01,  -4.58279860e-01,  -4.06448860e-02,   2.09311188e+00,
-2.01335265e+00,  -1.31159826e-01,   7.75204218e-01,   1.91982640e-01,
 1.98440745e-01,   8.92243713e-01,   7.50723176e-01,   1.10413810e+00,
 1.50974120e+00,  -1.26745299e+00,   1.81945360e+00,  -3.22861130e-01,
 2.85820642e-01,  -1.24428457e+00,   6.67139311e-01,  -1.06178835e-01,
 1.02628542e+00,  -6.81862936e-01,  -7.65051631e-02,   2.55322896e+00,
 8.19948300e-01,   1.53713013e+00,  -1.86709906e+00,   7.02115035e-01,
-3.89901956e-01,  -1.99150575e+00,   4.34675961e-01,   5.38036479e-01,
-1.23197796e-01,  -1.75625489e+00,   7.29478898e-01,   3.96389738e-01,
 1.36663097e-01,   1.27717346e+00,   4.38587763e-01,  -6.05993192e-01,
-7.78309192e-01,   1.59551534e+00,   2.39319764e-01,   2.67797197e-01,
-4.75116199e-01,   1.02979800e+00,   3.83078542e-01,  -7.18271992e-01,
-2.90315346e-01,   9.66096057e-02,   4.28152731e-01,   2.07790859e-01,
 1.11369065e-01,  -1.54700331e+00,   1.48281322e-01,   6.77395844e-01,
 2.18407684e-02,   8.27492446e-01,  -1.83274373e-01,  -7.34317315e-01,
 1.14555306e-01,  -7.74433558e-01,   4.23353742e-01,   8.12703531e-01,
-1.64184207e+00,   6.96421501e-01,   9.25531518e-01,  -7.58526162e-01,
 6.27295534e-01,   2.03090251e+00,   7.36297256e-01,   9.50178580e-01,
 4.44389141e-01,  -1.34851994e+00,  -4.81723164e-02,   1.14780097e-01,
-6.47895280e-02,   5.49459844e-01,   3.10768052e-02,   1.24842996e+00,
```

```
 1.37251320e+00,   4.89262174e-01,  -6.48990569e-01,  -1.28846965e+00,
 1.02632398e+00,  -6.70358370e-01,   1.75493818e+00,   6.43745088e-01,
-2.21524775e-01,  -4.38134701e-01,  -2.41934279e-01,  -1.84494926e+00,
-5.59296254e-01,   1.14994419e+00,   6.47087551e-01,   1.45689954e+00,
-1.08396992e-01,  -6.34483868e-01,  -1.55305436e+00,  -7.47148870e-01,
-3.17059928e-01,   5.81696077e-01,   5.15452256e-01,  -1.34708111e-01,
-3.03542290e-01,   2.53912039e-01,   8.06727771e-01,  -1.88856775e+00,
-1.48783579e+00,   1.51096548e+00,  -9.24717626e-01,   9.90207331e-01,
 4.33582260e-01,   3.02098731e-02,   2.23009303e+00,  -8.43035610e-01,
 1.28516466e+00,  -9.05450538e-01,   1.44832156e+00,   5.18246744e-01,
-2.45945098e-01,  -4.25458119e-02,   9.38729872e-01,   1.12649194e+00,
-2.42162448e-01,  -1.42745513e+00,   1.09684370e+00,   4.98039088e-01,
 2.82144835e+00,   7.81828360e-02,  -9.03099727e-01,   5.08704616e-01,
-4.52028810e-01,   1.47778127e-01,  -8.53746547e-01,  -1.88352629e-02,
 1.56243615e-01,   6.55323546e-01,   8.37593944e-01,   1.61565737e+00,
 6.70183708e-01,  -3.23270873e-01,   5.91762949e-01,   5.63228755e-01,
 1.42324892e+00,  -1.03294379e+00,  -6.53050448e-01,  -8.71938980e-01,
-1.87129341e+00,  -1.40443157e+00,   8.11813602e-01,  -1.30346783e-01,
-5.00008854e-01,  -4.29054505e-01,   9.15155093e-01,  -2.60226375e-01,
-9.40774037e-01,   1.69019686e+00,   1.78467528e+00,   2.58339554e-01,
-5.92282205e-01,   3.01542585e-01,   1.70554741e+00,   2.34212546e-02,
-5.21301390e-01,  -8.66309985e-02,  -9.66301897e-01,  -1.46436259e+00,
 1.13358452e+00,   9.21836097e-01,  -5.99907875e-01,  -9.63146832e-02,
 4.98055408e-01,   3.08775360e-01,   1.43825048e+00,  -3.42507556e-01,
-2.70402770e+00,  -8.15137791e-01,  -1.46601994e+00,  -1.31744074e+00,
 1.85216909e-01,   1.07276795e+00,  -1.07832630e+00,  -1.44271407e+00,
 1.80531174e+00,  -1.51475185e+00,  -4.38811368e-01,   1.80120053e+00,
-1.14932064e+00,  -4.84076578e-01,  -8.20815661e-01,  -6.96419676e-01,
 2.06902417e-01,  -2.45000222e+00,  -1.34154131e+00,  -9.09396343e-01,
-6.98447562e-01,  -1.67844710e+00,   6.41183625e-01,  -2.40988218e-01,
-4.20891031e-01,   7.25677346e-01,   1.83257933e-02,   2.20540654e+00,
 1.13636025e-01,  -1.13302826e+00,   6.59668840e-02,   1.42216096e+00,
-7.41242763e-02,  -1.13306532e-01,   1.92745215e-02,  -8.98193185e-01,
-1.77276657e-01,  -5.70102529e-01,  -1.88153084e-01,   6.90449776e-02,
-1.03779568e+00,   6.83311139e-01,  -2.80556116e-01,   1.52568713e+00,
 2.98893579e-01,  -5.50872481e-01,   4.82384693e-02,   1.19618187e-01,
-1.30231833e+00,  -1.85188536e+00,  -4.10079585e-01,   2.18927460e-01,
-9.78426788e-02,   1.49218985e-01,   1.46881188e+00,  -8.98128449e-01,
 1.04576727e+00,  -1.19328698e+00,  -5.92185312e-01,   4.43072180e-01,
 1.35786383e+00,  -3.56344777e-01,  -1.21216761e+00,  -1.87360068e-01,
 9.85558602e-01,  -6.67806042e-01,  -7.92751413e-01,  -8.98674509e-01,
 5.95117404e-01,   2.53487239e-01,  -2.70508973e+00,  -1.74363147e-01,
 8.51536165e-01,   2.41155130e-01,   4.93809706e-01,  -1.50948617e-01,
 9.33845465e-01,   4.45565247e-01,   1.79857322e-01,  -7.55992666e-01,
 2.23692021e+00,  -1.80147443e+00,  -1.02993027e+00,   7.60510012e-01,
 1.63597406e-01,   7.23138230e-01,   2.84229009e+00,  -2.30401674e+00,
 1.39596137e+00,   1.09080000e+00,   5.89010205e-03,   3.96359804e-01,
```

```
-2.33108137e-01,   1.06010350e+00,  -5.40170040e-01,  -2.08402277e+00,
 1.41149313e+00,   2.13965129e-01,  -4.27140803e-01,  -4.30989991e-02,
-7.30951067e-02,   1.77984603e-01,  -1.48351268e+00,   3.14474215e+00,
 6.23242353e-01,   7.78498737e-01,  -1.24778285e+00,  -4.73973723e-01,
-6.30520108e-01,  -6.87878185e-01,  -6.74711761e-01,   9.87710067e-01,
-4.10555436e-01,   3.66254728e-01,  -1.63884136e+00,  -1.67780575e-01,
-1.28603739e+00,   1.63723867e+00,  -7.95101429e-01,   1.67723937e-01,
 5.25547049e-01,  -2.57470231e-04,  -2.42380573e-01,   2.44343258e+00,
 1.64376144e-02,   7.74109640e-01,  -1.41792611e-01,  -4.87915563e-01,
 3.45494065e+00,   8.10279756e-01,  -1.35821591e+00,   2.61358520e-01,
 5.19631788e-01,   3.61118382e-01,  -1.39156926e+00,   2.17948490e-02,
 9.47625380e-01,   1.44352379e-01,  -4.35040321e-01,   7.02082697e-01,
 9.01228064e-01,  -3.66091554e-01,  -1.67610656e-02,   1.45909019e+00,
 4.90072374e-02,  -7.18946273e-02,   2.34423871e-01,   1.04360762e+00,
-1.20653319e+00,   4.05530511e-01,   1.20609114e+00,   1.15990294e+00,
 8.82777199e-01,   2.48913521e-01,   1.13394958e+00,  -1.65261953e+00,
 1.51266723e-01,  -1.00053547e+00,   1.77218693e+00,  -5.83664528e-01,
 1.80713178e-01,  -1.27127105e+00,  -5.18089820e-01,  -9.94028576e-01,
 9.67487086e-01,  -9.53042923e-01,  -1.15127612e+00,   2.85163277e-01,
 1.92844005e+00,   1.74097038e+00,  -3.20847219e-01,  -1.02015267e-01,
 6.07636437e-01,  -1.02600249e+00,   1.36820890e+00,   6.75898831e-01,
-1.22537965e-01,  -1.94882782e-01,   7.13713525e-01,   9.80450077e-01,
-1.52302121e+00,  -7.93212018e-01,  -2.53257361e-01,  -8.96825211e-01,
-1.28407494e+00,  -7.71820381e-01,   1.22272444e+00,   8.25847505e-01,
-1.31719429e-02,  -1.05144810e+00,   8.48602872e-01,  -1.01058408e+00,
 3.62684964e-01,   3.42272466e-01,  -9.22760234e-01,  -8.89129901e-01,
-1.27442457e-01,  -7.51008283e-01,   1.40205752e-01,   1.04613138e+00,
-1.99901118e-01,  -4.27407252e-01,   1.02488143e+00,  -1.15652275e+00,
 7.72104364e-01,  -6.20173636e-01,   5.69342273e-01,   1.57167274e+00,
-3.35858767e-01,  -1.10808911e+00,  -1.70446711e+00,   1.00896944e-01,
-6.52681152e-01,   4.84580439e-01,   1.07316489e+00,   6.13415610e-01,
 1.41476224e-01,  -4.83768842e-01,  -5.05084703e-01,  -4.66525802e-01,
-1.19432241e+00,   2.21772127e+00,   1.30779196e+00,   1.08829185e+00,
 8.03583597e-01,   4.04274138e-01,   8.07684283e-02,   6.93332705e-01,
 2.10216815e-01,   4.29935770e-01,   1.23836578e+00,   1.42042479e+00,
-6.62307442e-01,   1.30188053e+00,  -2.64850073e+00,   1.47996575e+00,
 2.03557191e+00,   1.27991564e+00,   3.29386709e-01,  -6.08265286e-02,
-6.06499419e-01,   1.86754568e-02,   6.02185964e-01,   1.94300218e-01,
 4.18865961e-01,   4.38759141e-01,  -4.01122779e-01,  -3.61106722e-01,
-1.46288204e+00,   4.58334745e-01,  -4.42916522e-01,  -4.14554248e-01,
 2.09963851e+00,   7.27681291e-01,  -7.69910478e-01,   3.95128011e-01,
 1.01047852e+00,  -5.13548425e-01,   1.29446816e-01,  -2.26585764e+00,
 1.01777144e+00,  -7.73919182e-01,   7.70650352e-02,  -9.39591864e-01,
-2.51175774e-01,  -1.24007607e+00,   6.80648496e-01,   1.10739812e+00,
 3.72056048e-01,  -2.88998665e-01,   1.16392987e+00,   1.02469383e-01])
```
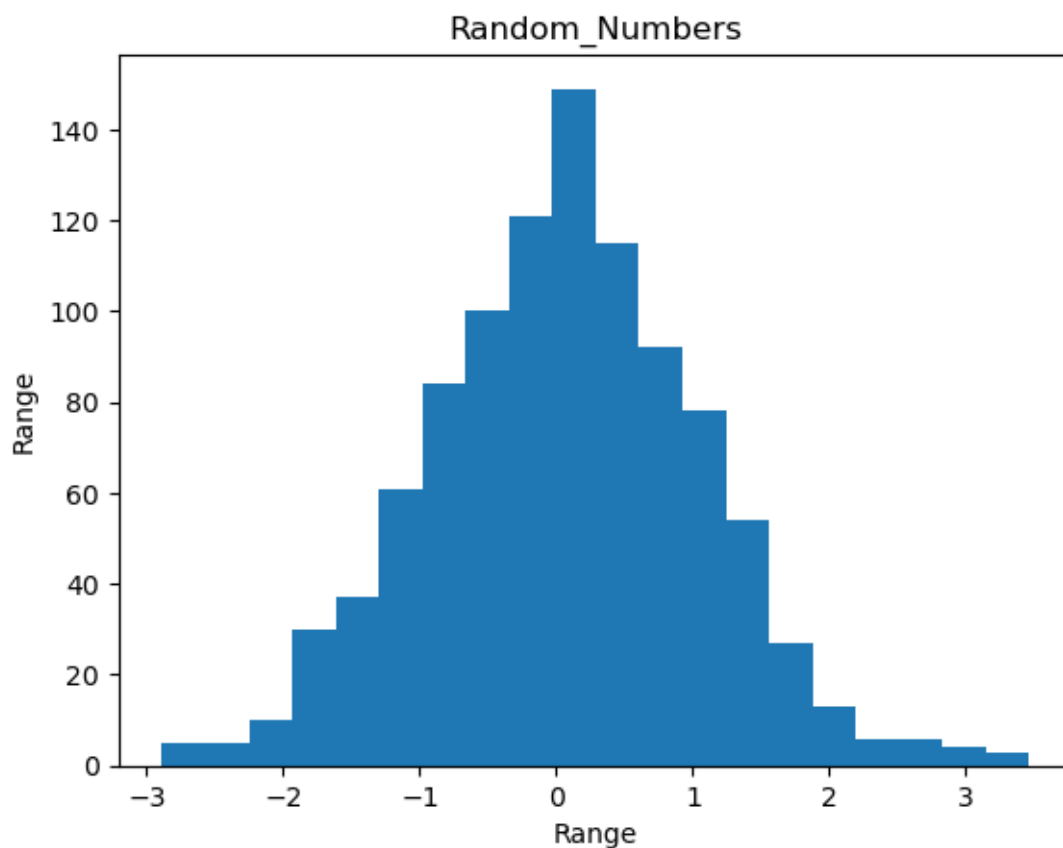
```
print("Mean : ",random_numbers.mean())
print("STD : ",random_numbers.std())
```

```
Mean :   0.061596015017091825
STD :   0.9982487634153451
```

```
# a=np.random.uniform(0,100)
# a
```

```
# Random_Numbers=np.linspace(-2,2,num=1000)

# Random_Numbers
```

```
plt.hist(random_numbers,bins=20)
plt.title("Random_Numbers")
plt.xlabel("Range")
plt.ylabel("Range")
plt.show()
```

```python
print("MEAN : ",int(random_numbers.mean()))
print("Expected MEAN : 0")
print("STD DEV : ",int(random_numbers.std()))
print("Expected STD DEV : 1")
```

```
MEAN :  0
Expected MEAN : 0
STD DEV :  0
Expected STD DEV : 1
```

0.3 PROBLEM 3

```python
# def function1(x):
#     y=(2*x)+1
#     return y
# list1=[]
# for i in range(0,10):
#     # print("hello")
#     list1.append(function1(i))
x=np.linspace(0,3*np.pi,10)
y=np.cos(x)

x2=np.linspace(0,3.5*np.pi,10)
y2=2*x+1

# fig1,fig2=plt.subplot()
plt.plot(x,y2,'-D',label='y = 2x+1',marker="o")

plt.plot(x2,y,'-o',label='Cosine',marker="x")



plt.legend()

plt.title("Straight line and Cosine")
plt.xlabel("y")
plt.xlabel("x")
plt.show()
# s=np.cos(x)
# plt.plot(s)
# plt.show()
```

```
/tmp/ipykernel_23122/3390654586.py:15: UserWarning: marker is redundantly
defined by the 'marker' keyword argument and the fmt string "-D" (->
marker='D'). The keyword argument will take precedence.
  plt.plot(x,y2,'-D',label='y = 2x+1',marker="o")
/tmp/ipykernel_23122/3390654586.py:17: UserWarning: marker is redundantly
defined by the 'marker' keyword argument and the fmt string "-o" (->
```

marker='o'). The keyword argument will take precedence.
```
plt.plot(x2,y,'-o',label='Cosine',marker="x")
```