

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
In [2]: bank_df=pd.read_csv("bank.csv",sep=";")
bank_df
```

Out[2]:

	age	job	marital	education	default	balance	housing	loan	contact	day
0	30	unemployed	married	primary	no	1787	no	no	cellular	1
1	33	services	married	secondary	no	4789	yes	yes	cellular	2
2	35	management	single	tertiary	no	1350	yes	no	cellular	3
3	30	management	married	tertiary	no	1476	yes	yes	unknown	4
4	59	blue-collar	married	secondary	no	0	yes	no	unknown	...
...
4516	33	services	married	secondary	no	-333	yes	no	cellular	4517
4517	57	self-employed	married	tertiary	yes	-3313	yes	yes	unknown	4518
4518	57	technician	married	secondary	no	295	no	no	cellular	4519
4519	28	blue-collar	married	secondary	no	1137	no	no	cellular	4520
4520	44	entrepreneur	single	tertiary	no	1136	yes	yes	cellular	

4521 rows × 17 columns

```
In [3]: cat_col=bank_df.select_dtypes(include="object").columns
cat_col
```

```
Out[3]: Index(['job', 'marital', 'education', 'default', 'housing', 'loan', 'contact',
       'month', 'poutcome', 'y'],
       dtype='object')
```

```
In [4]: num_col=bank_df.select_dtypes(exclude="object").columns
num_col
```

```
Out[4]: Index(['age', 'balance', 'day', 'duration', 'campaign', 'pdays', 'previous'], dtype='object')
```

=====standardization & normalization=====

```
In [6]: age=bank_df[["age"]]
age
```

Out[6]:

	age
0	30
1	33
2	35
3	30
4	59
...	...
4516	33
4517	57
4518	57
4519	28
4520	44

4521 rows × 1 columns

In [7]:

```
#mean  
mean_age=bank_df["age"].mean()  
mean_age
```

Out[7]: 41.17009511170095

In [8]:

```
#std  
std_age=bank_df["age"].std()  
std_age
```

Out[8]: 10.576210958711275

In [9]:

```
#standardization  
standardization=(age-mean_age)/std_age  
standardization
```

Out[9]:

	age
0	-1.056153
1	-0.772497
2	-0.583394
3	-1.056153
4	1.685850
...	...
4516	-0.772497
4517	1.496746
4518	1.496746
4519	-1.245256
4520	0.267573

4521 rows × 1 columns

In [10]:

```
# standardization using StandardScaler method

from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
ss_standardization=bank_df["ss_stdardization"]=ss.fit_transform(bank_df[["age"]])
ss_standardization
```

Out[10]: array([[-1.05626965],
 [-0.77258281],
 [-0.58345826],
 ...,
 [1.49691189],
 [-1.24539421],
 [0.26760226]])

In [11]:

```
age_=bank_df["age"]
age_
```

Out[11]: 0 30
 1 33
 2 35
 3 30
 4 59
 ..
 4516 33
 4517 57
 4518 57
 4519 28
 4520 44
Name: age, Length: 4521, dtype: int64

```
In [12]: #normalization  
normalization=(age_-min(age_))/(max(age_)-min(age_))  
normalization
```

```
Out[12]: 0      0.161765  
1      0.205882  
2      0.235294  
3      0.161765  
4      0.588235  
...  
4516    0.205882  
4517    0.558824  
4518    0.558824  
4519    0.132353  
4520    0.367647  
Name: age, Length: 4521, dtype: float64
```

```
In [13]: # normalization using minmaxscaler method  
  
from sklearn.preprocessing import MinMaxScaler  
mm=MinMaxScaler()  
mm_normalization=bank_df["mm_normalization"]=mm.fit_transform(bank_df[["age"]])  
mm_normalization
```

```
Out[13]: array([[0.16176471],  
                 [0.20588235],  
                 [0.23529412],  
                 ...,  
                 [0.55882353],  
                 [0.13235294],  
                 [0.36764706]])
```

```
In [14]: df=bank_df[["age","ss_satandardization","mm_normalization"]]  
df
```

Out[14]:

	age	ss_satandardization	mm_normalization
0	30	-1.056270	0.161765
1	33	-0.772583	0.205882
2	35	-0.583458	0.235294
3	30	-1.056270	0.161765
4	59	1.686036	0.588235
...
4516	33	-0.772583	0.205882
4517	57	1.496912	0.558824
4518	57	1.496912	0.558824
4519	28	-1.245394	0.132353
4520	44	0.267602	0.367647

4521 rows × 3 columns

In [15]:

```
#normalization
d=bank_df["age"].values.reshape(-1,1)
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
ss_standardization=bank_df["ss_satandardization"]=ss.fit_transform(d)
ss_standardization
```

Out[15]: array([[-1.05626965],
 [-0.77258281],
 [-0.58345826],
 ...,
 [1.49691189],
 [-1.24539421],
 [0.26760226]])

In [16]:

```
#standardization
d=bank_df["age"].values.reshape(-1,1)
from sklearn.preprocessing import MinMaxScaler
mm=MinMaxScaler()
mm_normalization=bank_df["mm_normalization"]=mm.fit_transform(bank_df[["age"]])
mm_normalization
```

Out[16]: array([[0.16176471],
 [0.20588235],
 [0.23529412],
 ...,
 [0.55882353],
 [0.13235294],
 [0.36764706]])

===== Transformation=====

```
In [18]: #exponential transformation  
exp_data=np.random.exponential(size=1000)  
exp_data
```

```
Out[18]: array([2.18817021e-01, 8.31199322e-02, 8.15180088e-01, 1.12681067e+00,
 1.53094687e+00, 9.55655497e-01, 8.71606352e-01, 3.58169049e-01,
 1.75507885e+00, 2.60055036e+00, 2.45129327e+00, 3.42046602e+00,
 9.41715082e-01, 1.05923198e+00, 1.96970832e-01, 2.53385770e-01,
 2.69531303e+00, 2.51518346e+00, 1.92138639e+00, 5.89666675e-01,
 1.85658620e-01, 1.08828000e+00, 7.25885073e-01, 1.55465425e-01,
 3.25925332e-01, 2.75446685e+00, 3.48258704e-02, 2.05775982e+00,
 6.47291803e-01, 1.93876742e+00, 4.87203810e-01, 3.22004782e-01,
 8.02337090e-01, 1.38638608e+00, 1.78488703e-01, 1.70300663e+00,
 5.08779982e-01, 6.75501617e-01, 3.98920354e+00, 2.76574430e+00,
 3.94984086e-01, 7.06094485e-01, 2.18810483e-01, 2.68121963e-01,
 5.94463022e-01, 6.88898351e-01, 1.59595369e+00, 2.93088689e-01,
 1.00685671e+00, 8.50727114e-02, 2.74719568e-01, 9.75537402e-01,
 3.11542461e-01, 2.28896483e-01, 1.55004421e+00, 6.79201930e-02,
 3.21086950e+00, 1.95641799e+00, 2.95085822e+00, 2.01812545e+00,
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 6.96239474e-01, 5.62494180e-01, 2.60174830e-01, 1.08874703e+00,
 5.19539108e-02, 1.44403042e+00, 7.95793100e-01, 7.39596431e-01,
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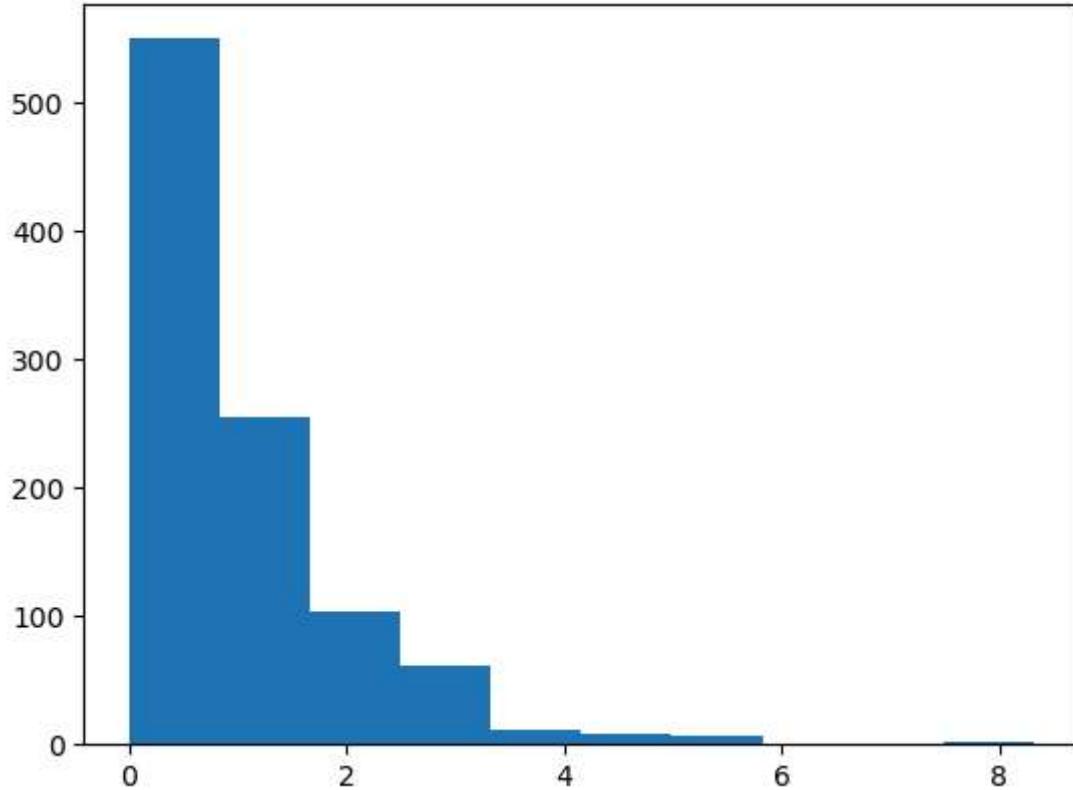
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```

```
In [19]: plt.hist(exp_data)
plt.show()
```



```
In [20]: #normal  
nor_data=np.random.normal(size=1000)  
nor_data
```

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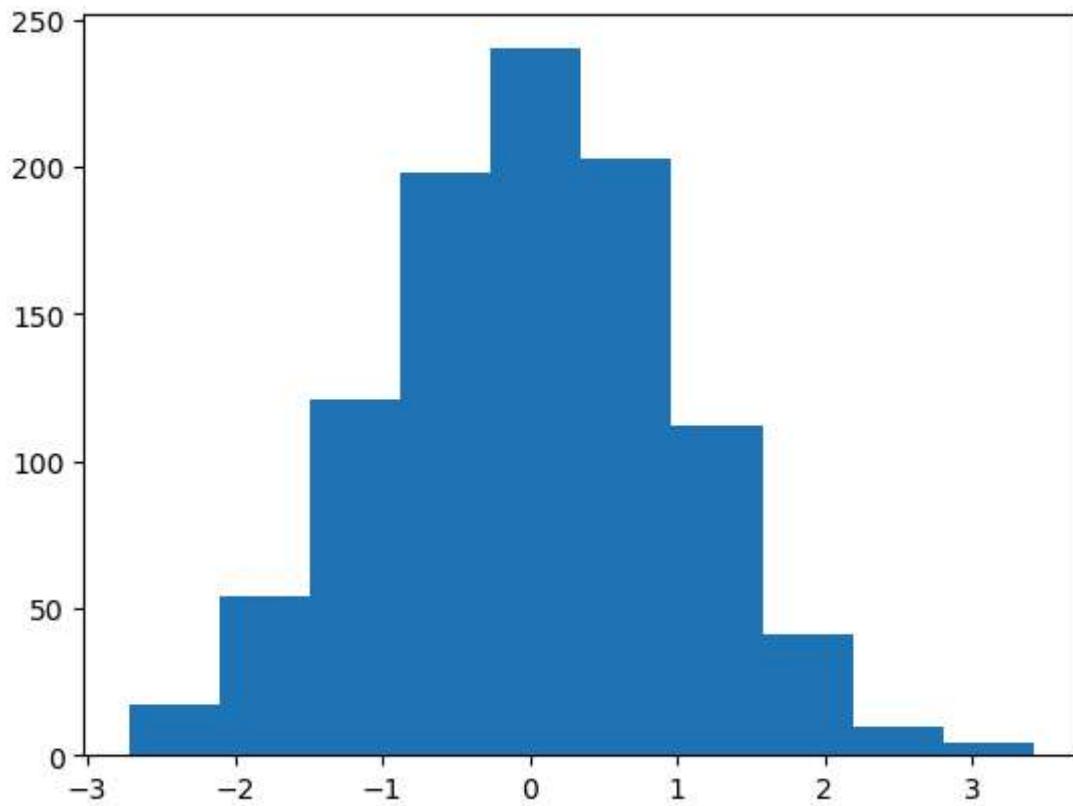
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2.61606582e-01, -8.84404431e-01, 8.67780957e-01, -9.20276419e-01])
```

```
In [21]: plt.hist(nor_data)
plt.show()
```



```
In [22]: #Log transformation  
log_tr_=np.log(exp_data)  
log_tr_
```

```
Out[22]: array([-1.51951942e+00, -2.48747075e+00, -2.04346224e-01, 1.19391224e-01,
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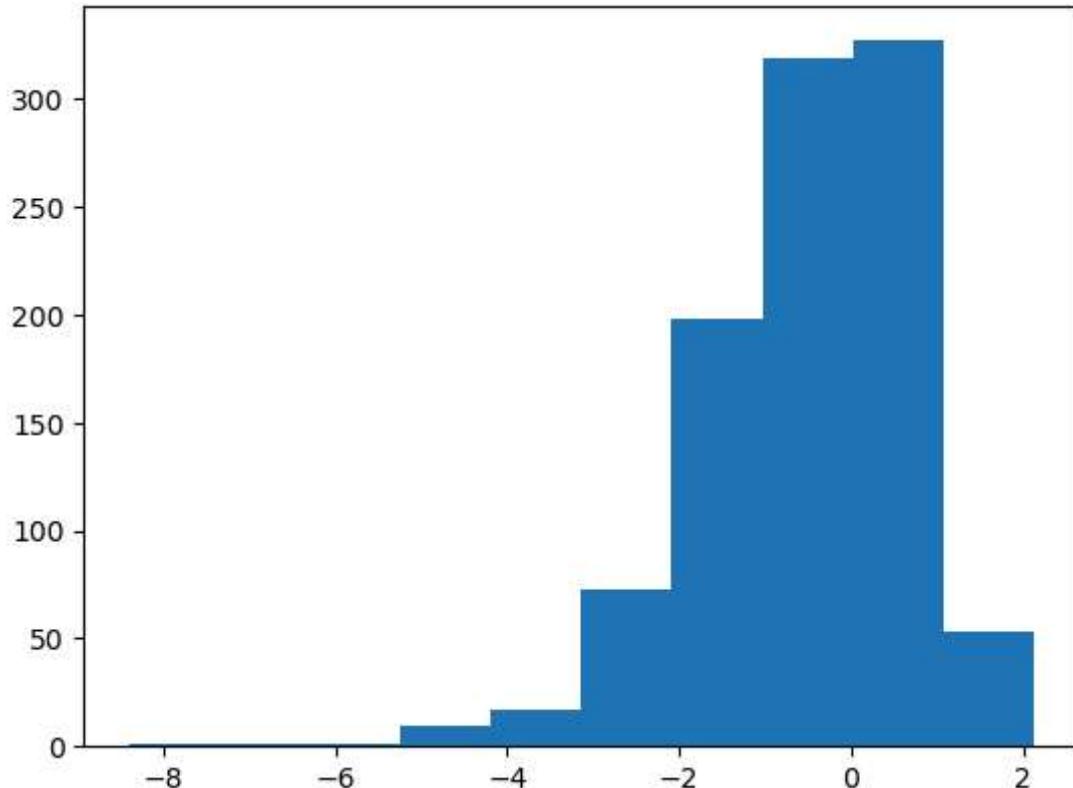
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9.00162687e-02,  2.80632165e-01,  -1.87205293e+00,  -2.43045161e+00,
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-9.22158885e-01,  -2.71332372e-01,  -1.91551454e+00,  2.02548684e-01])
```

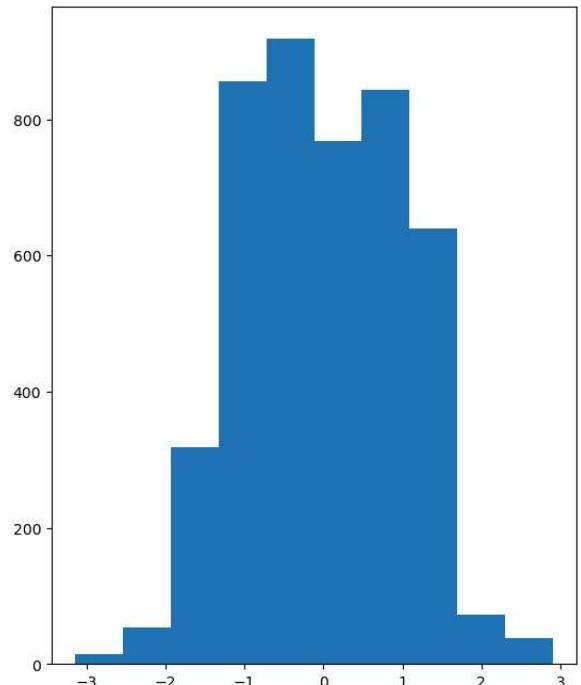
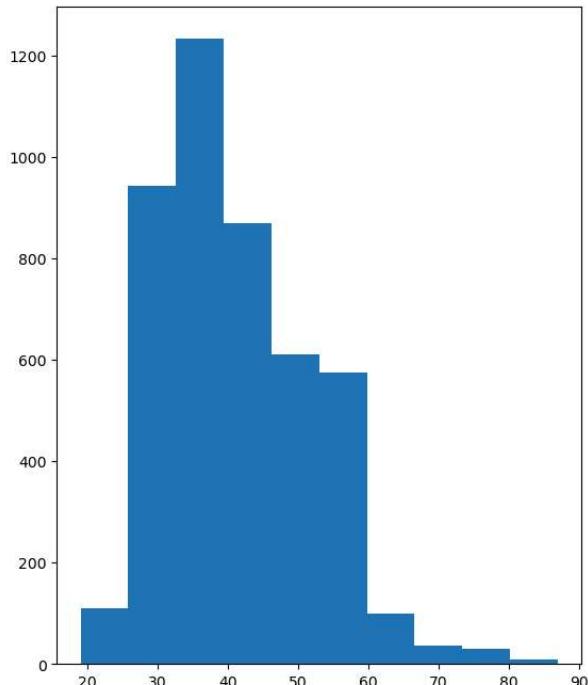
```
In [23]: plt.hist(log_tr_)
plt.show()
```



```
In [24]: #power transformation
from sklearn.preprocessing import PowerTransformer
pt=PowerTransformer()
pow_tr_=pt.fit_transform(bank_df[["age"]])
pow_tr_
```

```
Out[24]: array([-1.14068386,
                 -0.74380935,
                 -0.50225905,
                 ...,
                 1.39859711,
                 -1.43229538,
                 0.41207287])
```

```
In [25]: df=bank_df[["age"]]
plt.figure(figsize=(14,8))
plt.subplot(1,2,1).hist(df)
plt.subplot(1,2,2).hist(pow_tr_)
plt.show()
```



```
In [ ]:
```