Data Transformation Techniques

- Generally used for to convert Normal distribution
- Because all statistical math analysis by assumption Data follows Normal distribution
- It is also avoid skew ness also
- We have some important transformation
  - Log transformation
  - Exponential transformation
  - Reciprocal transformation
  - Square root transformation
  - Power transformaton

$Step - 1$

Read the required packages

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

$Step - 2$

Read the data

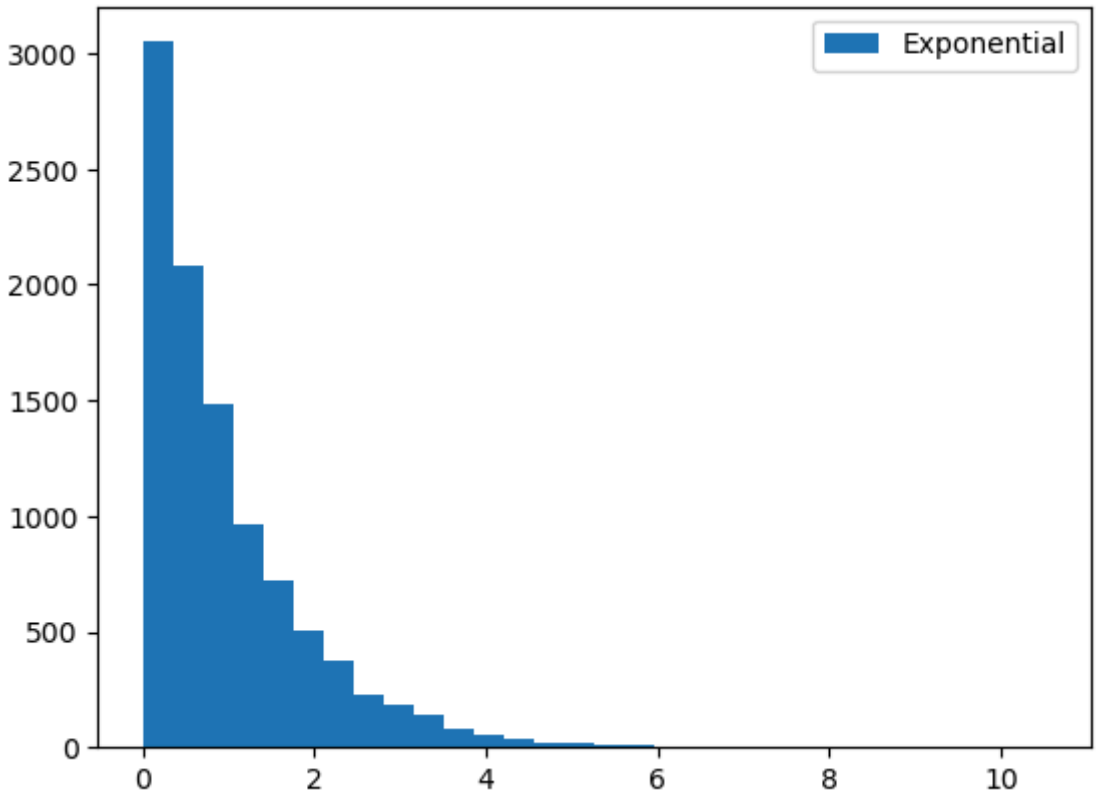
$Exponential - data$

In [2]:
```
exp_data=np.random.exponential(size=10000)
exp_data[:10]

# We are consider exponential data set with random 1k observations
# using numpy package
```

Out[2]:
```
array([7.73011522e-01, 4.44471406e+00, 1.37768693e+00, 1.41605528e+00,
       1.46048573e-01, 5.19345332e-01, 5.48210064e-01, 2.51184417e-04,
       7.64626973e-01, 5.34139109e-01])
```

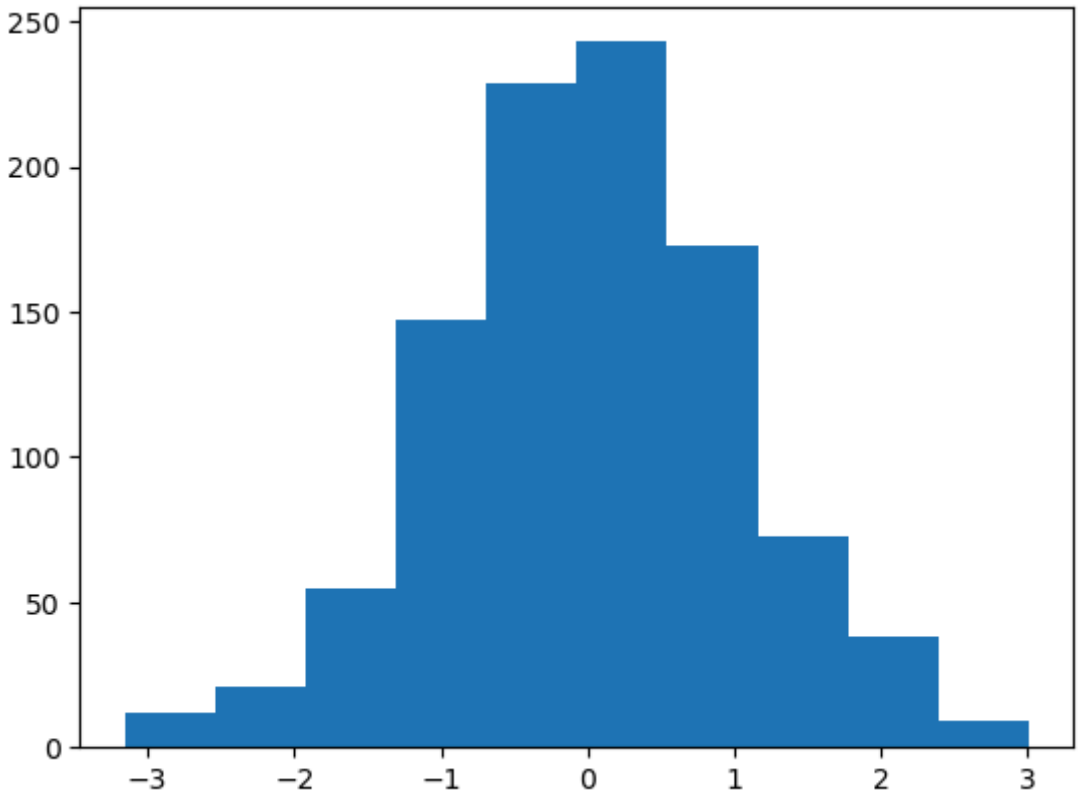
In [3]:
```
plt.hist(exp_data,bins=30,label='Exponential')
plt.legend()
plt.show()
```



$Norm - data$

In [4]:
```
norm_data=np.random.normal(size=1000)
plt.hist(norm_data)
```

Out[4]:
```
(array([ 12.,  21.,  55., 147., 229., 243., 173.,  73.,  38.,   9.]),
 array([-3.15424458, -2.53824956, -1.92225454, -1.30625952, -0.6902645 ,
        -0.07426948,  0.54172554,  1.15772056,  1.77371558,  2.3897106 ,
         3.00570562]),
 <BarContainer object of 10 artists>)
```



$Step - 3$

Log Transformaton

- np.log is used for log transformation
- Generally log transformation will not convert data into normal
- It avoids skew ness
- np.log means natural logorithm base=e

In [5]:
```
x=2
import numpy as np
np.log(2)
```

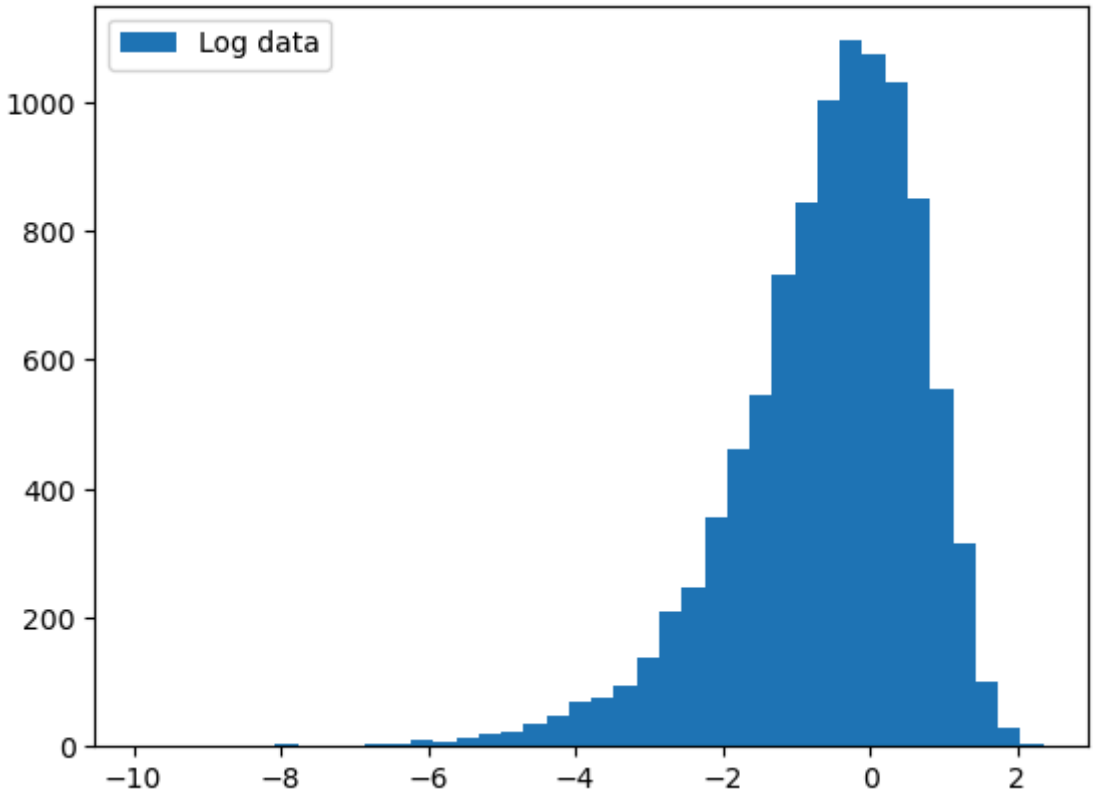
Out[5]:
```
0.6931471805599453
```

In [6]:
```
log_data=np.log(exp_data)
log_data[:10]
```

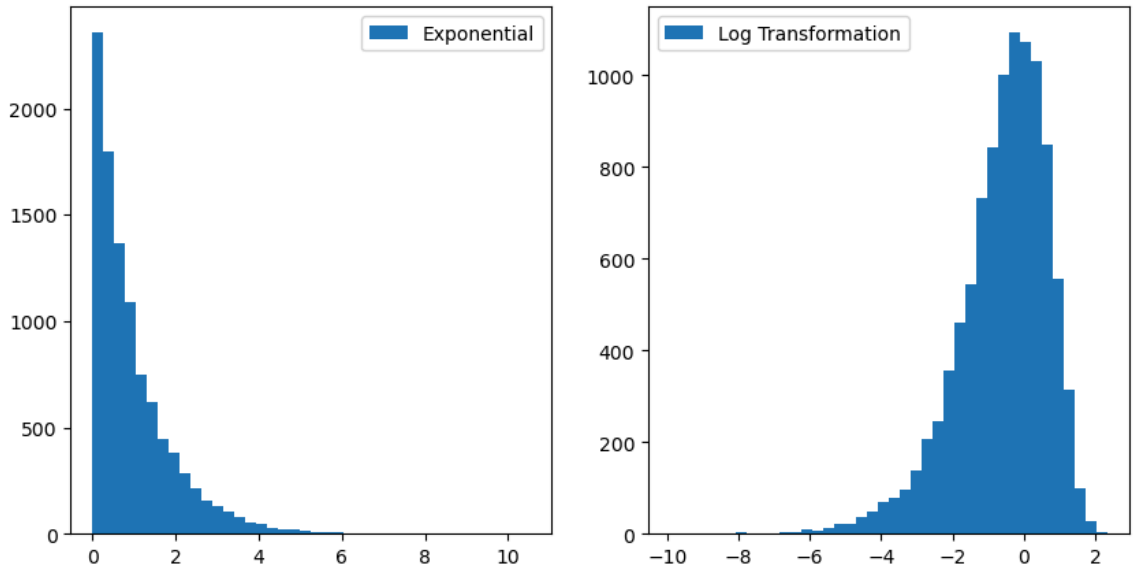
Out[6]:
```
array([-0.25746132,  1.49171554,  0.32040596,  0.34787504, -1.92381602,
       -0.65518624, -0.60109674, -8.28932316, -0.26836718, -0.62709897])
```

In [ ]:
```
exp_data[:10]
```

In [7]:
```
plt.hist(log_data,bins=40,label='Log data')
plt.legend()
plt.show()
```



In [8]:
```
plt.figure(figsize=(10,5))
plt.subplot(1,2,1).hist(exp_data,
                        bins=40,
                        label='Exponential')
plt.legend()
plt.subplot(1,2,2).hist(log_data,
                        bins=40,
                        label='Log Transformation')
plt.legend()
plt.show()
```



$Step - 4$

Reciprocal transformation

- Reciprocal transformation fails when data has zero value

In [ ]:
```
# Take the exponential data
# rec_data= 1/exp_data
# plot the histogram and check it
```

In [11]:
```
x=3
np.reciprocal(x)
```

Out[11]:
```
0
```

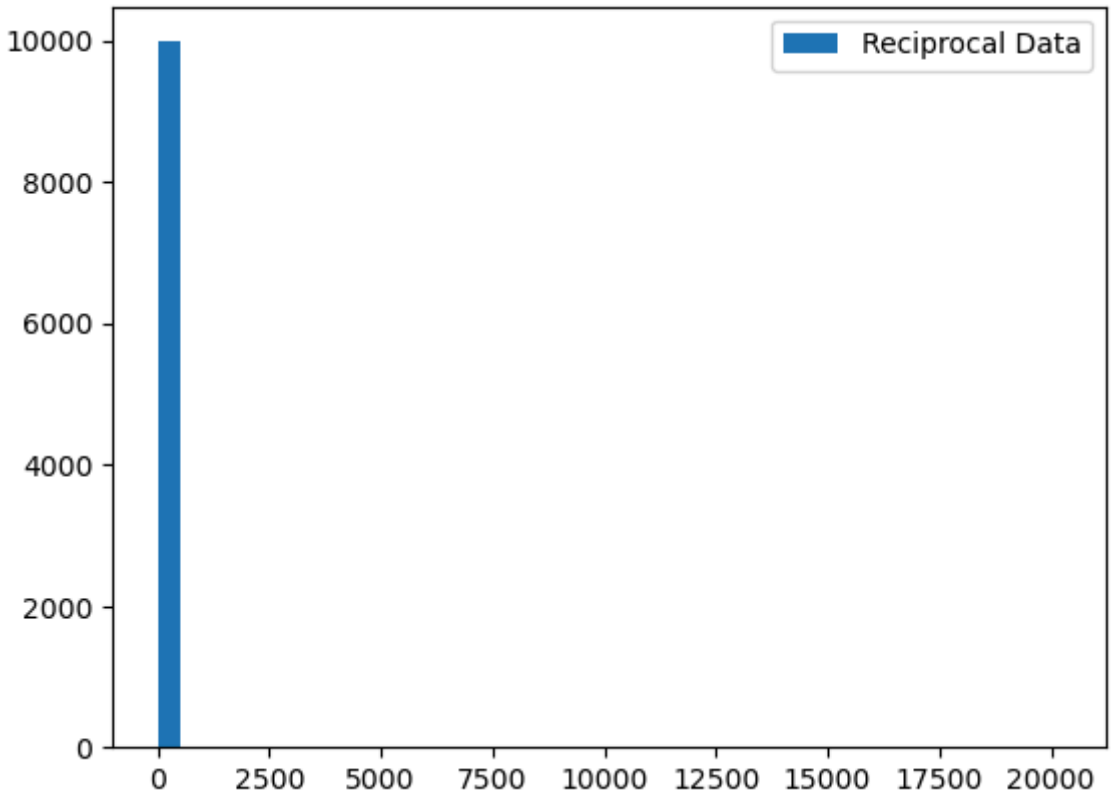
In [14]:
```
exp_data,rec_data
```

Out[14]:
```
(array([0.77301152, 4.44471406, 1.37768693, ..., 0.12437243, 2.2502534 ,
        0.43547471]),
 array([1.29364178, 0.22498635, 0.72585431, ..., 8.04036702, 0.44439439,
        2.29634461]))
```

In [15]:
```
1/0.77
```

Out[15]:
```
1.2987012987012987
```

In [12]:
```
rec_data=np.reciprocal(exp_data)
plt.hist(rec_data,bins=40,label='Reciprocal Data')
plt.legend()
plt.show()
```



In [ ]:
```
exp_data[:2]
```

In [ ]:
```
1/1.687,1/0.88
```

$Step - 5$

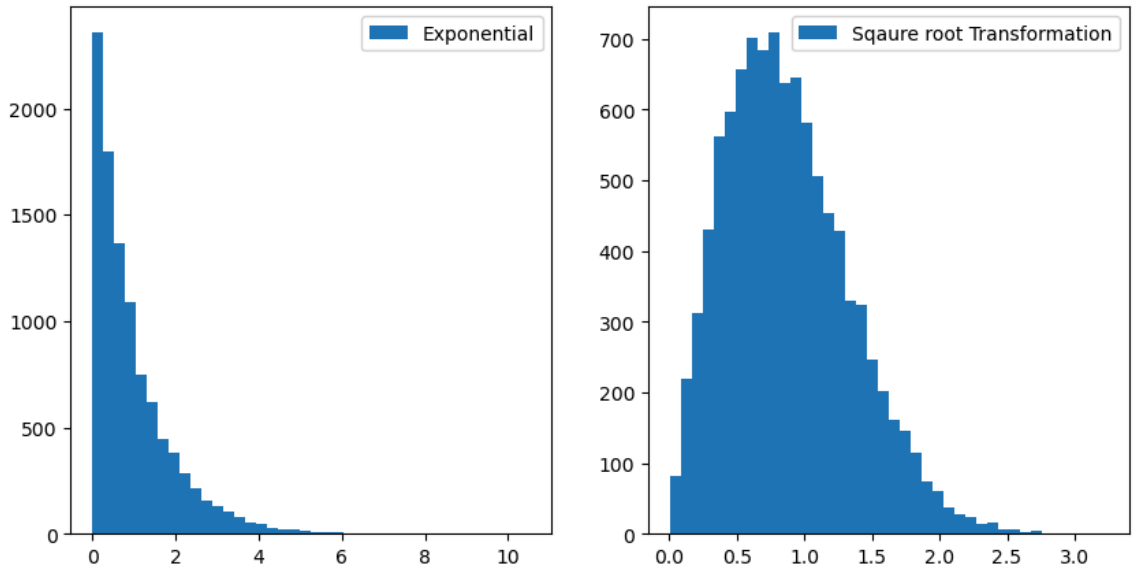
Square root transformation

In [16]:
```
print(25**2) # square,
print(25**(1/2)) # square root
print(np.sqrt(25))
```

```
625
5.0
5.0
```

In [17]:
```
sqrt_data=np.sqrt(exp_data)
```

In [18]:
```
plt.figure(figsize=(10,5))
plt.subplot(1,2,1).hist(exp_data,
                        bins=40,
                        label='Exponential')
plt.legend()
plt.subplot(1,2,2).hist(sqrt_data,
                        bins=40,
                        label='Sqaure root Transformation')
plt.legend()
plt.show()
```



In [ ]:
```
import seaborn as sns
sns.displot(sqrt_data)
```

$Step - 6$

Power transformer

- It is related to sklearn package
- Package name: sklearn.preprocessing
- Method name: Power Transformer
- Inside Box-Cox , yeo-jhonson

In [21]:
```
exp_data
```

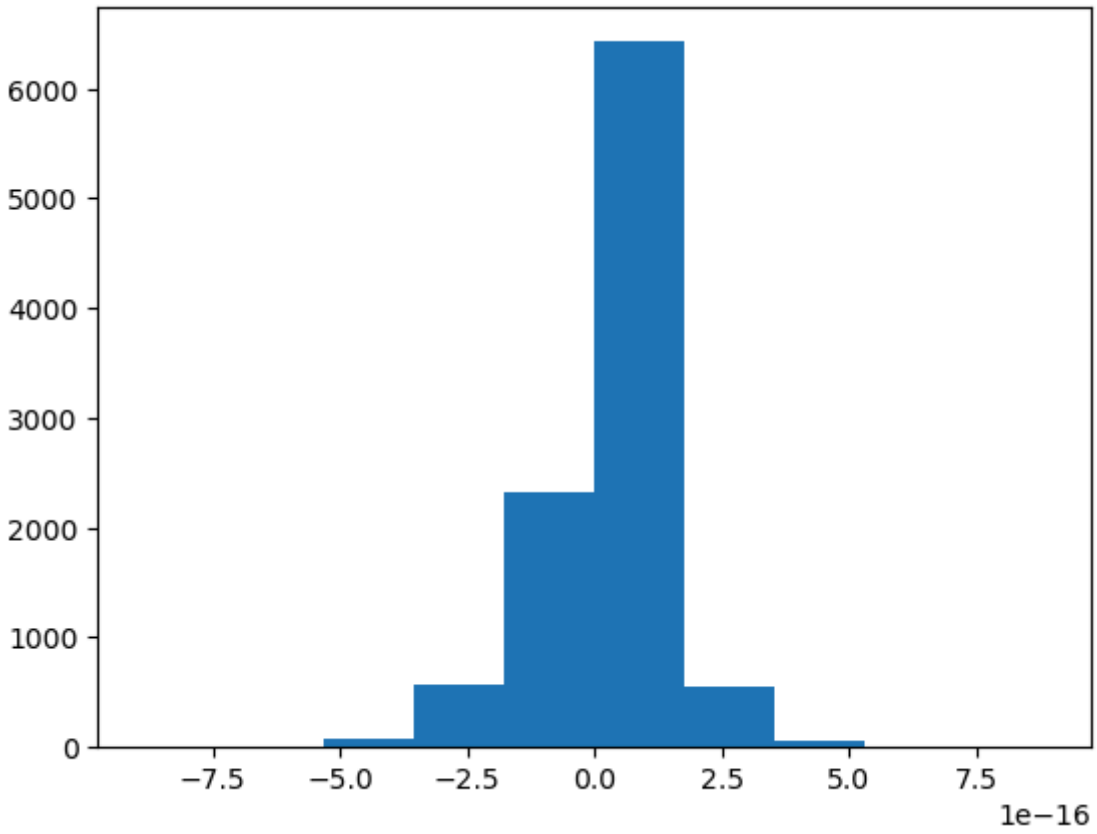
Out[21]:
```
array([3.57645714, 0.45701262, 0.36380708, ..., 1.27247759, 0.4684463 ,
       2.48816533])
```

In [19]:
```
from sklearn.preprocessing import PowerTransformer
pt=PowerTransformer()
pt_data=pt.fit([exp_data]).transform([exp_data])
```

In [27]:
```
pt_data
```

Out[27]:
```
array([[-4.44089210e-16,  5.55111512e-17,  5.55111512e-17, ...,
         0.00000000e+00,  0.00000000e+00,  0.00000000e+00]])
```

In [20]:
```
plt.hist(pt_data[0])
plt.show()
```



In [ ]:

In [ ]: