```python
In [20]: import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         from scipy.stats import t
```

Log Normal Distribution

```python
In [2]: df=pd.read_csv("waiting_time.csv")
        df
```

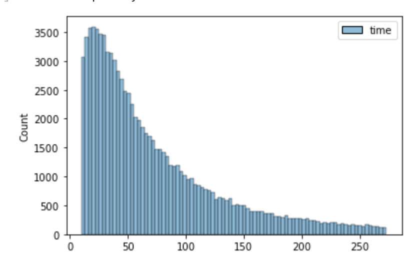
Out[2]:

	time
0	184.003075
1	36.721521
2	29.970417
3	75.640285
4	61.489439
...	...
90041	135.885984
90042	15.223970
90043	207.839528
90044	140.488418
90045	50.719544

90046 rows × 1 columns

```python
In [4]: sns.histplot(df)
```

Out[4]: <AxesSubplot:ylabel='Count'>



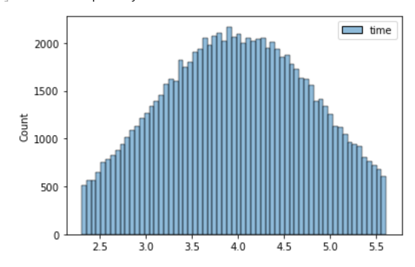

```python
In [11]: x1=10
         x2=100
         x3=1000
         x4=10000
```

```python
In [13]: print("log(x1) : ",np.log(x1))
         print("log(x2) : ",np.log(x2))
         print("log(x3) : ",np.log(x3))
         print("log(x4) : ",np.log(x4))
```

```
log(x1) :  2.302585092994046
log(x2) :  4.605170185988092
log(x3) :  6.907755278982137
log(x4) :  9.210340371976184
```

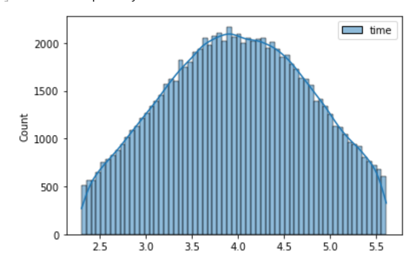
```python
In [14]: sns.histplot(np.log(df))
```

Out[14]: <AxesSubplot:ylabel='Count'>



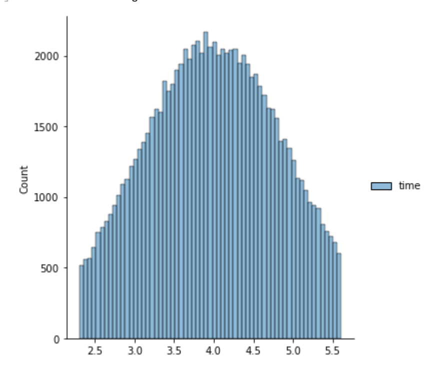

```python
In [18]: sns.histplot(np.log(df),kde=True)
```

Out[18]: <AxesSubplot:ylabel='Count'>




```python
In [19]: sns.displot(np.log(df))
```

Out[19]: <seaborn.axisgrid.FacetGrid at 0x7fe650581f70>



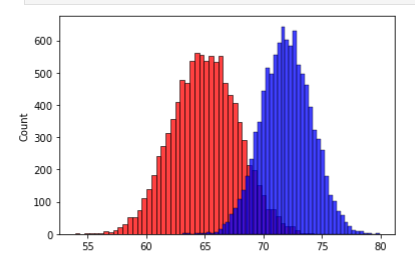
Simulations

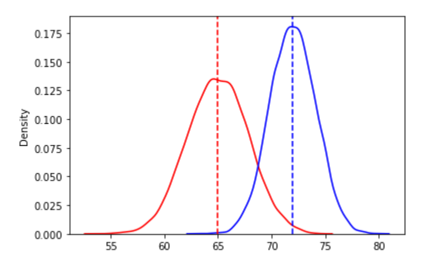
```python
In [5]: def simulate_two_gaussians(n_samples, n_simulations=1000, mu1=0, mu2=1, s1=1, s2=1):
            samples_1 = [np.random.normal(loc=mu1, scale=s1, size=n_samples) for i in range(n_simulations )]
            means_1 = np.mean(samples_1, axis=1)

            samples_2 = [np.random.normal(loc=mu2, scale=s2, size=n_samples) for i in range(n_simulations)]
            means_2 = np.mean(samples_2, axis=1)


            sns.histplot(means_1, bins=50, color="red")
            sns.histplot(means_2, bins=50, color="blue")
            plt.show()
            sns.kdeplot(means_1, color="red")
            sns.kdeplot(means_2, color="blue")
            plt.axvline(means_1.mean(), color="red",linestyle="--")
            plt.axvline(means_2.mean(), color="blue",linestyle="--")
```

```python
In [29]: n_samples = 2
         n_simulations = 10000
         mu1 = 65
         mu2 = 72
         s1 = 4
         s2 = 3
         simulate_two_gaussians(n_samples=n_samples, n_simulations=n_simulations, mu1=mu1, mu2=mu2, s1=s1, s2=s2)
```






```python
In [22]: 1-t.cdf((70-65)/(4/np.sqrt(2)),df=1)
```

Out[22]: 0.16386782498092456

```python
In [23]: 1-t.cdf((70-65)/(4/np.sqrt(10)),df=9)
```

Out[23]: 0.001670134201011364

Standardisation and Normalisation

```python
In [31]: df=pd.read_csv("weight-height.csv")
         df
```

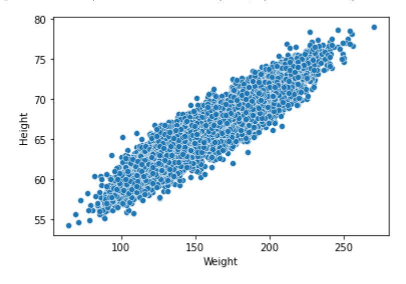
Out[31]:

	Gender	Height	Weight
0	Male	73.847017	241.893563
1	Male	68.781904	162.310473
2	Male	74.110105	212.740856
3	Male	71.730978	220.042470
4	Male	69.881796	206.349801
...	...	...	...
9995	Female	66.172652	136.777454
9996	Female	67.067155	170.867906
9997	Female	63.867992	128.475319
9998	Female	69.034243	163.852461
9999	Female	61.944246	113.649103

10000 rows × 3 columns

```python
In [33]: sns.scatterplot(x=df["Weight"],y=df["Height"])
```

Out[33]: <AxesSubplot:xlabel='Weight', ylabel='Height'>




```python
In [38]: df["Height_Standard"]=(df["Height"]-df["Height"].mean())/df["Height"].std()
         df["Weight_Standard"]=(df["Weight"]-df["Weight"].mean())/df["Weight"].std()
```

```python
In [39]: df["Height"].mean()
```

Out[39]: 66.36755975482106

```python
In [40]: df["Weight"].mean()
```

Out[40]: 161.44035683283076

```python
In [41]: df["Height_Standard"].mean()
```

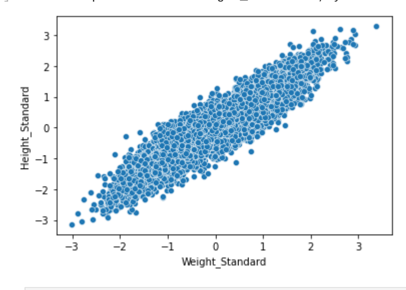
Out[41]: 4.7031045724565956e-14

```python
In [42]: df["Weight_Standard"].mean()
```

Out[42]: 3.589573083218056e-16

```python
In [44]: sns.scatterplot(x=df["Weight_Standard"],y=df["Height_Standard"])
```

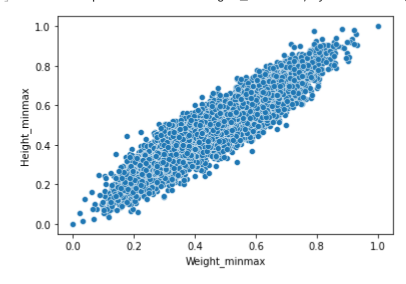
Out[44]: <AxesSubplot:xlabel='Weight_Standard', ylabel='Height_Standard'>




```python
In [45]: df["Height_minmax"]=(df["Height"]-df["Height"].min())/(df["Height"].max()-df["Height"].min())
         df["Weight_minmax"]=(df["Weight"]-df["Weight"].min())/(df["Weight"].max()-df["Weight"].min())
```

```python
In [46]: sns.scatterplot(x=df["Weight_minmax"],y=df["Height_minmax"])
```

Out[46]: <AxesSubplot:xlabel='Weight_minmax', ylabel='Height_minmax'>




```python
In [ ]: # scikit learn
```

```python
In [49]: from sklearn.preprocessing import StandardScaler, MinMaxScaler
```

```python
In [54]: df=pd.read_csv("weight-height.csv")
         df.drop(columns=["Gender"],inplace=True)
```

```python
In [55]: df.head()
```

Out[55]:

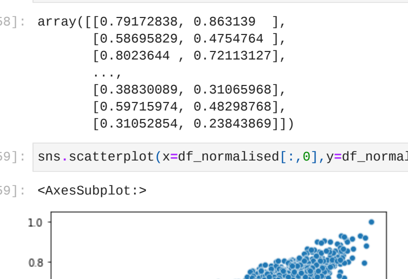
	Height	Weight
0	73.847017	241.893563
1	68.781904	162.310473
2	74.110105	212.740856
3	71.730978	220.042470
4	69.881796	206.349801

```python
In [56]: df_standard=StandardScaler().fit_transform(df)
         df_standard
```

```
Out[56]: array([[ 1.94406149,  2.50579697],
                [ 0.62753668,  0.02710064],
                [ 2.01244346,  1.59780623],
                ...,
                [-0.64968792, -1.02672965],
                [ 0.69312469,  0.07512745],
                [-1.14970831, -1.48850724]])
```

```python
In [57]: sns.scatterplot(x=df_standard[:,0],y=df_standard[:,1])
```

Out[57]: <AxesSubplot:>

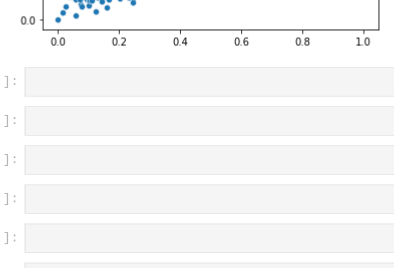


```python
In [58]: df_normalised=MinMaxScaler().fit_transform(df)
         df_normalised
```

```
Out[58]: array([[0.79172838, 0.863139  ],
                [0.58695829, 0.4754764 ],
                [0.8023644 , 0.72113127],
                ...,
                [0.38830089, 0.31065968],
                [0.59715974, 0.48298768],
                [0.31052854, 0.23843869]])
```

```python
In [59]: sns.scatterplot(x=df_normalised[:,0],y=df_normalised[:,1])
```

Out[59]: <AxesSubplot:>



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