Probability and Random Processes
ECS 315

Asst. Prof. Dr. Prapun Suksompong

prapun@siit.tu.ac.th

Continuous Random Variables

Office Hours:
BKD 3601-7

Monday	**14:00-16:00**
Wednesday	**14:40-16:00**

`rand` function

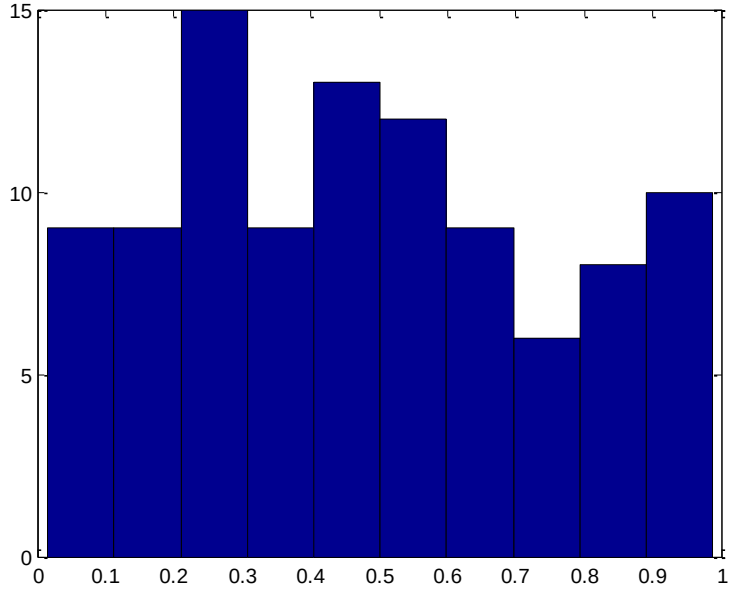
- Generate an array of uniformly distributed pseudorandom numbers.
  - The pseudorandom values are drawn from the **standard uniform distribution** on the open **interval (0,1)**.
- `rand` returns a scalar.
- `rand(m,n)` or `rand([m,n])` returns an *m*-by-*n* matrix.
  - `rand(n)` returns an *n*-by-*n* matrix

```
>> rand

ans =

    0.3816

>> rand(10,2)

ans =

    0.7655    0.6551
    0.7952    0.1626
    0.1869    0.1190
    0.4898    0.4984
    0.4456    0.9597
    0.6463    0.3404
    0.7094    0.5853
    0.7547    0.2238
    0.2760    0.7513
    0.6797    0.2551
```

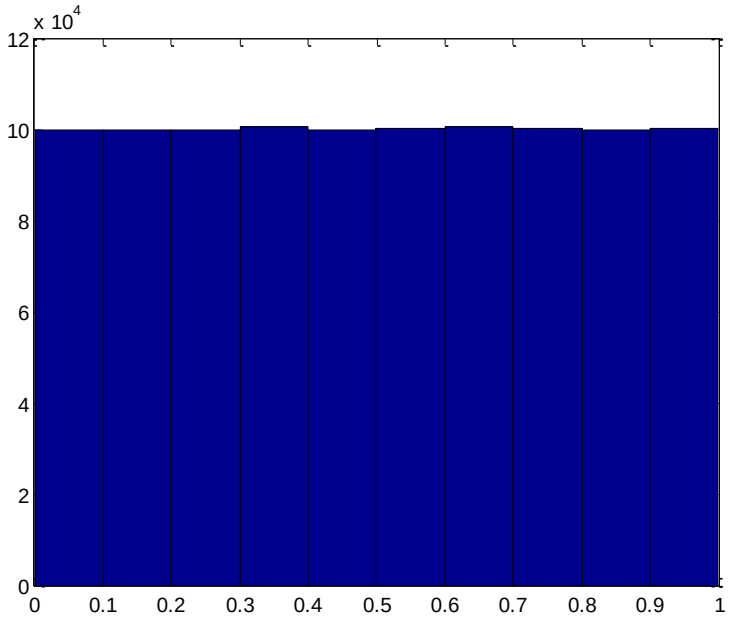
`rand` function: Histogram

- The generation is **unbiased** in the sense that "any number in the range is **as likely to occur** as another number."
- Histogram is flat over the interval (0,1).

`hist(rand(1,100))`

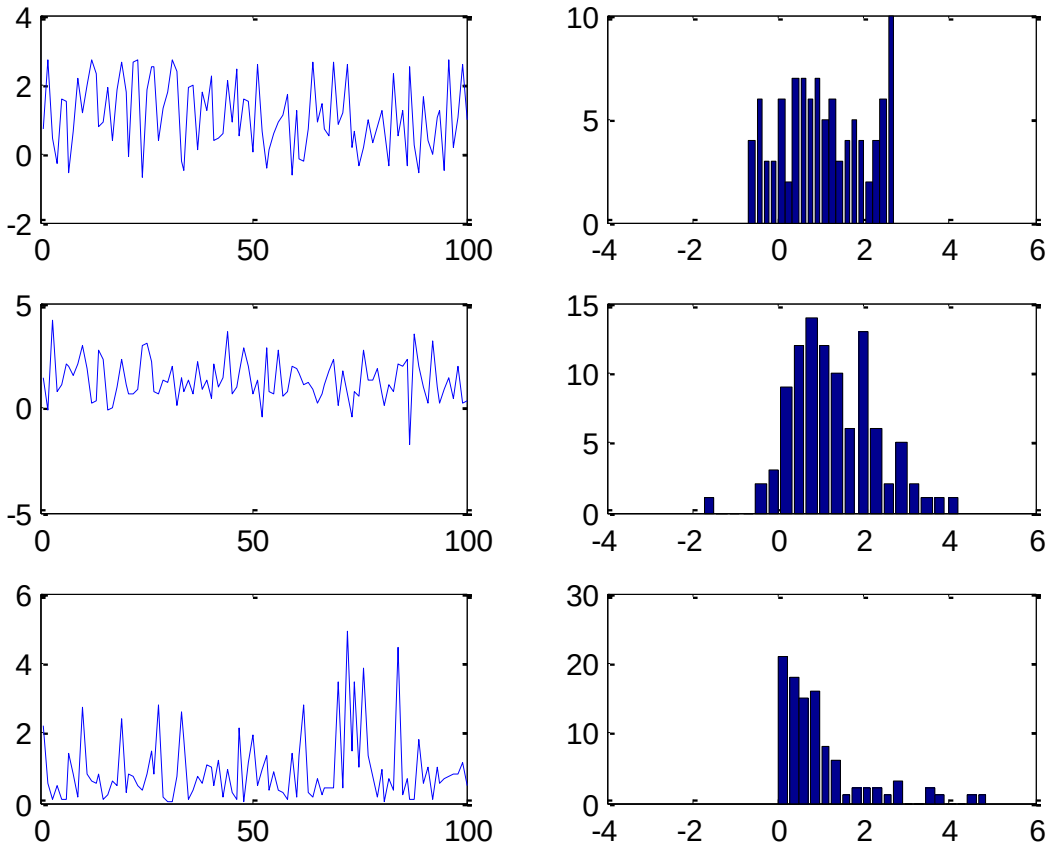


`hist(rand(1,1e6))`



Roughly the same height

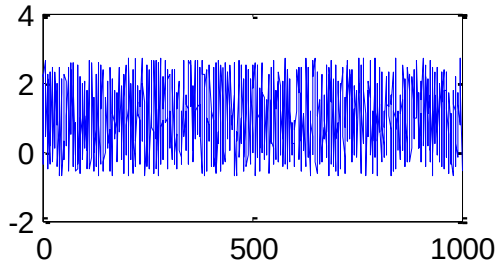
Three Important Continuous RVs

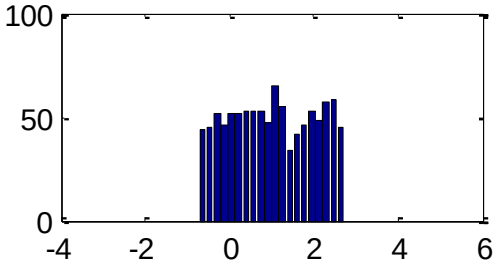


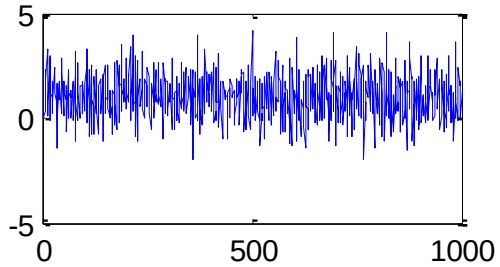
Mean = 1
Std = 1
N = 100

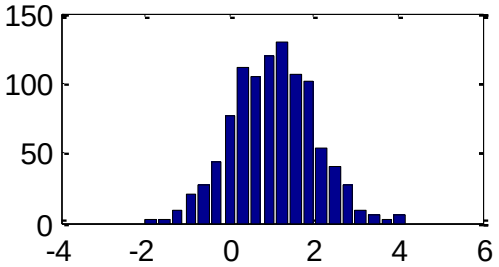
[IntroThreeContinuousRV.m]

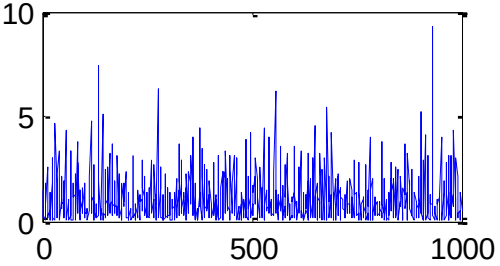
Three Important Continuous RVs

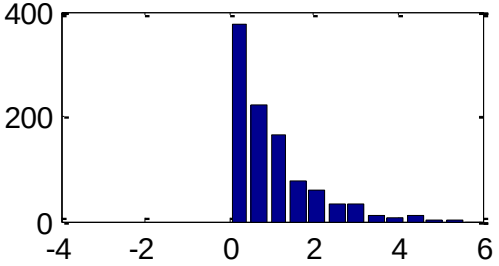






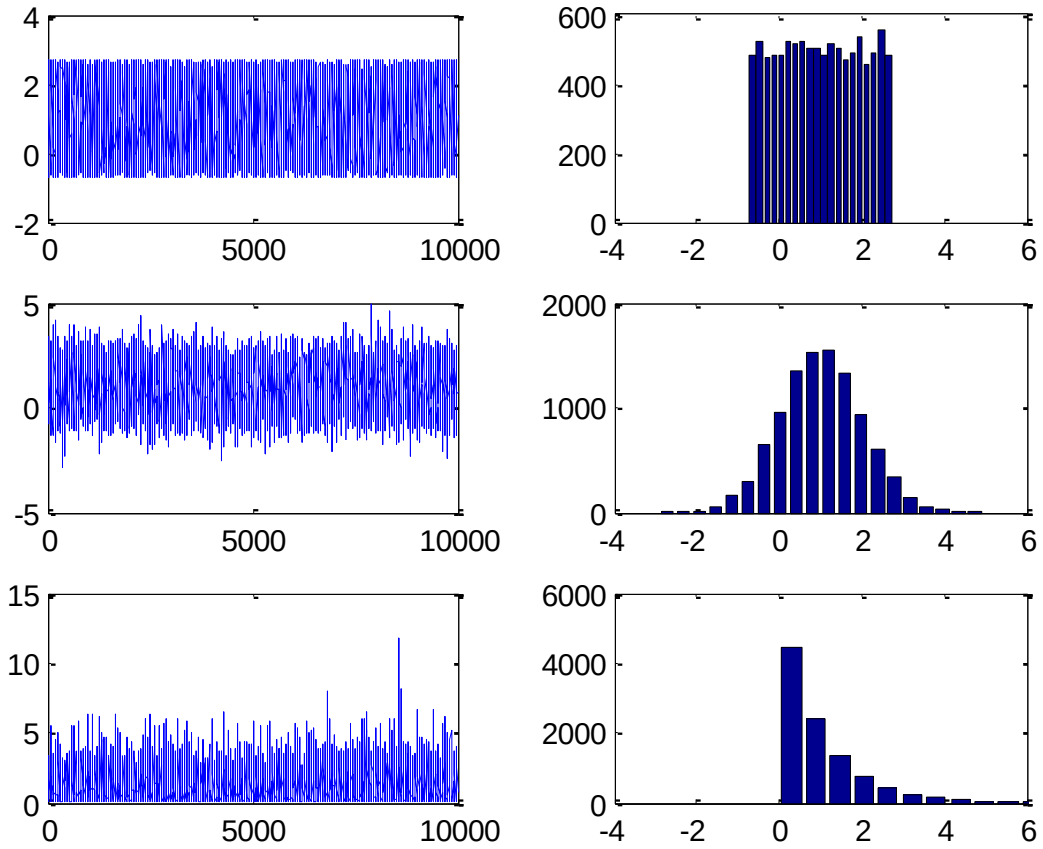






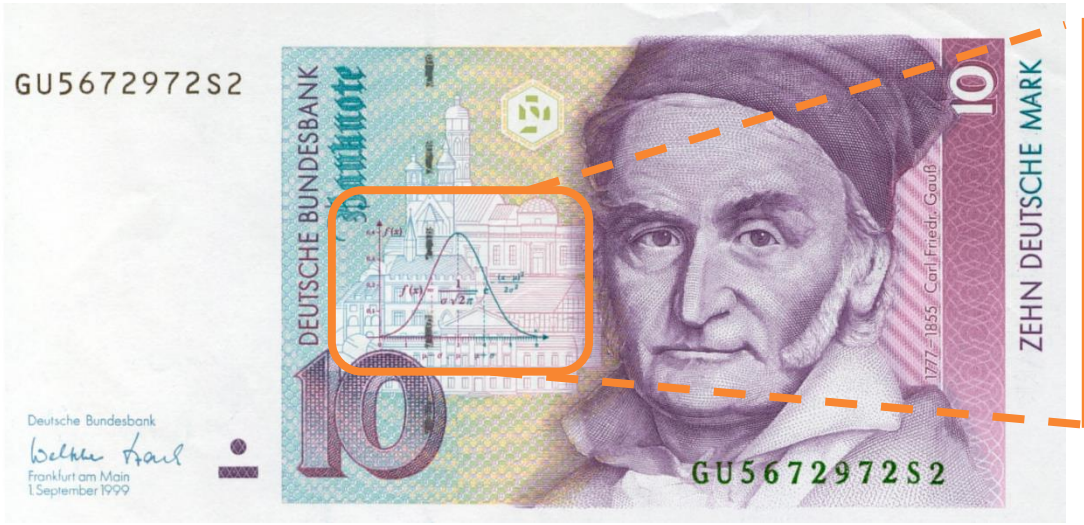
Mean = 1
Std = 1
N = 1,000

Three Important Continuous RVs

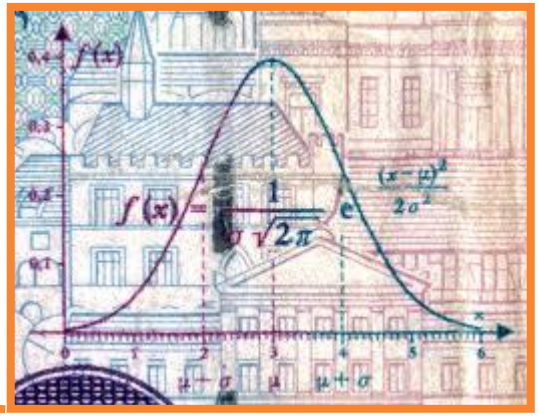


Mean = 1
Std = 1
N = 10,000

Johann Carl Friedrich Gauss



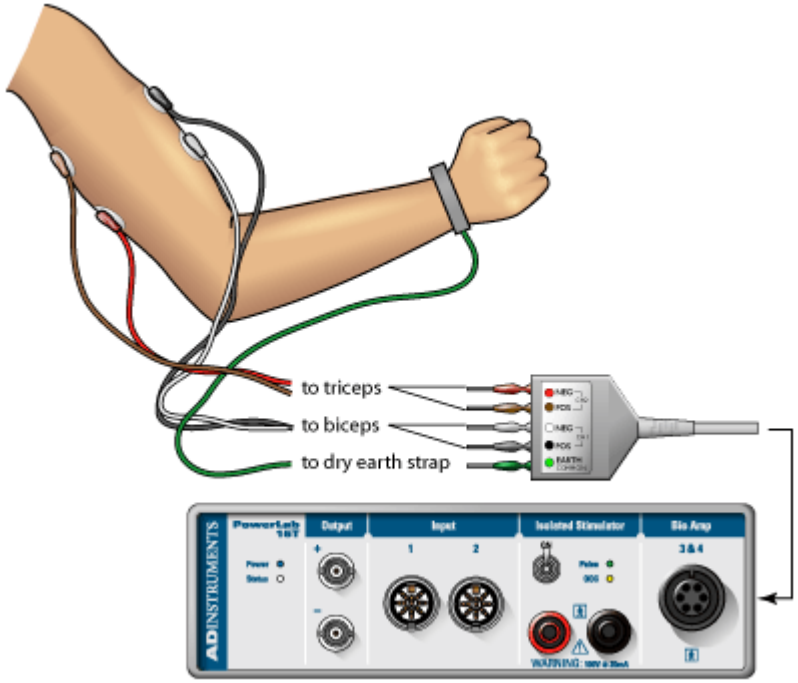
German 10-Deutsche Mark Banknote (1993; discontinued)



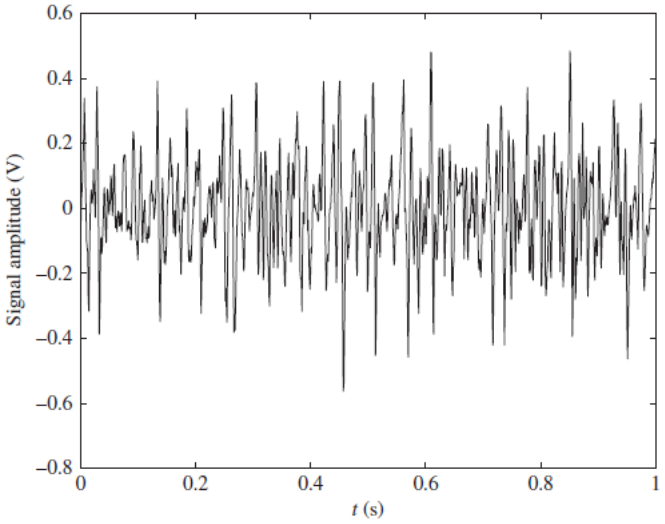
- 1777 –1855
- A German mathematician

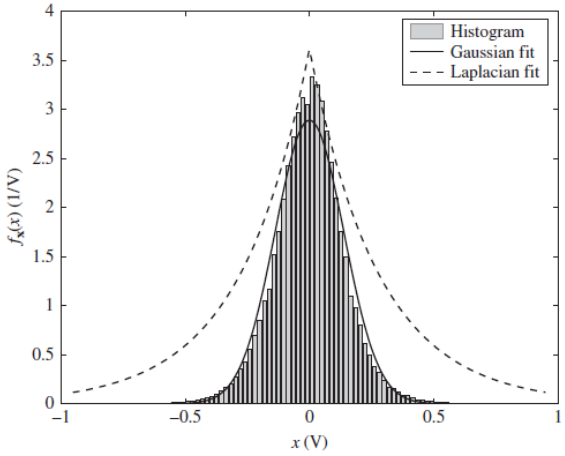
Ex. Muscle Activity

- Look at electrical activity of skeletal muscle by recording a human electromyogram (EMG).



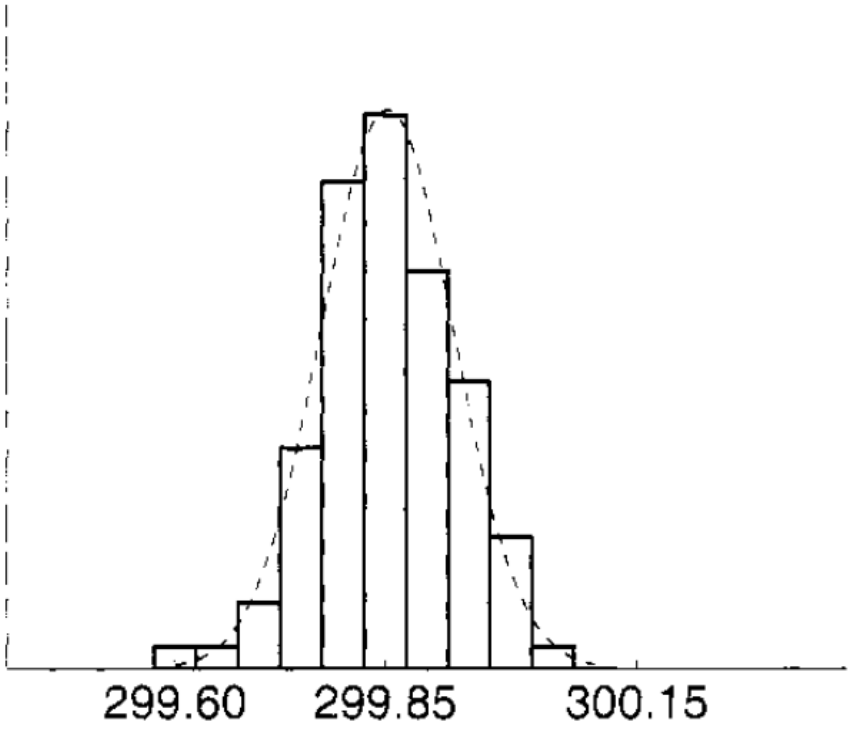
[http://www.adinstruments.com/solutions/education/ltexp/electromyography-emg-german]



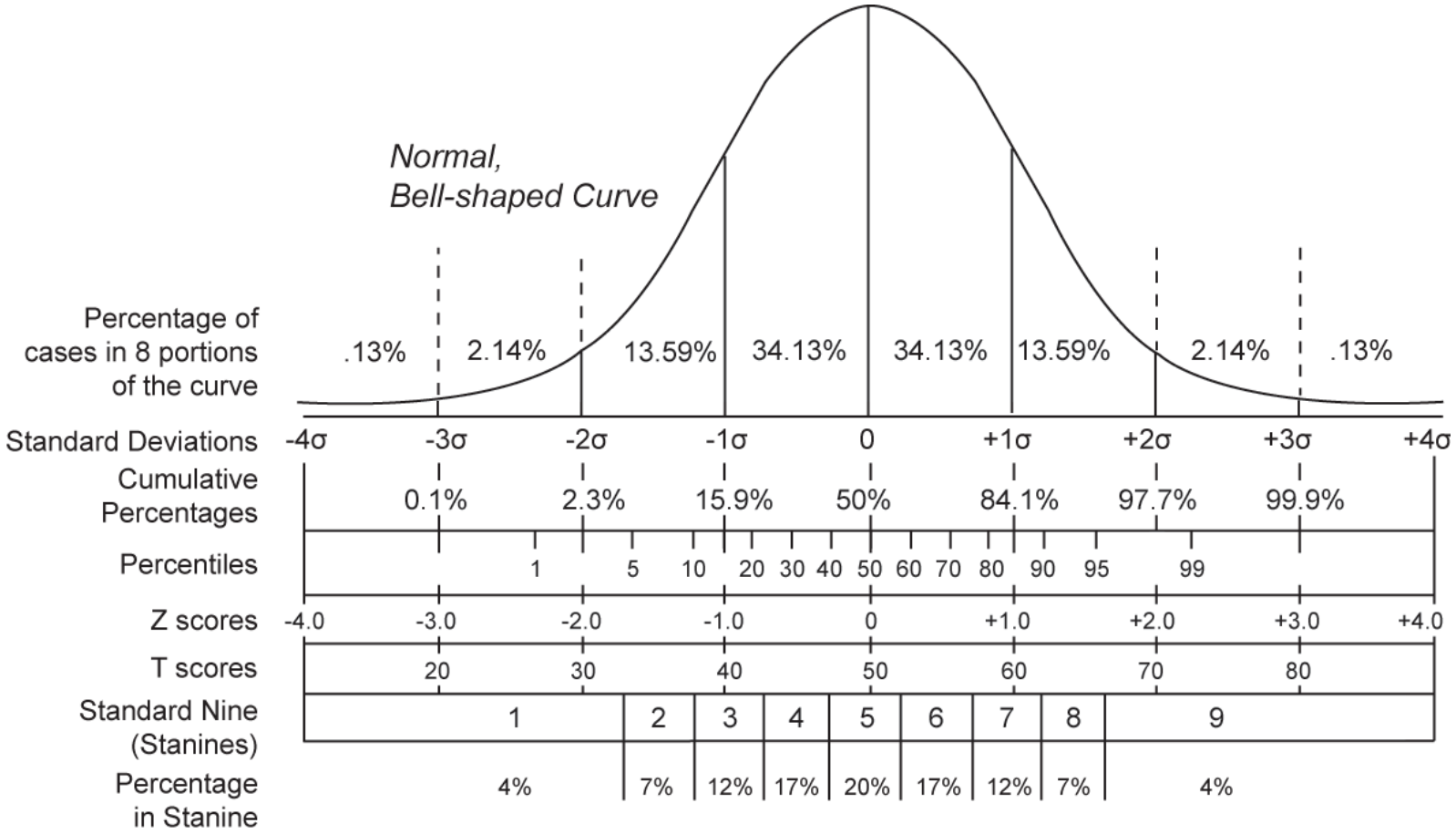


Ex. Measuring the speed of light

- 100 measurements of the speed of light (×1,000 km/second), conducted by Albert Abraham Michelson in 1879.



Gaussian Random Variable



[Wikipedia.org]