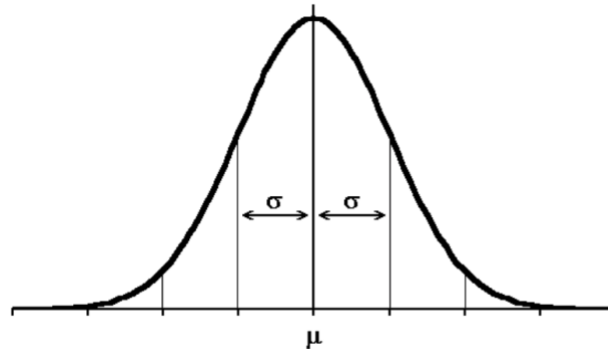




Normal Distribution

Ha Khanh Nguyen (hknguyen)

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}},$$
$$-\infty < x < \infty.$$

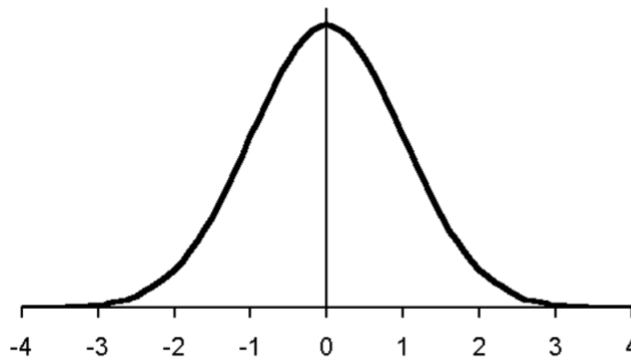


μ – mean

σ – standard deviation

$N(\mu, \sigma^2)$

Standard Normal Distribution.



mean

0

standard deviation

1

$N(0, 1)$

Example 1:

Assume the heights of adult men is a normally distributed random variable with mean 69.1 inches and standard deviation 2.9 inches.

(a) What proportion of the adult men population are shorter than 67 inches?

(b) What proportion of the adult men population are taller than 73.6 inches?

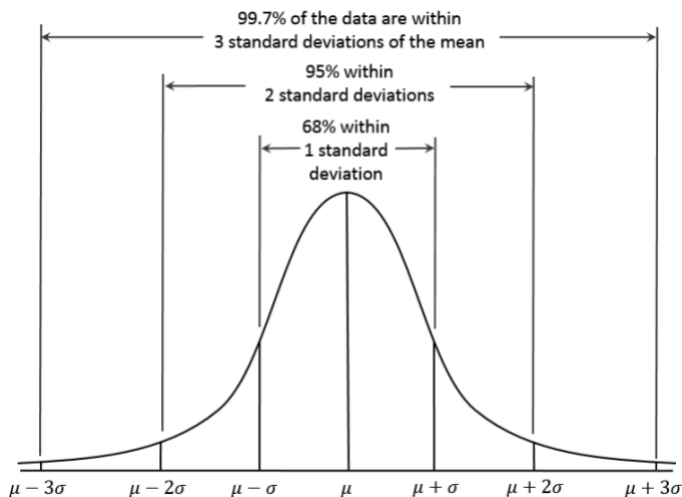
(c) What is the probability that a randomly selected man's height is at least 68 inches?

(d) What is the probability that a man chosen at random will have height between 66 inches and 72 inches?

Computing Normal Distribution Probabilities using `scipy.stats` in Python

```
from scipy.stats import norm  
  
norm.pdf(x=0, loc=0, scale=1) #f(x) when X ~ N(mean=0, sd=1)  
norm.cdf(x=0, loc=0, scale=1) #P(X <= x) = P(X < x)  
norm.ppf(q=0.5, loc=0, scale=1) #x value such that P(X <= x)=0.5
```

The Empirical Rule (the 68-95-99.7 rule)



Example 2:

At Illini Donuts, the salaries of the employees are normally distributed with mean of \$48,000 and standard deviation of \$5,000.