భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
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Biostatistics BT2023

Lecture 9

Himanshu Joshi
2 September 2022

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Start-up notes

History fact

Abraham de Moivre (1667-1754) in 18th century first derived the Normal distribution function which was later independently derived by Gauss and Laplace ~ 200 years later

Goal of biostatistics

To learn about a population of biological population using information in a sample.

Fun fact

The early development of statistics is intimately related to gambling.

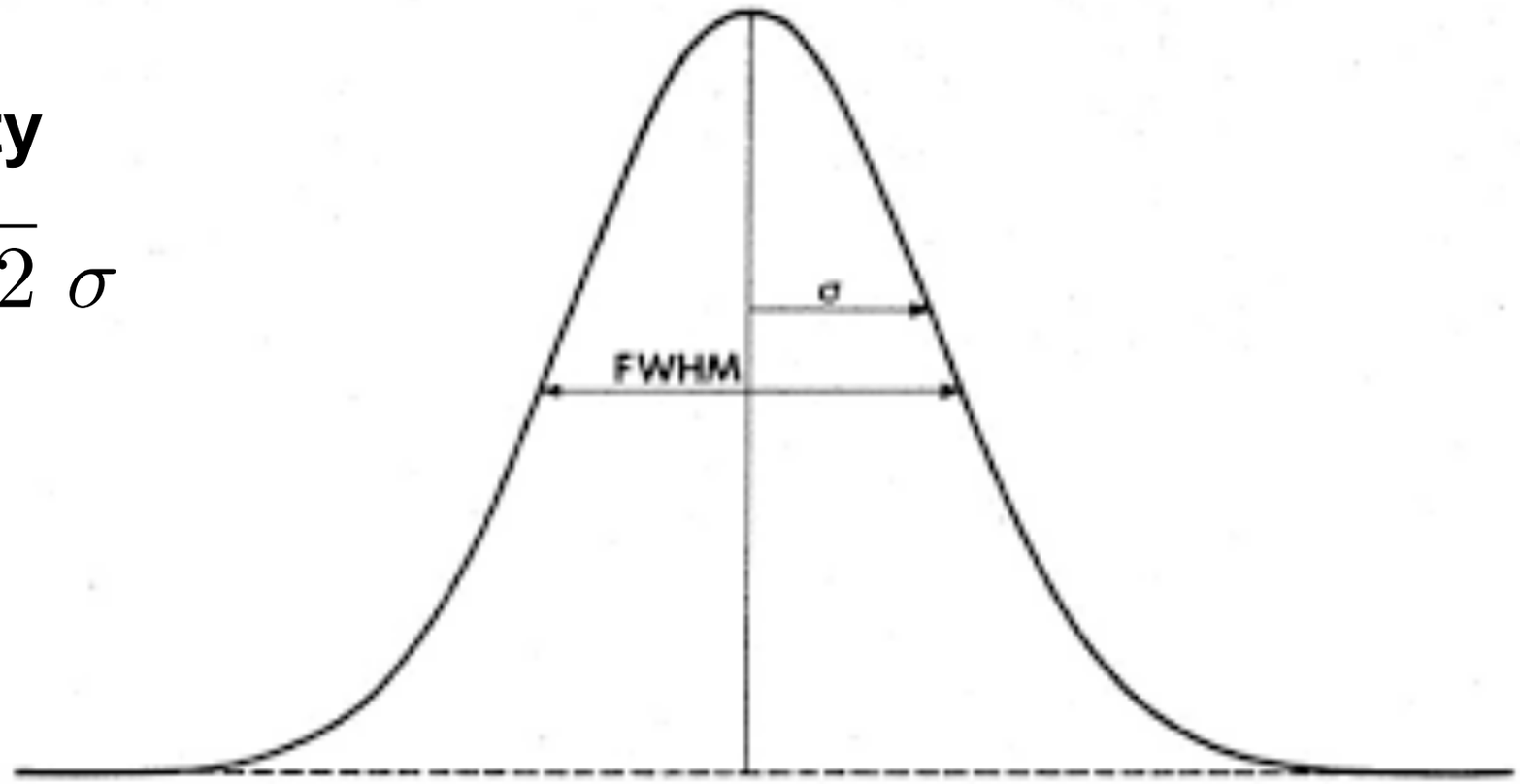
Now when are sitting in the class 0.7 population of the world population is drunk

Normal or symmetrical distribution

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} exp - \left[\frac{(x - x_0)^2}{2\sigma^2}\right]$$

Limits of Variability

$$FWHM = 2\sqrt{2ln2}\ \sigma$$



Plotting this function

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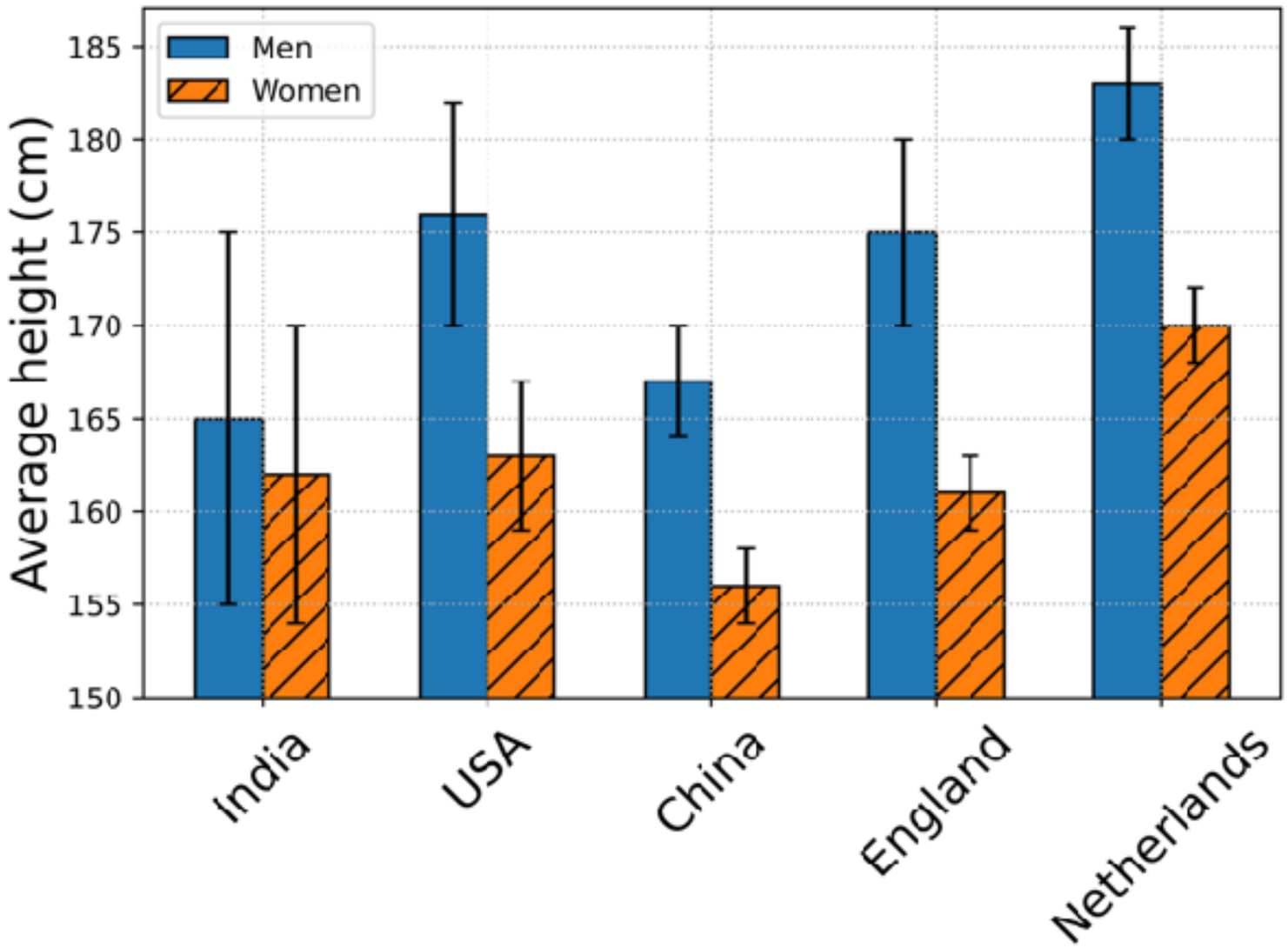
Plot of the day



Question

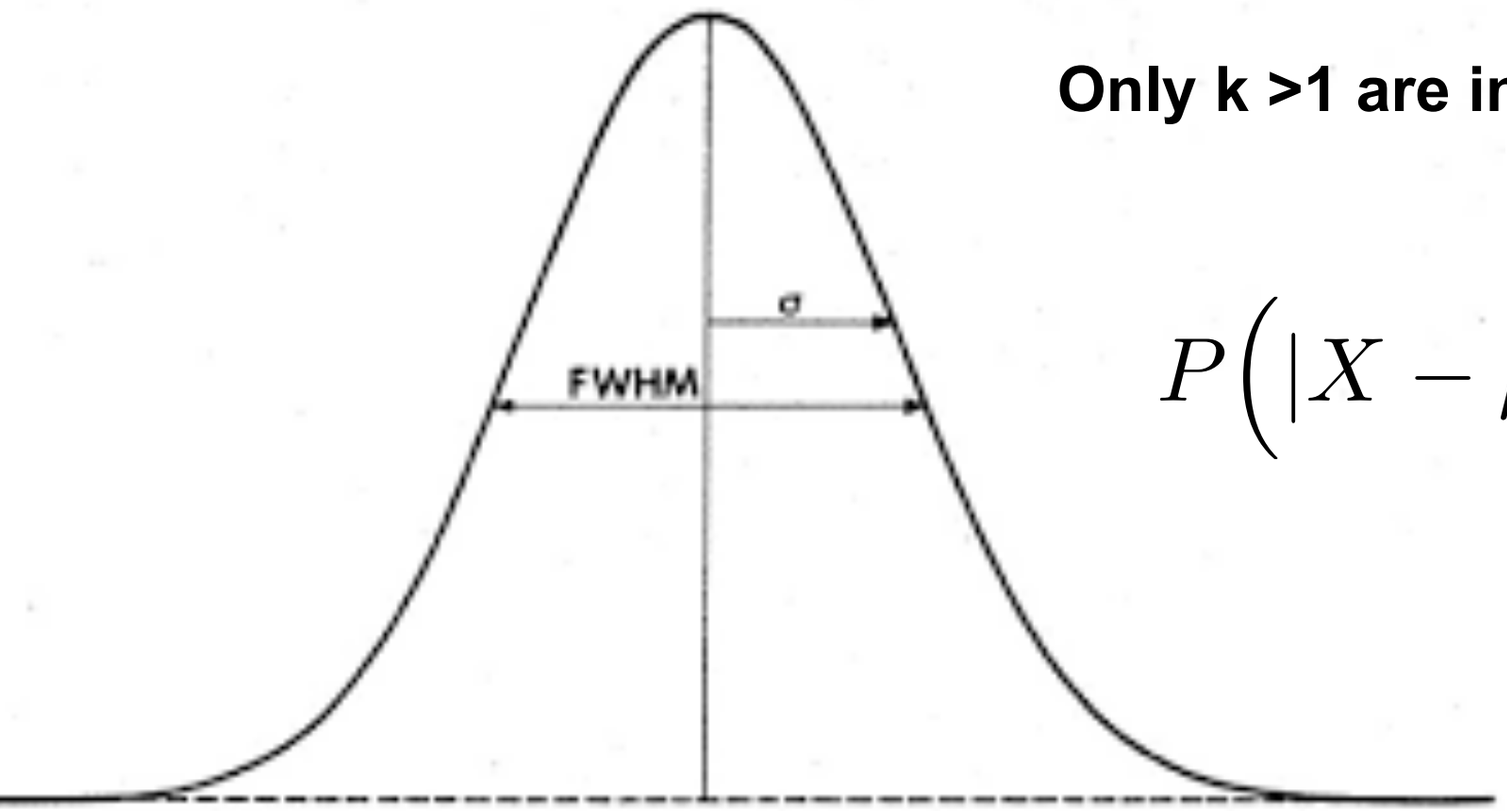
What is difference b/w a bar plot and histogram

Measure of dispersion

Chebyshev's inequality

The rule is often known as Chebyshev's theorem, tells about the range of standard deviations around the mean, in statistics.In a probability distribution, no more than a certain fraction of values can be more than a certain distance from the mean.

$$P(r)\Big(|X-\mu| \geq k \times \sigma\Big) \leq \frac{1}{k^2}$$



Only k >1 are interesting because for k<1 it trivial

$$P\Big(|X-\mu| < k \times \sigma\Big) \geq 1 - \frac{1}{k^2}$$

Mean, Mode, Median

Line plot,

Histogram,

Bar płot,

Pie chart,

Scatter plot,

double axis plot,

Log log plot

Plot the data with standard deviation of error,

Skewness, Kurtosis

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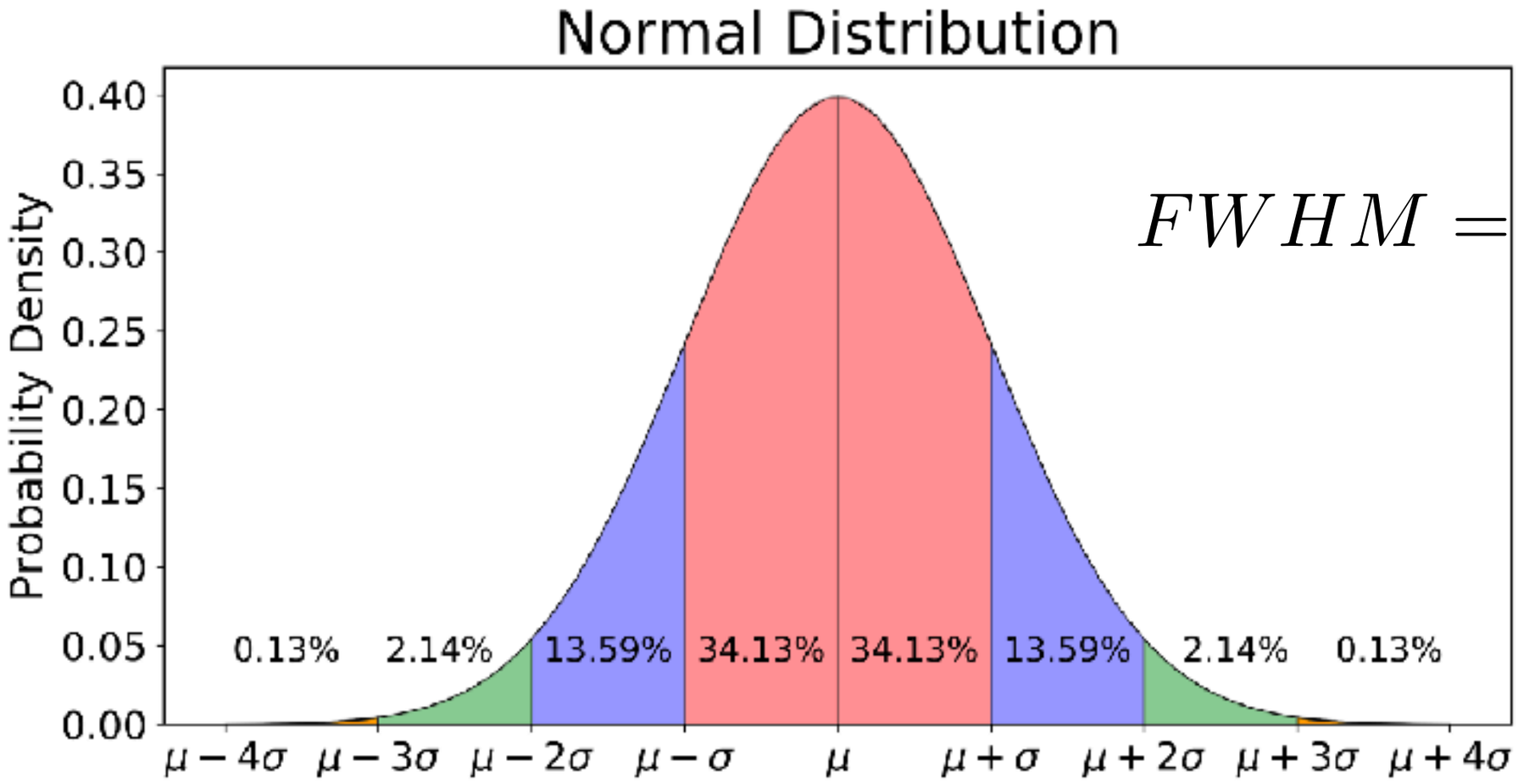
Limits of Variability

68–95–99.7 rule
For a normal distribution



$$FWHM = 2\sqrt{2ln2}\ \sigma$$

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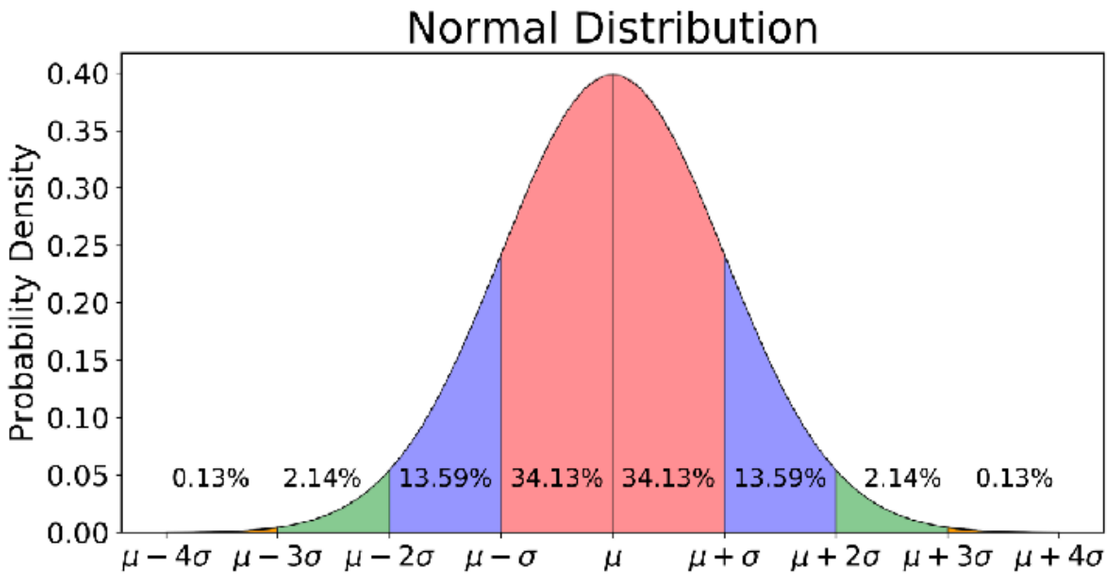
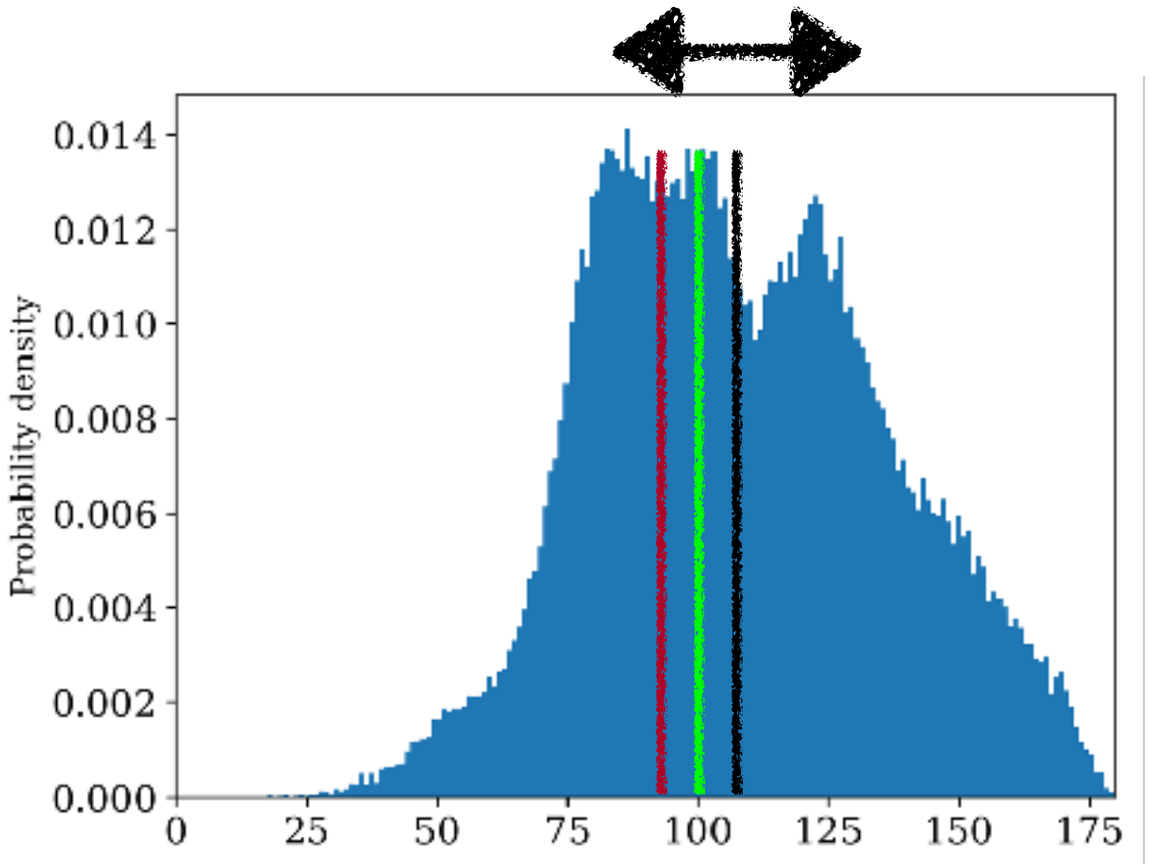
Chebyshev inequality
Comparing the normal distribution with the any other distribution





mean= 108.16
mode= 79.86
median= 105.78
standard deviation= 28.14

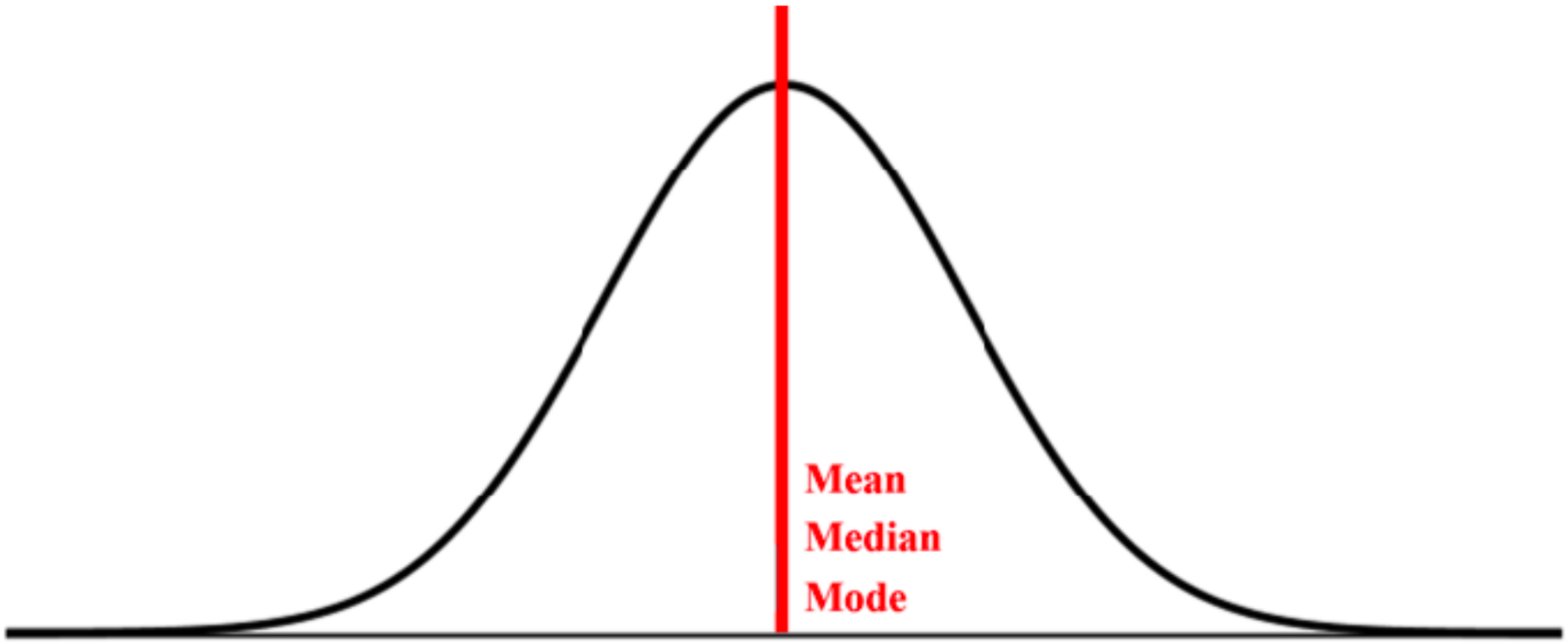
Absolute skewness

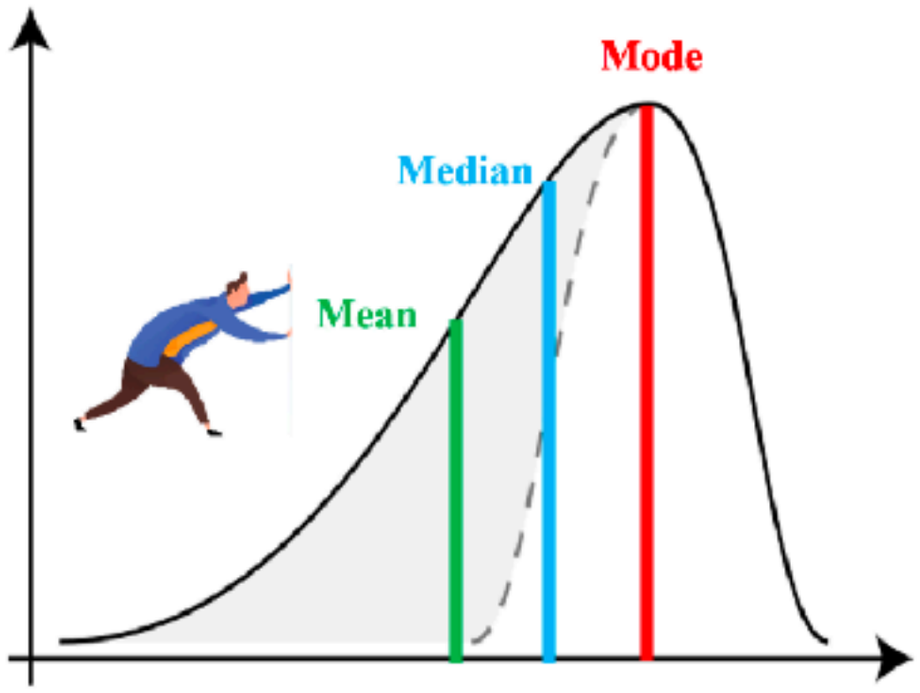
Mean - Mode

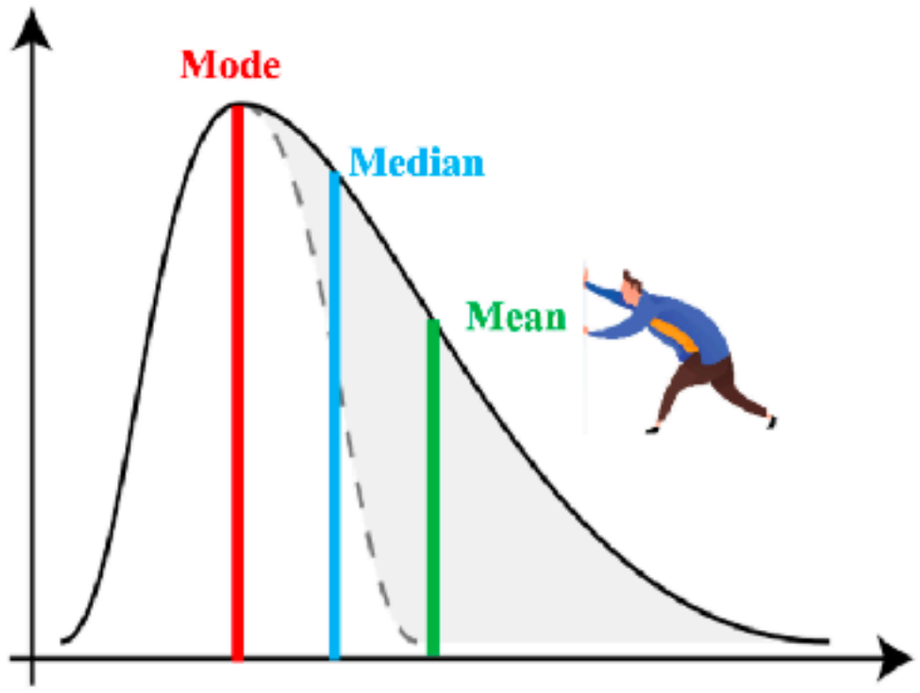
Karl Pearson coefficient of skewness

$$S_k = \frac{Mean - Mode}{Stanadrd\ deviation} = \frac{3(Mean - Median)}{Standard\ deviation}$$

Skewness



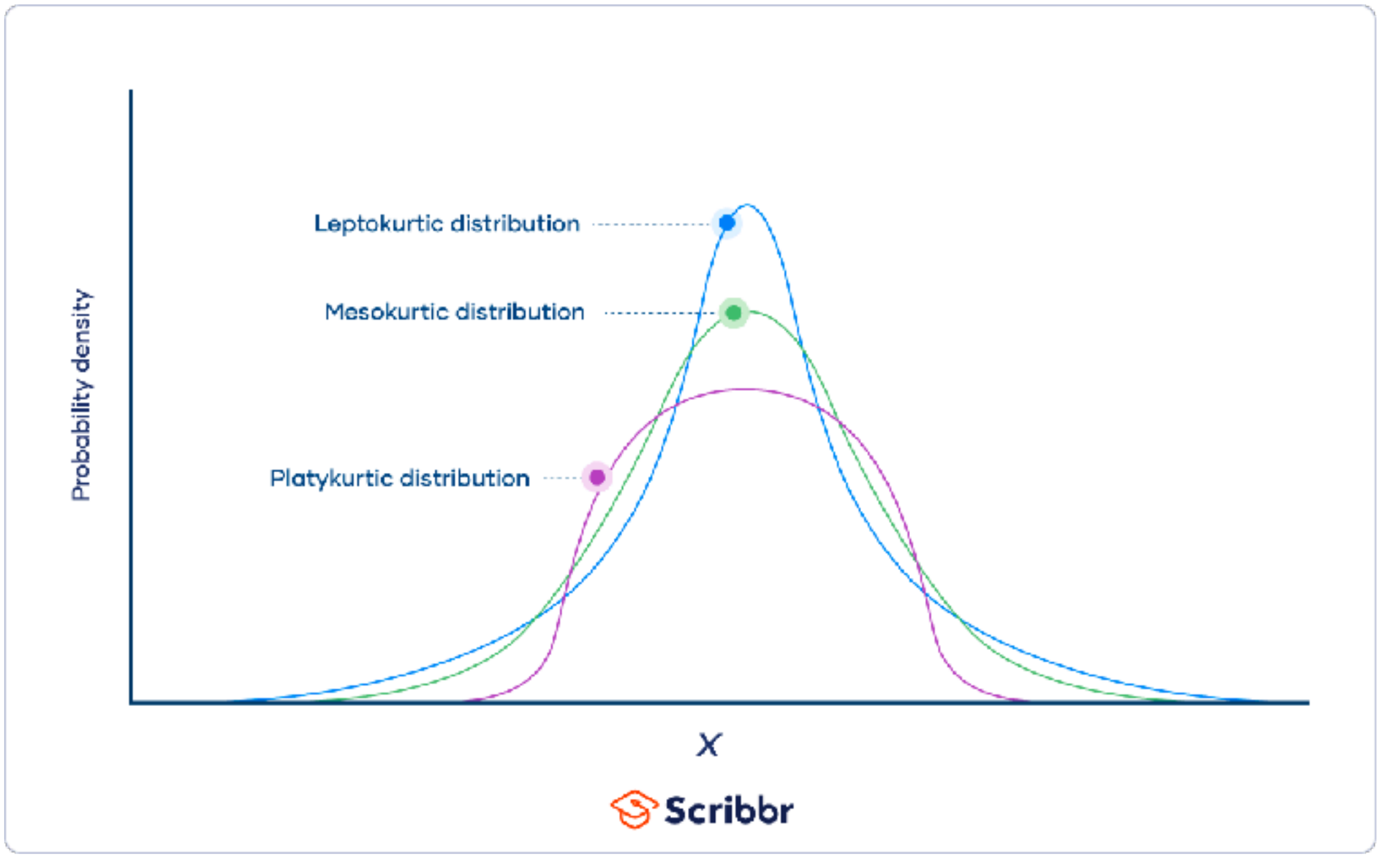




Reference
Towards Data Science

Kurtosis

Kurtosis refers to the degree of the peakedness of the hump in the distribution



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Next Class

2:30 PM Friday, 7 September 2022