భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
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Indian Institute of Technology Hyderabad

Biostatistics BT2023

Lecture 8

Himanshu Joshi
30 August 2022

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Start up notes

- Students should be made to think, to doubt, to communicate, to question, to l*earn from their mistakes,* and most importantly have fun in their learning.

- The best way I have found, always ready to adjust, to change, to unlearn.

- Try to make full of the resources available around you.

- Learn to use internet

- Role of social media in current age of information.

- Don’t run out of energy

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Measure of dispersion

15, 20, 17, 19, 21, 13, 12, 10, 17, 9, 12

Range: subtract two farthest data points

Interquartile range : Divide your data into four parts, the range between first and third quartile is you IQR.

Mean Deviation or average deviation: The arithmetical mean of the mode of all the deviations from the central values,

$$\frac{1}{n}\sum |x_i - \bar{x}|$$

From mean

$$\frac{1}{n}\sum |x_i - M_d$$

From median

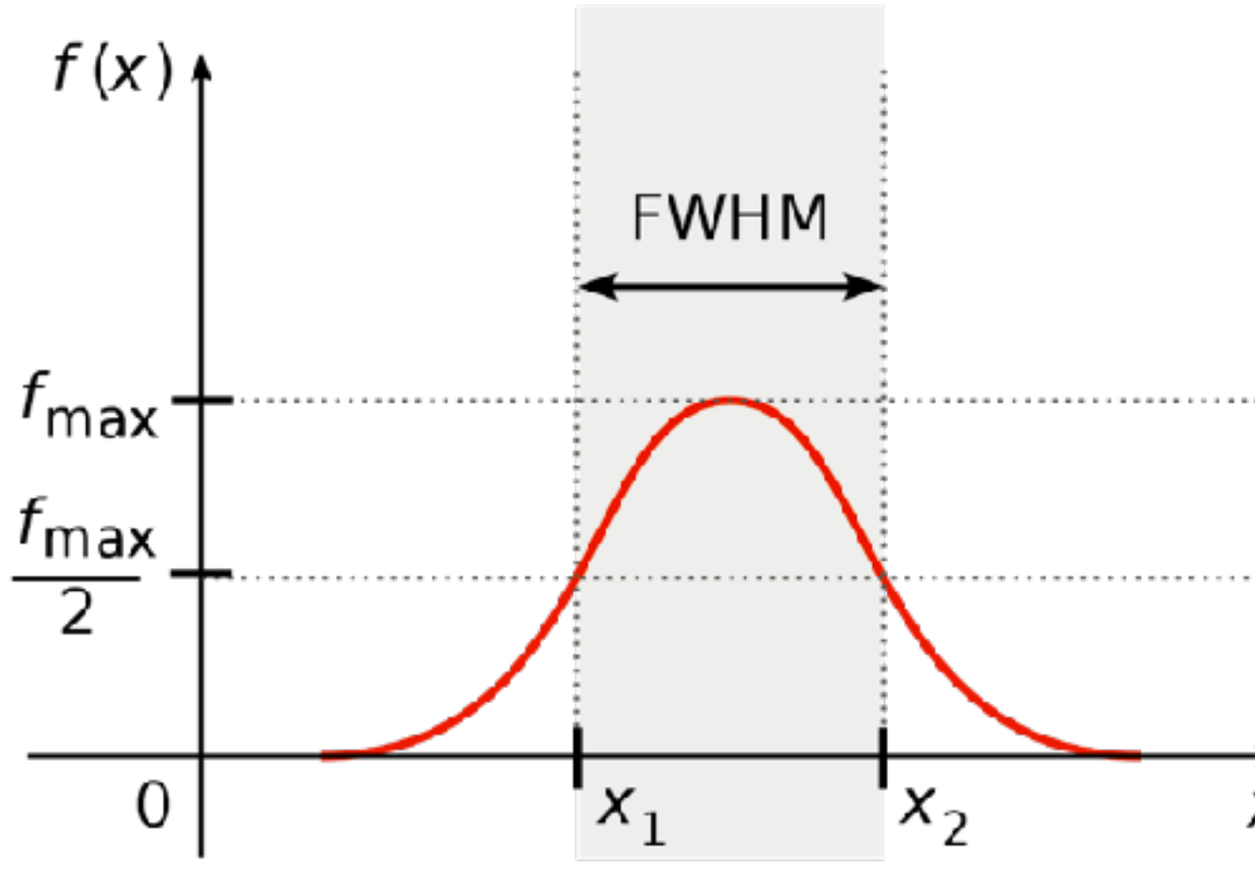
$$\frac{1}{n}\sum |x_i - Z|$$

From mod

Coefficient of mean deviation $\frac{MD_x}{\bar{x}}$

The relative measure of dispersion corresponding to the mean deviation is called coefficient of mean deviation, be it the Mean, Mode or Median

Full width half maximum



Measurement of dispersion

Standard deviation

$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

Coefficient of standard deviation $\frac{\sigma}{\bar{x}}$

Variance σ^2

15, 20, 17, 19, 21, 13, 12, 10, 17, 9, 12

Handy method of computing standard deviation

$$Y = X - A$$

$$\text{Mean } (X) = \text{mean}(Y) + A$$

$$\sigma = \sqrt{\frac{\sum {d_i}^2}{n} - (\frac{\sum d}{n})^2}$$

48, 43, 65, 57, 31, 60, 37, 48, 59, 78 $\sigma = 13.26$

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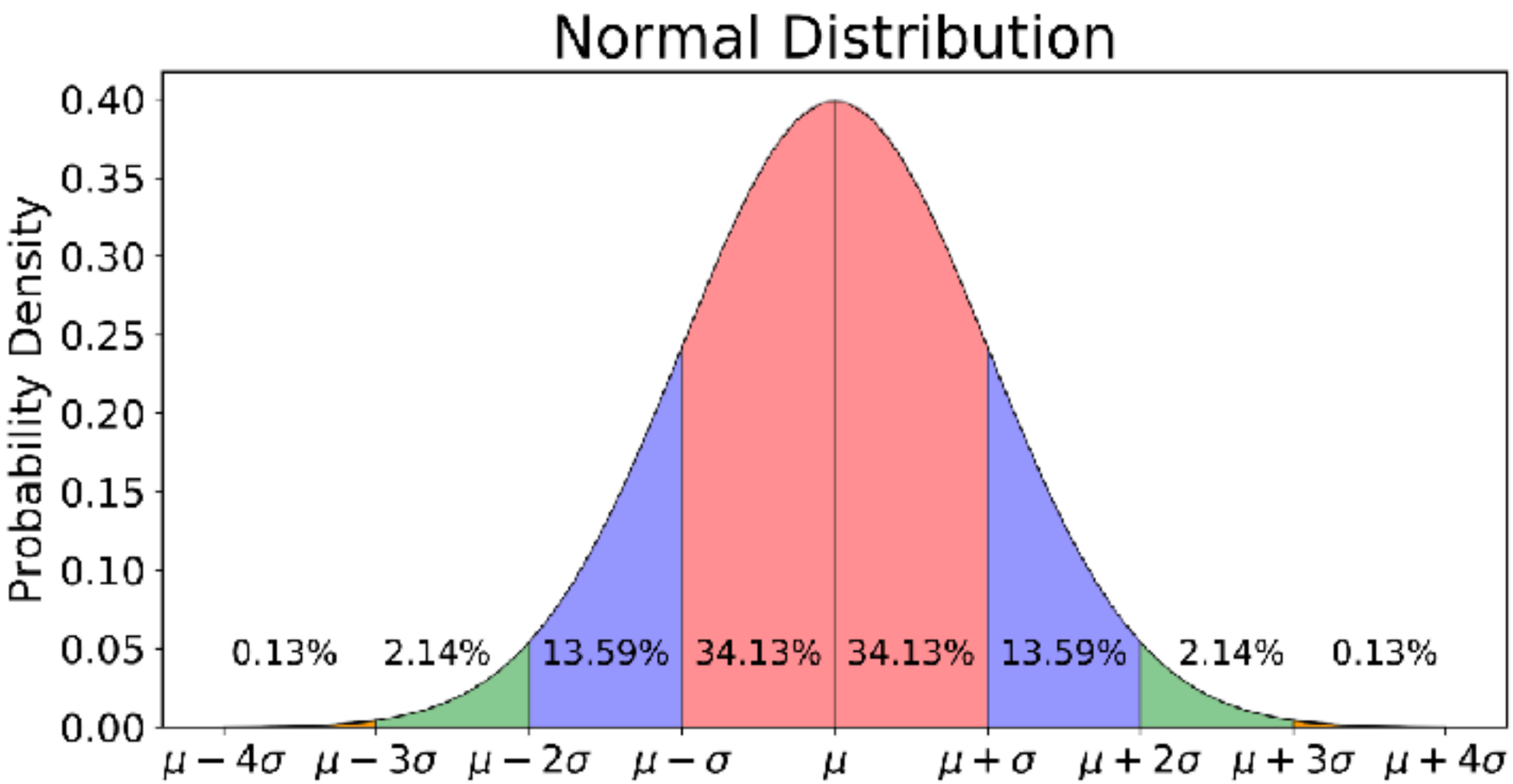
Limits of Variability

68–95–99.7 rule

For a normal distribution



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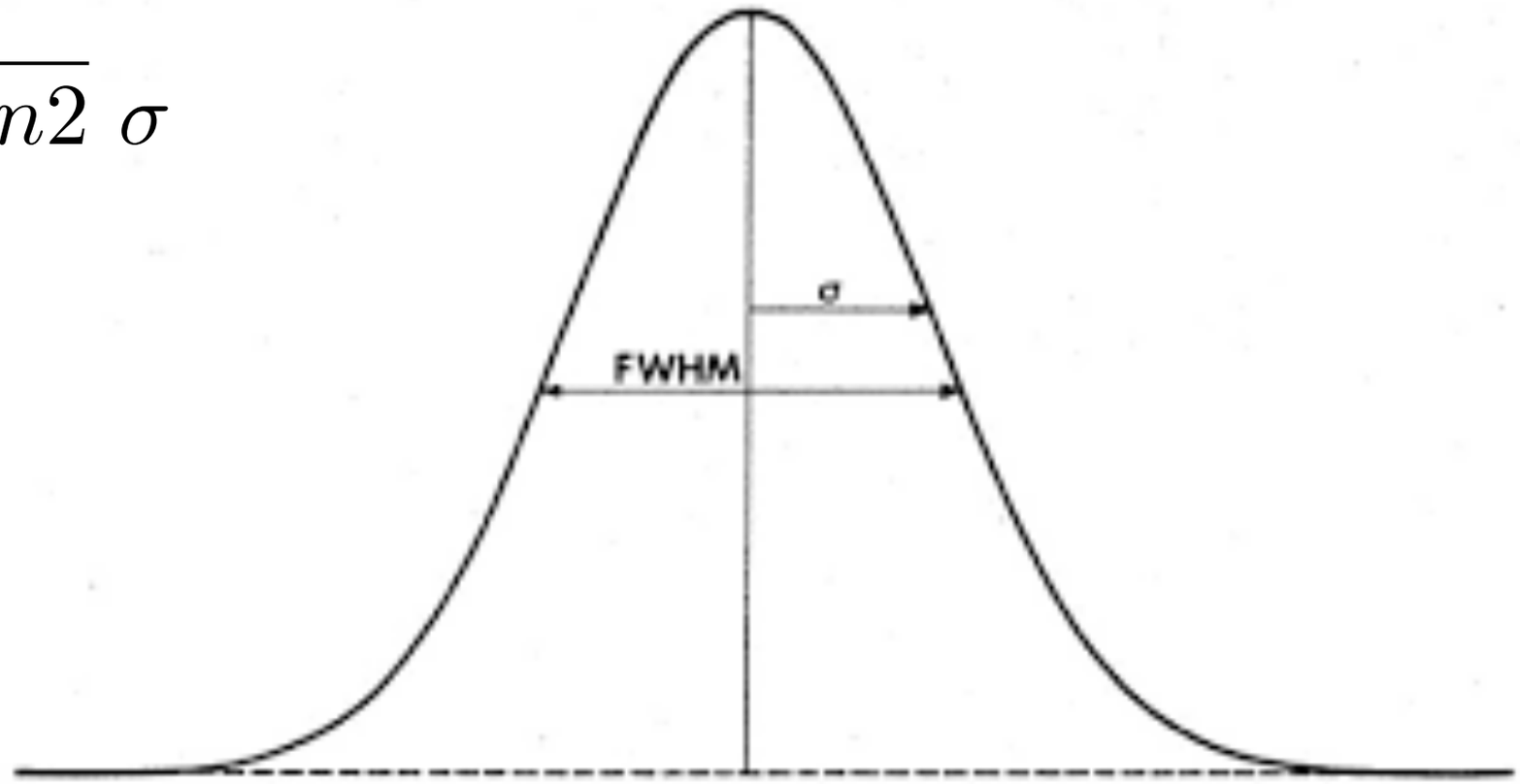
Normal or symmetrical distribution

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

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



Plotting this function

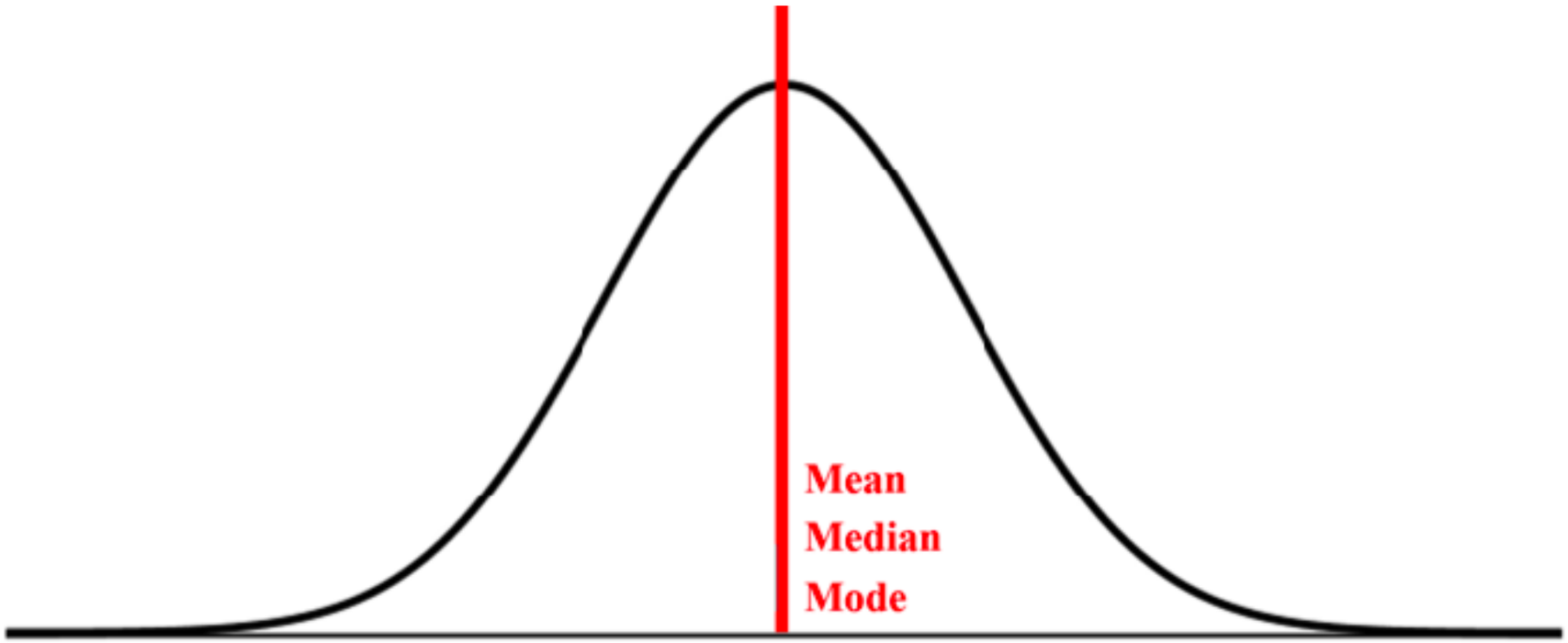
Measure of dispersion

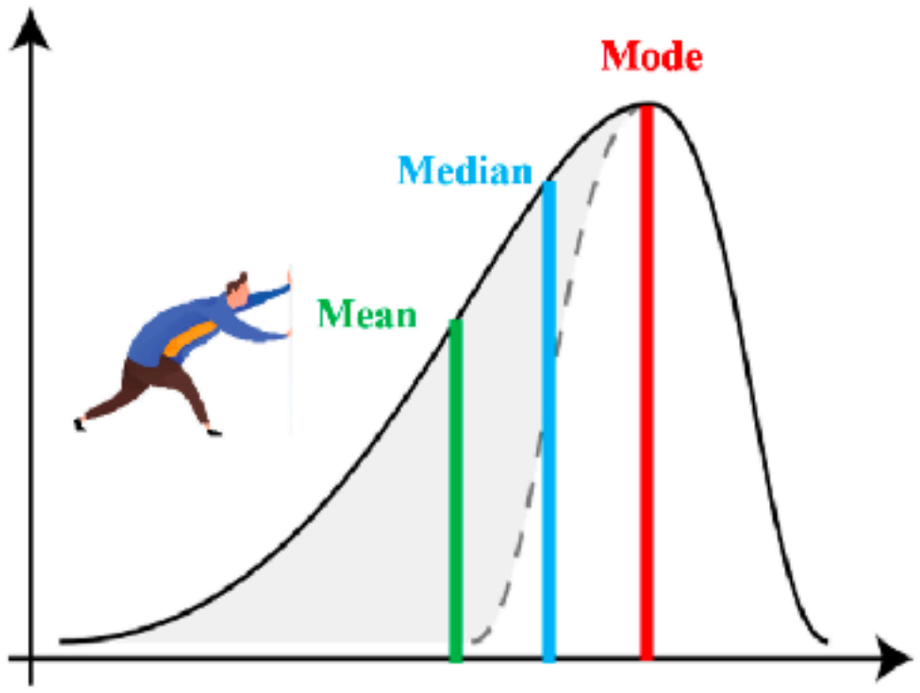
Chebyshev's inequality

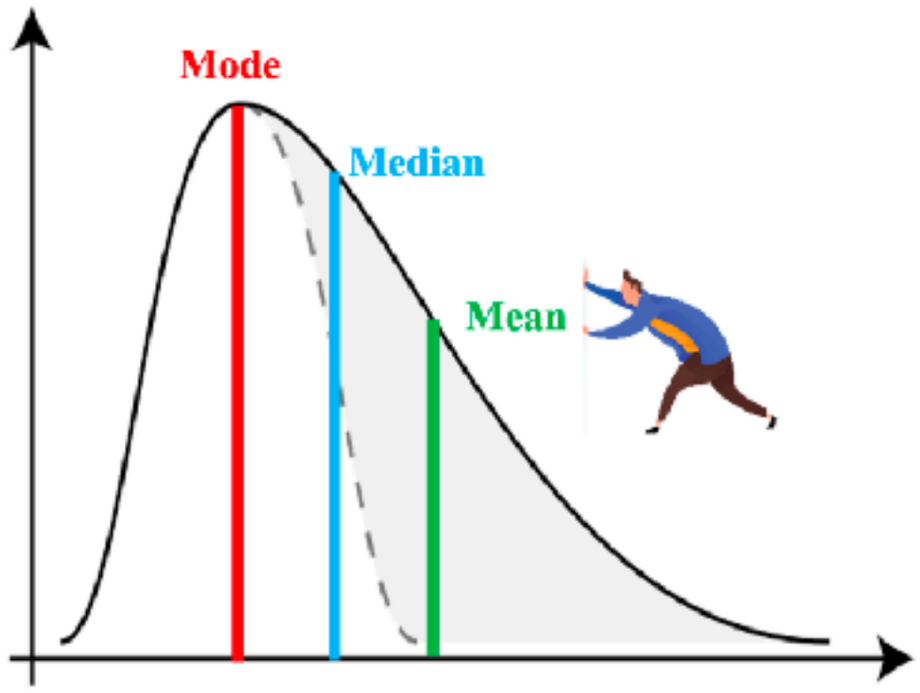
In a probability distribution, no more than a certain fraction of values can be more than a certain distance from the mean.

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

Skewness







Reference
Towards Data Science

Absolute skewness

Mean - Mode

Karl Pearson coefficient of skewness

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

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Next Class

2:30 PM Friday, 2 September 2022