Measure of Central Tendency

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Measure of Central Tendency

- A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position within that set of data.
- As such, measures of central tendency are sometimes called measures of central location. They are also classed as summary statistics.
- These one number summary is of three types.
  - Mean
  - Median
  - Mode

What is mean?

- Mean : Mean is defined as the ratio of the sum of all the observations in the data to the total number of observations.
- This is also known as Average.
- Thus mean is a number around which the entire data set is spread.

Example:

- Consider the following data points.

  17, 16, 21, 18, 15, 17, 21, 19, 11, 23

  Mean — Mean is calculated as

$$Mean = \frac{17+16+21+18+15+17+21+19+11+23}{10} = \frac{178}{10} = 17.8$$

What is median?

- Median is the point which divides the entire data into two equal halves. One-half of the data is less than the median, and the other half is greater than the same.
- Median is calculated by first arranging the data in either ascending or descending order.
  - If the number of observations are odd, median is given by the middle observation in the sorted form.
  - If the number of observations are even, median is given by the mean of the two middle observation in the sorted form.
- An important point to note that the order of the data (ascending or descending) does not effect the median.

What is median?

- To calculate Median, lets arrange the data in ascending order.

  11, 15, 16, 17, 17, 18, 19, 21, 21, 23

- Since the number of observations is even (10), median is given by the average of the two middle observations (5th and 6th here).

$$Median = \frac{5^{th}\ Obs + 6^{th}\ Obs}{2} = \frac{17 + 18}{2} = 17.5$$

What is mode?

- Mode is the number which has the maximum frequency in the entire data set, or in other words,mode is the number that appears the maximum number of times. A data can have one or more than one mode.
  - If there is only one number that appears maximum number of times, the data has one mode, and is called Uni-modal.
  - If there are two numbers that appear maximum number of times, the data has two modes, and is called Bi-modal.
  - If there are more than two numbers that appear maximum number of times, the data has more than two modes, and is called Multi-modal.

What is mode?

- The data:

  11, 15, 16, 17, 17, 18, 19, 21, 21, 23

- Mode is given by the number that occurs maximum number of times.
- Here, 17 and 21 both occur twice. Hence, this is a Bimodal data and the modes are 17 and 21.

Note:

- Since Median and Mode does not take all the data points for calculations, these are robust to outliers, i.e. these are not effected by outliers.
- At the same time, Mean shifts towards the outlier as it considers all the data points. This means if the outlier is big, mean overestimates the data and if it is small, the data is underestimated.
- If the distribution is symmetrical, Mean = Median = Mode. Normal distribution is an example.

Mid-range

- The midrange is a type of average, or mean. Electronic gadgets are sometimes classified as “midrange”, meaning they’re in the middle-price bracket.

  The formula to find the midrange = (high + low) / 2.
- Sample problem: Current cell phone prices in a mobile phone store range from ₹40 (the cheapest) to ₹550 (the most expensive). Find the midrange.

  Step 1: Add the lowest value to the highest: ₹550 + ₹40 = ₹590.

  Step 2: Divide Step 1 by two: ₹590 / 2 = ₹295.
- The mid priced phones would be priced at around ₹295.

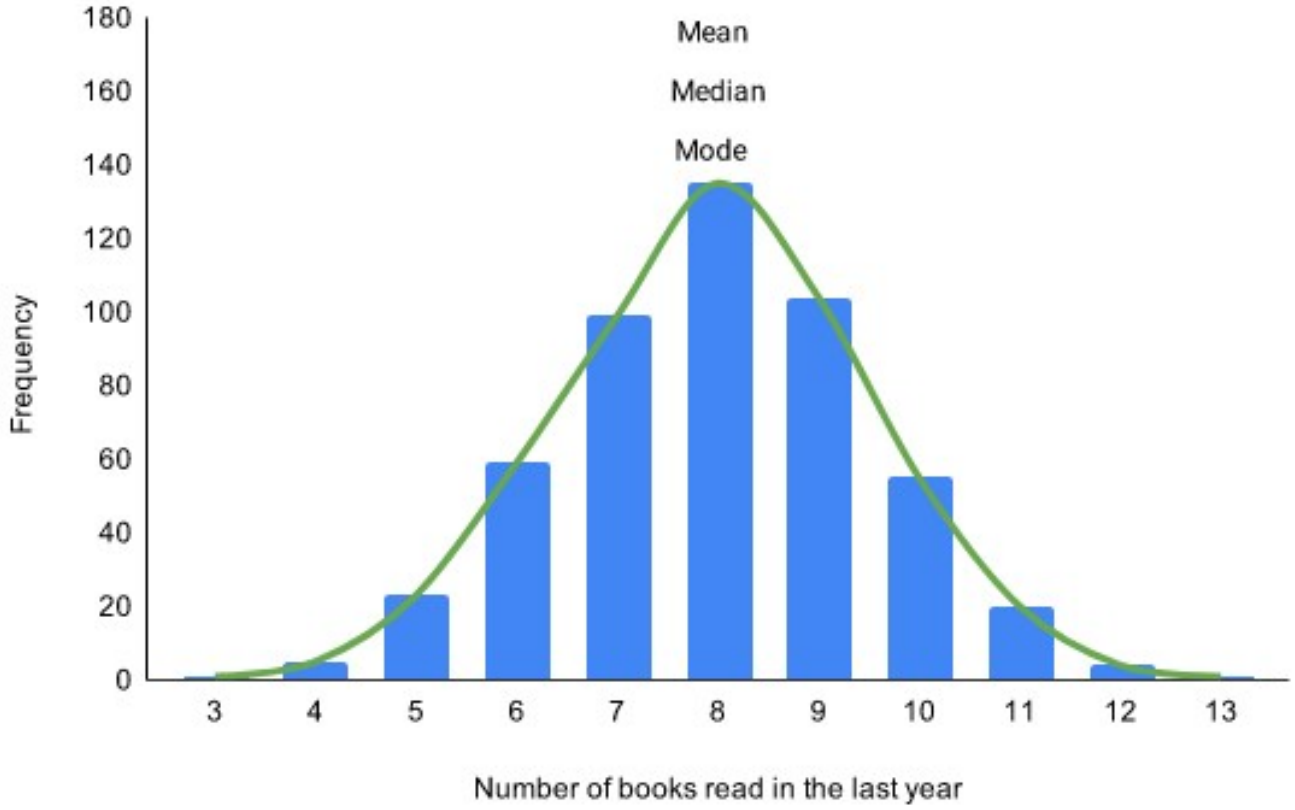
Best Measure

- There can often be a "best" measure of central tendency with regards to the data you are analysing, but there is no one "best" measure of central tendency.
- This is because whether you use the median, mean or mode will depend on the type of data you have, such as nominal or continuous data; whether your data has outliers and/or is skewed; and what you are trying to show from your data.

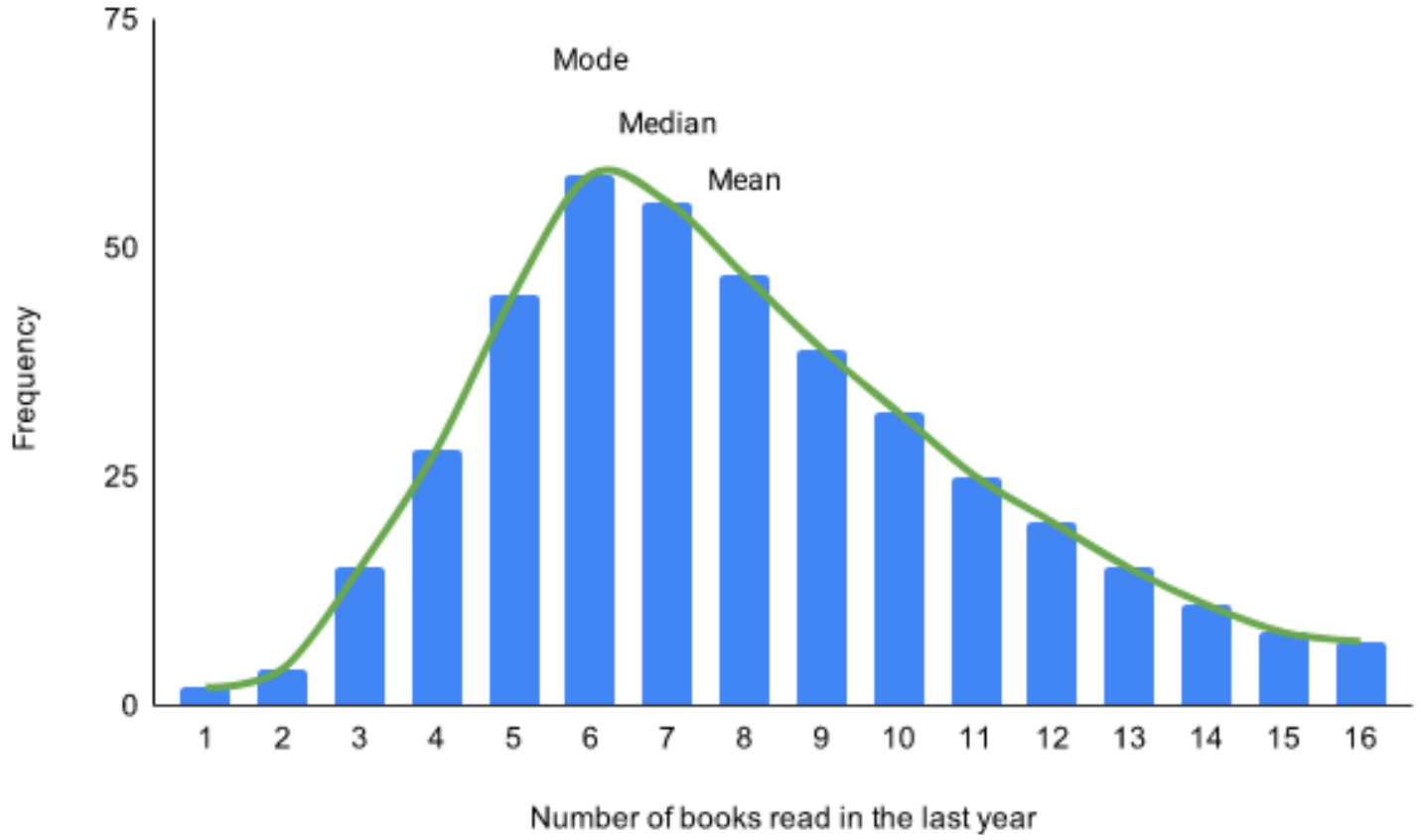
Summary

Levels of measurement	Examples	Measure of central tendency
Nominal	• Ethnicity • Political ideology	• Mode
Ordinal	• Level of anxiety • Income bracket	• Mode • Median
Interval and ratio	• Reaction time • Test score • Temperature	• Mode • Median • Mean

Perfectly Distributed Data



Skewed Distributed Data



Thank you

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