

Measures of Central Tendency

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Introduction

A measure of central tendency is a summary statistic that represents the center point or typical value of a dataset. These measures indicate where most values in a distribution fall and are also referred to as the central location of a distribution. We can think of it as the tendency of data to cluster around a middle value. In **statistics**, the three most common measures of central tendency are the **mean**, **median**, and **mode**. The mean, median and mode are all valid measures of central tendency, but under different conditions, some measures of central tendency become more appropriate to use than others. Choosing the best measure of central tendency depends on the type of data we have.

Mean

The mean is the most commonly used measure of central tendency. Computation of the mean requires scores that are numerical values measured on an interval or ratio scale. The mean is obtained by computing the sum, or total, for the entire set of scores, then dividing this sum by the number of scores.

$$\frac{x_1 + x_2 + \cdots + x_n}{n}$$

The calculation of the mean incorporates all values in the data. If we change any value, the mean changes.

Uses of Mean

Some uses of Mean are as following:

1. Mean is the centre of gravity in the distribution and each score contributes to the determination of it when the spread of the scores are symmetrically around a central point.

2. Mean is more stable than the median and mode. So that when the measure of central tendency having the greatest stability is wanted mean is used.
3. Mean is used to calculate other statistics like S.D., coefficient of correlation, ANOVA, ANCOVA etc.

Disadvantages of Mean

The disadvantages of Mean are as follows:

1. Mean is affected by extreme scores.
2. Sometime mean is a value which is not present in the series.
3. Sometimes it gives absurd values. For example there are 41, 44 and 42 students in class V, VI and VII of a school. So the average students per class are 42.33. It is never possible.
4. In case of open ended class intervals, it cannot be calculated without assuming the size of the open end classes.

Median

Median is the value which occupies the middle position when all the observations are arranged in an ascending/descending order. It divides the frequency distribution exactly into two halves. Fifty percent of observations in a distribution have scores at or below the median. Hence median is the 50th percentile. Median is also known as 'positional average'. It is easy to calculate the median. If the number of observations are odd, then $(n + 1)/2$ th observation (in the ordered set) is the median. When the total number of observations are even, it is given by the mean of $n/2$ th and $(n/2 + 1)$ th observation.

Uses of Median

Some uses of Median are as following:

1. Median is used when the exact midpoint of the distribution is needed or the 50% point is wanted.
2. When extreme scores affect the mean at that time median is the best measure of central tendency.

3. Median is used when it is required that certain scores should affect the central tendency, but all that is known about them is that they are above or below the median.
4. Median is used when the classes are open ended or it is of unequal cell size.

Disadvantages of Median

Followings are the disadvantages of Median:

1. It does not take into account the precise value of each observation and hence does not use all information available in the data.
2. Unlike mean, median is not amenable to further mathematical calculation and hence is not used in many statistical tests.
3. If we pool the observations of two groups, median of the pooled group cannot be expressed in terms of the individual medians of the pooled groups.

Mode

Mode is defined as the value that occurs most frequently in the data. Some data sets do not have a mode because each value occurs only once. On the other hand, some data sets can have more than one mode. This happens when the data set has two or more values of equal frequency which is greater than that of any other value. Mode is rarely used as a summary statistic except to describe a **bimodal** distribution. In a bimodal distribution, the taller peak is called the major mode and the shorter one is the minor mode.

Uses of Mode

The mode is used:

1. When we want a quick and approximate measure of central tendency.
2. When we want a measure of central tendency which should be typical value. For example when we want to know the typical dress style of Indian women i.e. the most popular dress style. Like this the average marks of a class is called modal marks.

Disadvantages of Mode

Disadvantages of Mode are as follows:

1. Mode is not defined rigidly like mean. In certain cases it may come out with different results.
2. It does not include all the observations of a distribution but on the concentration of frequencies of the items.
3. Further algebraic treatment cannot be done with mode like mean.
4. In multimodal and bimodal cases it is difficult to determine.
5. Mode cannot be determined from unequal class intervals.

The End