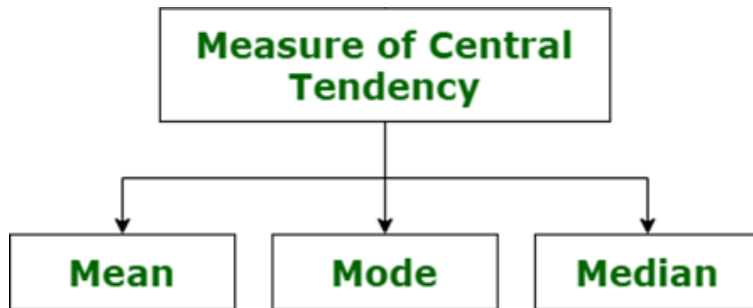


Central Tendency Measures

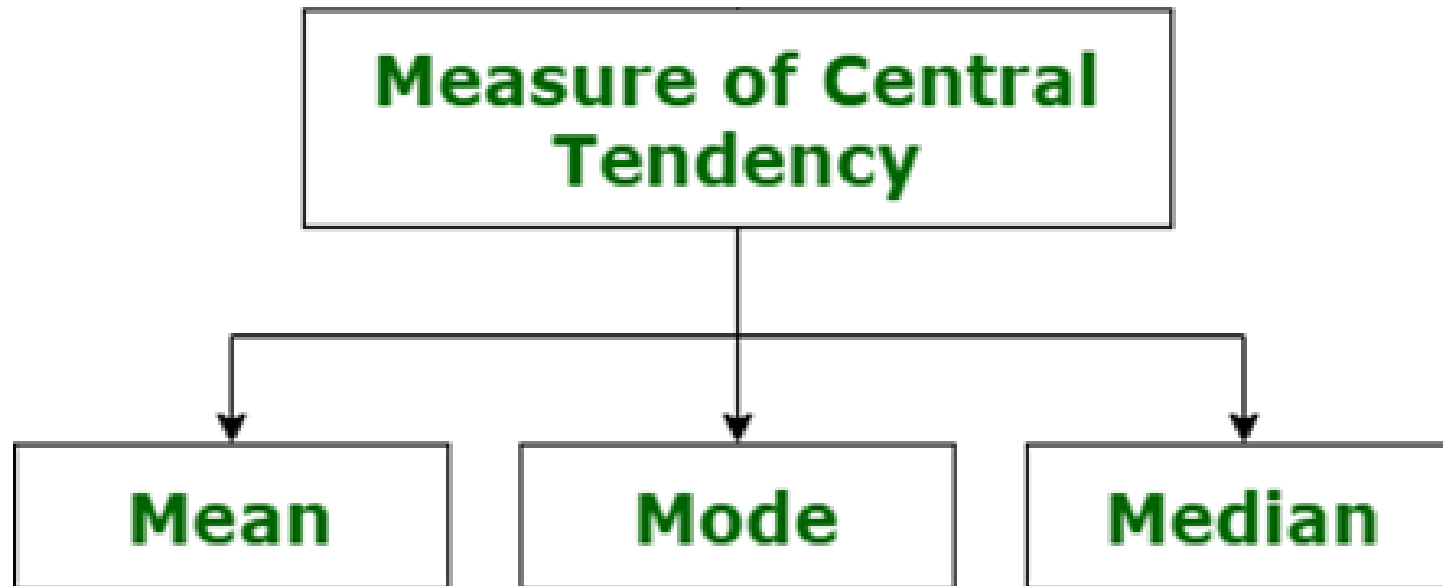
In the framework of the course:
“Applied Statistics”



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Introduction





Mean of Grouped Data

(i) To find the mean of grouped data, it is assumed that the frequency of each class interval is centered around its mid-point.

(ii) Direct Method:

$$\text{Mean } (\bar{x}) = \frac{f_i x_i}{f_i}$$

where the x_i (class mark) is the mid-point of the i^{th} class interval and f_i is the corresponding frequency.

(iii) Assumed Mean Method:

$$\text{Mean } (\bar{x}) = a + \frac{f_i d_i}{f_i}$$

a is the assumed mean and $d_i = x_i - a$ are the deviations of x_i from a for each i .



(iv) Step-deviation Method:

$$\text{Mean } (\bar{x}) = a + h \frac{f_i u_i}{f_i}$$

where a is the assumed mean, h is the class size and $u_i = \frac{x_i - a}{h}$

(v) If the class sizes are unequal, the formula in (iv) can still be applied by taking h to be a suitable divisor of all the d_i 's.

(i) **Mean of raw data**

$$\text{Mean} = \bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} = \frac{\sum_{i=1}^n x_i}{n}$$

where x_1, x_2, \dots, x_n are n observations.

(ii) **Mean of ungrouped data**

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

where f_i 's are frequencies of x_i 's.



Mode of Grouped Data



The observation that occurs most frequently, i.e., the observation with maximum frequency is called mode.

Mode of ungrouped data can be determined by observation/inspection.

- (i) In a grouped frequency distribution, it is not possible to determine the mode by looking at the frequencies. To find the mode of grouped data, locate the class with the maximum frequency. This class is known as the modal class. The mode of the data is a value inside the modal class.

(ii) Mode of grouped data can be calculated by using the formula:

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

where l is the lower limit of the modal class, h is the size of the class, f_1 is frequency of the modal class and f_0 and f_2 are the frequencies of the classes preceding and succeeding the modal class, respectively.



Median of Grouped Data



In statistics and probability theory, the **median** is the numerical value separating the higher half of a data sample, a population, or a probability distribution, from the lower half.

The **median** of a finite list of numbers can be found by arranging all the observations from lowest value to highest value and picking the middle one (e.g., the median of {3, 3, 5, 9, 11} is 5).

If there is an even number of observations, then there is no single middle value; the median is then usually defined to be the **mean** of the two middle values (the median of {3, 5, 7, 9} is $(5 + 7) / 2 = 6$).

This corresponds to interpreting the median as the fully trimmed mid-range.

Median of Grouped Data

- (i) Cumulative frequency table – the less than type and the more than type of the grouped frequency distribution.
- (ii) If n is the total number of observations, locate the class whose cumulative frequency is greater than (and nearest to) $\frac{n}{2}$. This class is called the *median class*.
- (iii) Median of the grouped data can be calculated by using the formula :

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) h,$$

where l is the lower limit of the median class, n is the number of observations, h is the class size, cf is the cumulative frequency of the class preceding the median class and f is the frequency of the median class.

A median is the value of the observation which divides the data into two equal parts, when the data is arranged in ascending (or descending) order.

Calculation of Median

When the ungrouped data is arranged in ascending (or descending) order, the median of data is calculated as follows :

- (i) When the number of observations (n) is odd, the median is the value of the

$$\left(\frac{n+1}{2}\right)^{th} \text{ observation.}$$

- (ii) When the number of observations (n) is even, the median is the average or

$$\text{mean of the } \left(\frac{n}{2}\right)^{th} \text{ and } \left(\frac{n}{2}+1\right)^{th} \text{ observations.}$$



Graphical Representation of Cumulative Frequency Distribution (Ogive)

– Less than type and more than type.

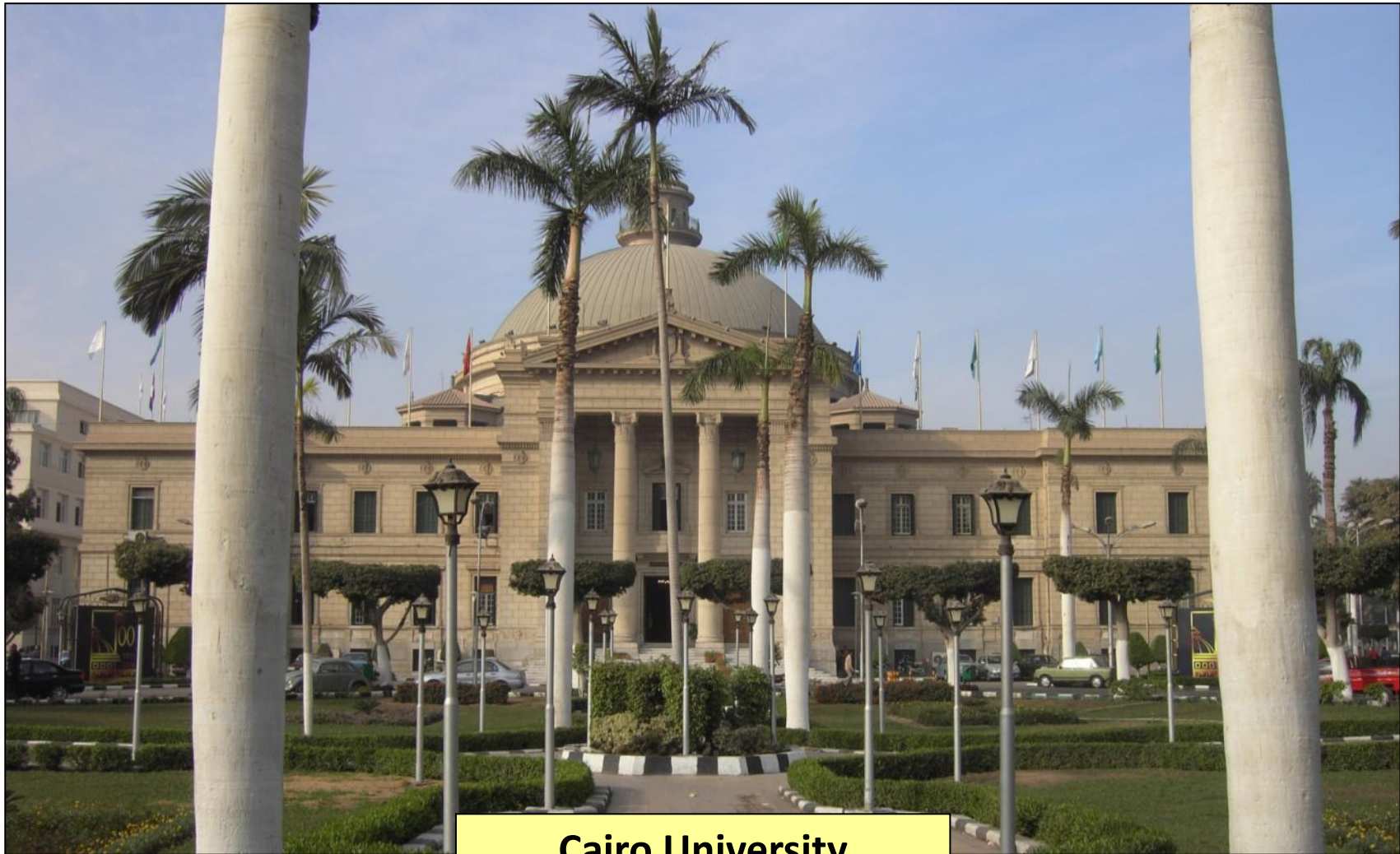
- (i) To find median from the graph of cumulative frequency distribution (less than type) of a grouped data.
- (ii) To find median from the graphs of cumulative frequency distributions (of less than type and more than type) as the abscissa of the point of intersection of the graphs.



Exercises and Solutions



Thank You!



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