Moments in Statistics

Data Science and A.I. Lecture Series

Bindeshwar Singh Kushwaha

PostNetwork Academy

Reach PostNetwork Academy

Website

PostNetwork Academy | www.postnetwork.co

YouTube Channel

www.youtube.com/@postnetworkacademy

PostNetwork Academy Facebook Page

www.facebook.com/postnetworkacademy

LinkedIn Page

www.linkedin.com/company/postnetworkacademy

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
    1. Moments about an arbitrary point

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
  1. Moments about an arbitrary point
  2. Moments about the mean (Central Moments)

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
  1. Moments about an arbitrary point
  2. Moments about the mean (Central Moments)
  3. Moments about the origin

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
  1. Moments about an arbitrary point
  2. Moments about the mean (Central Moments)
  3. Moments about the origin
- Moments can be calculated for:

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
  1. Moments about an arbitrary point
  2. Moments about the mean (Central Moments)
  3. Moments about the origin
- Moments can be calculated for:
  - Individual data

Introduction to Moments

- Moments are statistical measures that provide insights into the characteristics of a distribution.
- They are calculated as the r^{th} power of the deviation from a reference point.
- Types of moments:
  1. Moments about an arbitrary point
  2. Moments about the mean (Central Moments)
  3. Moments about the origin
- Moments can be calculated for:
  - Individual data
  - Frequency distributions

Moments about an Arbitrary Point (Individual Data)

Definition:

Moments about an Arbitrary Point (Individual Data)

Definition: The moments about an arbitrary point A for individual data are calculated as:

Moments about an Arbitrary Point (Individual Data)

Definition: The moments about an arbitrary point A for individual data are calculated as:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

Moments about an Arbitrary Point (Individual Data)

Definition: The moments about an arbitrary point A for individual data are calculated as:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- r: Order of the moment.

Moments about an Arbitrary Point (Individual Data)

Definition: The moments about an arbitrary point A for individual data are calculated as:

$$\mu'_r = \frac{1}{n} \sum_{i=1}^{n} (x_i - A)^r$$

- r: Order of the moment.
- x_i: Data points.

Moments about an Arbitrary Point (Individual Data)

Definition: The moments about an arbitrary point A for individual data are calculated as:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- r: Order of the moment.
- x_i: Data points.
- A: Reference point.

Moments about an Arbitrary Point (Frequency Distribution)

Definition:

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

$$\mu_r' = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- r: Order of the moment.

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- r: Order of the moment.
- x_i: Midpoints or values of the variable.

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i(x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- r: Order of the moment.
- x_i: Midpoints or values of the variable.
- f_i: Frequencies corresponding to x_i.

Moments about an Arbitrary Point (Frequency Distribution)

Definition: The moments about an arbitrary point A for a frequency distribution are calculated as:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- r: Order of the moment.
- x_i: Midpoints or values of the variable.
- f_i: Frequencies corresponding to x_i.
- A: Reference point.

Moments about the Mean (Central Moments for Individual Data)

Definition:

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Common central moments:

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Common central moments:

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Common central moments:
  - μ_2: Variance

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Common central moments:
  - μ_2: Variance
  - μ_3: Skewness

Moments about the Mean (Central Moments for Individual Data)

Definition: The r^{th} central moment about the mean $\bar{x}$ for individual data is:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Common central moments:
  - μ_2: Variance
  - μ_3: Skewness
  - μ_4: Kurtosis

Moments about the Mean (Central Moments for Frequency Distribution)

Definition:

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Common central moments:

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Common central moments:

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Common central moments:
  - μ_2: Variance

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Common central moments:
  - μ_2: Variance
  - μ_3: Skewness

Moments about the Mean (Central Moments for Frequency Distribution)

Definition: The r^{th} central moment about the mean $\bar{x}$ for a frequency distribution is:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Common central moments:
  - μ_2: Variance
  - μ_3: Skewness
  - μ_4: Kurtosis

Moments about the Origin (Individual Data)

Definition:

Moments about the Origin (Individual Data)

Definition: The moments about the origin (raw moments) for individual data are defined as:

Moments about the Origin (Individual Data)

Definition: The moments about the origin (raw moments) for individual data are defined as:

$$\mu_r'' = \frac{1}{n}\sum_{i=1}^{n} x_i^r$$

Moments about the Origin (Individual Data)

Definition: The moments about the origin (raw moments) for individual data are defined as:

$$\mu_r'' = \frac{1}{n}\sum_{i=1}^{n} x_i^r$$

- The first raw moment is the arithmetic mean:

Moments about the Origin (Individual Data)

Definition: The moments about the origin (raw moments) for individual data are defined as:

$$\mu_r'' = \frac{1}{n}\sum_{i=1}^{n} x_i^r$$

- The first raw moment is the arithmetic mean:

$$\mu_1'' = \bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Summary of Moment Formulas for Individual Data

Individual Data:

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- Central moments:

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- Central moments:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- Central moments:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Moments about the origin:

Summary of Moment Formulas for Individual Data

Individual Data:

- Moments about an arbitrary point:

$$\mu'_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - A)^r$$

- Central moments:

$$\mu_r = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^r$$

- Moments about the origin:

$$\mu''_r = \frac{1}{n}\sum_{i=1}^{n}x_i^r$$

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- Central moments:

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

$$\mu_r' = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- Central moments:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i(x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- Central moments:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i(x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Moments about the origin:

Summary of Moment Formulas for Frequency Distribution

Frequency Distribution:

- Moments about an arbitrary point:

$$\mu'_r = \frac{\sum_{i=1}^{n} f_i (x_i - A)^r}{\sum_{i=1}^{n} f_i}$$

- Central moments:

$$\mu_r = \frac{\sum_{i=1}^{n} f_i (x_i - \bar{x})^r}{\sum_{i=1}^{n} f_i}$$

- Moments about the origin:

$$\mu''_r = \frac{\sum_{i=1}^{n} f_i x_i^r}{\sum_{i=1}^{n} f_i}$$