

Statistical Techniques for Data Science

Introduction to Statistics

Measures of Dispersion

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Objective

After attending this session, you will be able to –

- **Calculate Range**
- **Calculate Standard Deviation and Variance**

Range

- Range is a measure of variation
- Range is from Minimum to Maximum values –

$$R = X_{\max} - X_{\min}$$

- Range ignores how data is distributed
- Range can be calculated in R as follows –

```
#Range Calculation  
> freq_data <- read.csv("freq_dist_data.csv") #Importing the Data  
> Range_Value <- max(freq_data$Distance) - min(freq_data$Distance)  
> Range_Value  
[1] 20.6
```

Standard Deviation

- **Standard Deviation is an important measure of variation**
- **It is also termed as Root Mean Square Deviation (RMSD)**
- **Standard Deviation is always a positive number**
- **Standard deviation is affected by extreme values**

Calculation of Standard Deviation

- For Ungrouped Data, the standard deviation is calculated as –

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (X_i - \mu)^2}{N}}, \text{ when population mean '}\mu\text{' is known}$$

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}, \text{ when population mean '}\mu\text{' is not known}$$

- For Grouped Data, the standard deviation is calculated as –

$$\sigma = \sqrt{\frac{\sum_{i=1}^n f_i (X_i - \mu)^2}{N}}, \text{ when population mean '}\mu\text{' is known}$$

$$s = \sqrt{\frac{\sum_{i=1}^n f_i (x_i - \bar{x})^2}{N - 1}}, \text{ when population mean '}\mu\text{' is not known}$$

Calculation of Standard Deviation

- **Standard Deviation can be calculated in R as follows -**

```
➤ sd(freq_data$Distance)
```

```
[1] 6.124916
```

Variance

- **Variance is the square of standard deviation**
- **The difference between variance and standard deviation is in terms of unit of measurement**
- **Variance is calculated in R as follows –**
 - `var(freq_data$Distance)`
[1] 37.51459



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