

Statistics

Lecture 06: | Summary Statistics

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| Summary Statistics

- A **sample** is often a **long list of numbers**.
- To help make the **important features** of a sample stand out, we compute **summary statistics**.

| Sample Mean

- The **mean** gives an indication of the center of the data
- The **sample mean** is also called the “arithmetic mean,” or, more simply, the **“average.”**

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

| Example

- A simple random sample of five men is chosen from a large population of men, and their heights are measured. The five heights (in inches) are **65.51, 72.30, 68.31, 67.05, and 70.68**. Find the sample mean.

| The Standard Deviation

- **Standard deviation** gives an **indication of how spread out the data are**

| The Standard Deviation

- The **sample variance** is the average of the squared deviations, except that we divide by $n - 1$ instead of n . It is customary to denote the sample variance by s^2

| Sample Standard Deviation

- To obtain a **measure of spread** whose **units** are the same as those of the **sample values**, we simply take the **square root of the variance**. This quantity is known as the **sample standard deviation**

| The Standard Deviation

- A **simple random sample** of five men is chosen from a large population of men, and their heights are measured. The five heights (in inches) are **65.51, 72.30, 68.31, 67.05, and 70.68**.
- Find the sample variance and the sample standard deviation for the height data

| The Standard Deviation

| The Standard Deviation

- What would happen to the sample mean, variance, and standard deviation if the heights were measured in centimeters rather than inches?
- if we multiply each sample item by a constant, the sample mean is multiplied by the same constant
- if we multiply each sample item by a constant, the sample standard deviation is multiplied by the same constant

| The Standard Deviation

- What if each man in the sample put on 2-inch heels? Then each sample height would increase by 2 inches and the sample mean would increase by 2 inches as well. In general, if a constant is added to each sample item, the sample mean increases (or decreases) by the same constant.
- The deviations, however, do not change, so the sample variance and standard deviation are unaffected

| The Standard Deviation

Summary

- If $X_1, \dots, X_n$ is a sample and $Y_i = a + bX_i$, where a and b are constants, then $\bar{Y} = a + b\bar{X}$.
- If $X_1, \dots, X_n$ is a sample and $Y_i = a + bX_i$, where a and b are constants, then $s_Y^2 = b^2 s_X^2$, and $s_Y = |b|s_X$.

$\bar{X} \xrightarrow{\substack{a \rightarrow \text{sum} \\ b \rightarrow \text{mul}}} \bar{Y} = a + b\bar{X}$