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Descriptive Statistics

Cheat Sheet

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> Key Definitions

Throughout this cheat sheet, you'll find terms and specific statistical jargon being used. Here's a rundown of all the terms you may encounter.

1. **Variable:** In statistics, a variable is a quantity that can be measured or counted. In data analysis, a variable is typically a column in a data frame.
2. **Descriptive statistics:** Numbers that summarize variables. They are also called summary statistics or aggregations.
3. **Categorical data:** Data that consists of discrete groups. The categories are called ordered (e.g., educational levels) if you can sort them from lowest to highest, and unordered otherwise (e.g., country of origin).
4. **Numerical data:** Data that consists of numbers (e.g., age).

> Categorical Data—Trail Mix

To illustrate statistical concepts on categorical data, we'll be using an unordered categorical variable, consisting different elements of a trail mix. Our categorical variable contains 15 almonds, 13 cashews, and 25 cranberries.

Counts and Proportions

Counts and proportions are measures of how much data you have. They allow you to understand how many data points belong to different categories in your data.

- A **count** is the number of times a data point occurs in the dataset.
- A **proportion** is the fraction of times a data point occurs in the dataset.

Food category	Count	Proportion
Almond	15	15 / 48 = 0.283
Cashew	13	13 / 48 = 0.245
Cranberry	25	25 / 48 = 0.472

Visualizing Categorical Variables

Bar plot

One of the easiest charts to read which helps in quick comparison of categorical data. One axis contains categories and the other axis represents values

Stacked bar chart

Best to compare subcategories within categorical data. Can also be used to compare proportions

Treemap chart

2D rectangles whose size is proportional to the value being measured and can be used to display hierarchically structured data

> Numerical Dataset—Glasses of Water

To illustrate statistical concepts on numerical data, we'll be using a numerical variable, consisting of the volume of water in different glasses.

Measures of Center

Measures of center allow you to describe or summarize your data by capturing one value that describes the center of its distribution.

Measure	Definition	How to find it	Result
Arithmetic mean	The total of the values divided by how many values there are	( )/7	205.7 ml
Median	The middle value, when sorted from smallest to largest	180ml	180 ml
Mode	The most common value	300ml 300ml 300ml	300 ml

Other Measures of Location

There are other measures that you can use, that can help better describe or summarize your data.

Measure	Definition	How to find it	Result
Minimum	The lowest value in your data	60ml	60 ml
Maximum	The highest value in your data	300ml	300 ml

- **Percentile**: Cut points that divide the data into 100 intervals with the same amount of data in each interval (e.g., in the water cup example, the 100th percentile is 300 ml)
- **Quartile**: Similar to the concept of percentile, but with four intervals rather than 100. The first quartile is the same as the 25th percentile, which is 120 ml. The third quartile is the same as the 75th percentile, which is 300 ml.

Measures of Spread

Sometimes, rather than caring about the size of values, you care about how different they are.

Measure	Definition	How to find it	Result
Range	The highest value minus the lowest value	300ml 60ml	240 ml
Variance	The sum of the squares of the differences between each value and the mean, all divided by one less than the number of data points	(60ml - Mean)^2 + ... + (300ml - Mean)^2 / (7 - 1)	9428.6 ml^2
Inter-quartile range	The third quartile minus the first quartile	300ml 120ml	180 ml

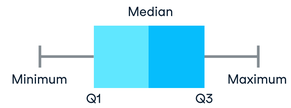
Visualizing Numeric Variables

There are a variety of ways of visualizing numerical data, here's a few of them in action:

Histogram

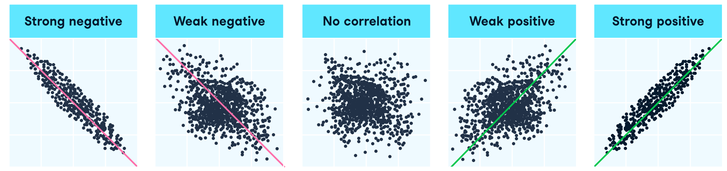
Shows the distribution of a variable. It converts numerical data into bins as columns. The x-axis shows the range, and the y-axis represents the frequency

Box plot



Shows the distribution of a variable using 5 key summary statistics—minimum, first quartile, median, third quartile, and maximum

> Correlation



Correlation is a measure of the linear relationship between two variables. That is, when one variable goes up, does the other variable go up or down? There are several algorithms to calculate correlation, but it is always a score between -1 and +1.

For two variables, X and Y, correlation has the following interpretation:

Correlation score	Interpretation
-1	When X increases, Y decreases. Scatter plot forms a perfect straight line with negative slope
Between -1 and 0	When X increases, Y decreases
0	There is no linear relationship between X and Y, so the scatter plot looks like a noisy mess
Between 0 and +1	When X increases, Y increases
+1	When X increases, Y increases. Scatter plot forms a perfect straight line with positive slope

Note that correlation does not account for non-linear effects, so if X and Y do not have a straight-line relationship, the correlation score may not be meaningful.