WHAT IS DATA VISUALIZATION?

Data visualization is the process of creating graphical representations of information. This process helps the presenter communicate data in a way that's easy for the viewer to interpret and draw conclusions.

There are many different techniques and tools you can leverage to visualize data, so you want to know which ones to use and when. Here are some of the most important data visualization techniques all professionals should know.
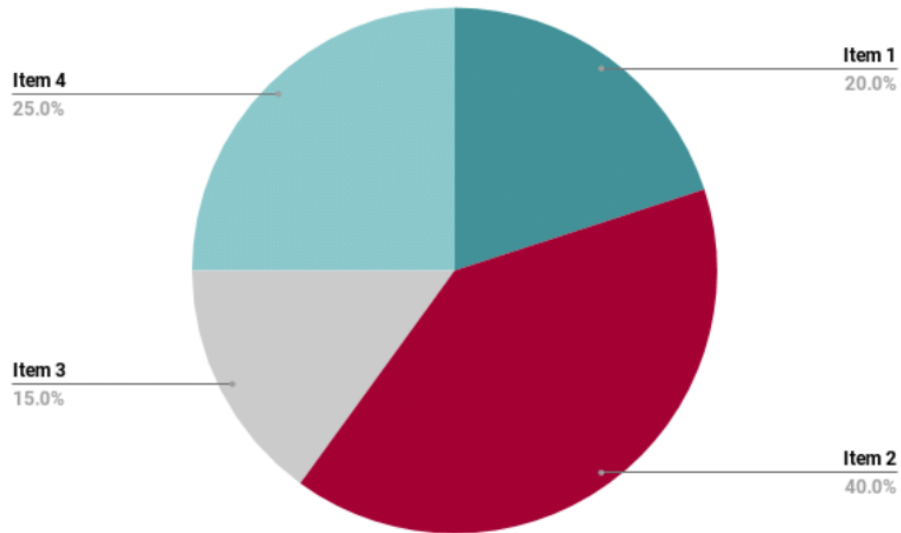
DATA VISUALIZATION TECHNIQUES

The type of data visualization technique you leverage will vary based on the type of data you're working with, in addition to the story you're telling with your data.

Here are some important data visualization techniques to know:

- Pie Chart
- Bar Chart
- Histogram
- Gantt Chart
- Heat Map
- Box and Whisker Plot
- Waterfall Chart
- Area Chart
- Scatter Plot
- Pictogram Chart
- Timeline
- Highlight Table
- Bullet Graph
- Choropleth Map
- Word Cloud
- Network Diagram
- Correlation Matrices

1. Pie Chart

Pie Chart

Item 4	Item 1
25.0%	20.0%
Item 3	Item 2
15.0%	40.0%

Pie charts are one of the most common and basic data visualization techniques, used across a wide range of applications. Pie charts are ideal for illustrating proportions, or part-to-whole comparisons.

Because pie charts are relatively simple and easy to read, they're best suited for audiences who might be unfamiliar with the information or are only interested in the key takeaways. For viewers who require a more thorough explanation of the data, pie charts fall short in their ability to display complex information.
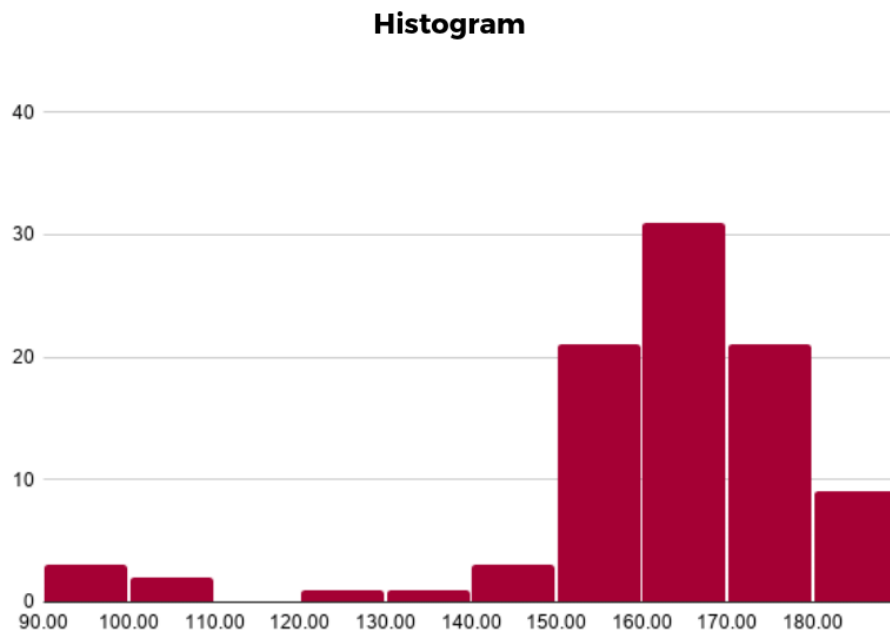
2. Bar Chart
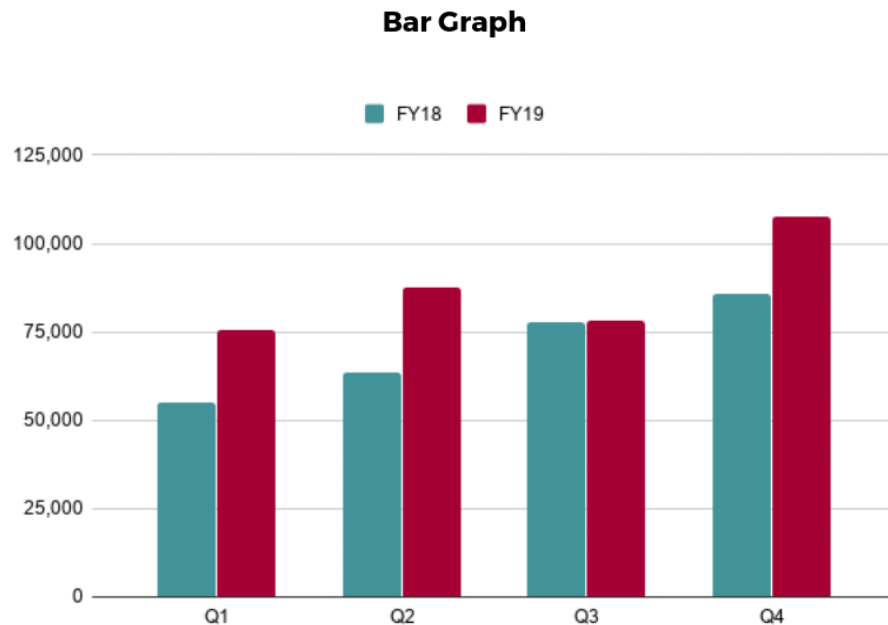
Bar Graph

The classic bar chart, or bar graph, is another common and easy-to-use method of data visualization. In this type of visualization, one axis of the chart shows the categories being compared, and the other, a measured value. The length of the bar indicates how each group measures according to the value.

One drawback is that labeling and clarity can become problematic when there are too many categories included. Like pie charts, they can also be too simple for more complex data sets.
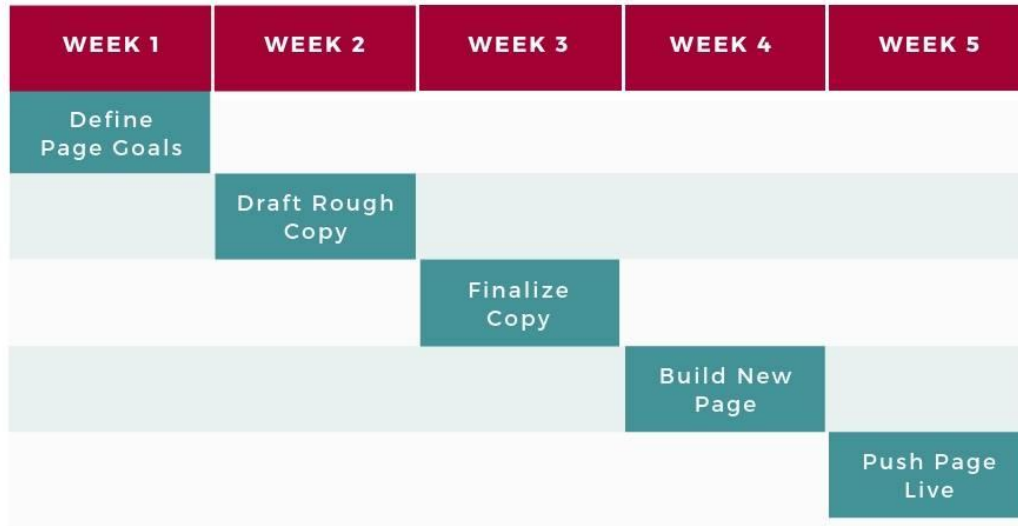
3. Histogram

Histogram

Unlike bar charts, histograms illustrate the distribution of data over a continuous interval or defined period. These visualizations are helpful in identifying where values are concentrated, as well as where there are gaps or unusual values.

Histograms are especially useful for showing the frequency of a particular occurrence. For instance, if you'd like to show how many clicks your website received each day over the last week, you can use a histogram. From this visualization, you can quickly determine which days your website saw the greatest and fewest number of clicks.

4. Gantt Chart

Launch Timeline

WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5
Define Page Goals				
	Draft Rough Copy			
		Finalize Copy		
			Build New Page	
				Push Page Live

Gantt charts are particularly common in project management, as they're useful in illustrating a project timeline or progression of tasks. In this type of chart, tasks to be performed are listed on the vertical axis and time intervals on the horizontal axis. Horizontal bars in the body of the chart represent the duration of each activity.

Utilizing Gantt charts to display timelines can be incredibly helpful, and enable team members to keep track of every aspect of a project. Even if you're not a project management professional, familiarizing yourself with Gantt charts can help you stay organized.

5. Heat Map
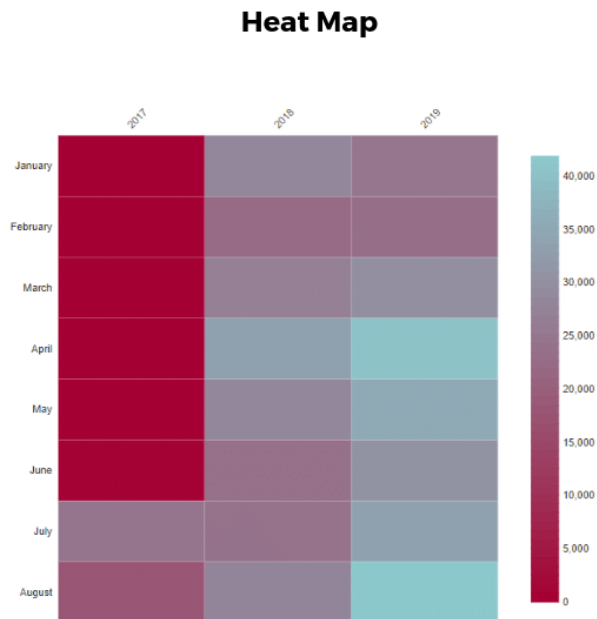
Heat Map

A heat map is a type of visualization used to show differences in data through variations in color. These charts use color to communicate values in a way that makes it easy for the viewer to quickly identify trends. Having a clear legend is necessary in order for a user to successfully read and interpret a heatmap.

There are many possible applications of heat maps. For example, if you want to analyze which time of day a retail store makes the most sales, you can use a heat map that shows the day of the week on the vertical axis and time of day on the horizontal axis. Then, by shading in the matrix with colors that correspond to the number of sales at each time of day, you can identify trends in the data that allow you to determine the exact times your store experiences the most sales.

6. A Box and Whisker Plot

Box and Whisker Plot
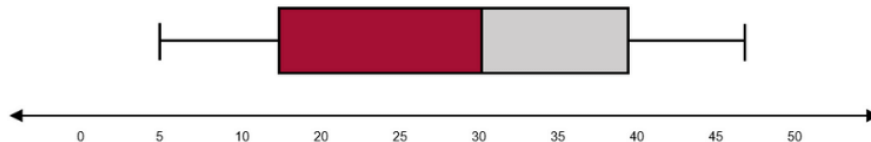
A box and whisker plot, or box plot, provides a visual summary of data through its quartiles. First, a box is drawn from the first quartile to the third of the data set. A line within the box represents the median. "Whiskers," or lines, are then drawn extending from the box to the minimum (lower extreme) and maximum (upper extreme). Outliers are represented by individual points that are in-line with the whiskers.

This type of chart is helpful in quickly identifying whether or not the data is symmetrical or skewed, as well as providing a visual summary of the data set that can be easily interpreted.

7. Waterfall Chart

Waterfall Chart
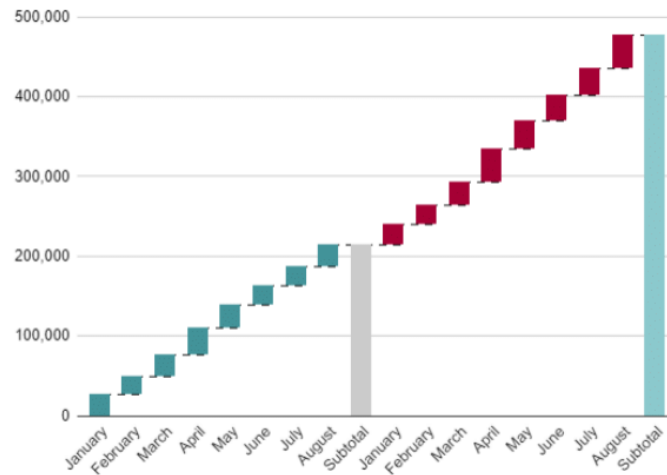
A waterfall chart is a visual representation that illustrates how a value changes as it's influenced by different factors, such as time. The main goal of this chart is to show the viewer how a value has grown or declined over a defined period. For example, waterfall charts are popular for showing spending or earnings over time.

8. Area Chart
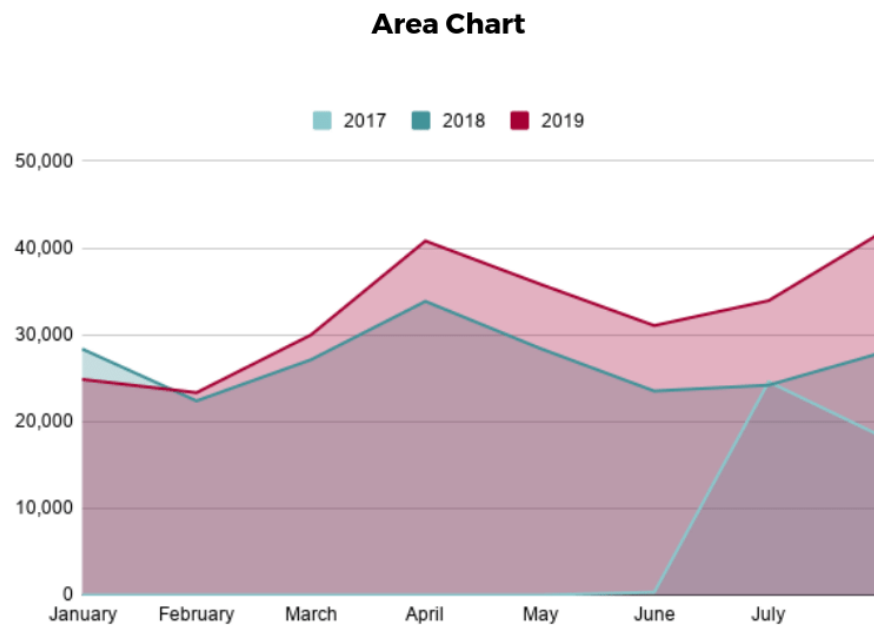
Area Chart

An area chart, or area graph, is a variation on a basic line graph in which the area underneath the line is shaded to represent the total value of each data point. When several data series must be compared on the same graph, stacked area charts are used.

This method of data visualization is useful for showing changes in one or more quantities over time, as well as showing how each quantity combines to make up the whole. Stacked area charts are effective in showing part-to-whole comparisons.

9. Scatter Plot
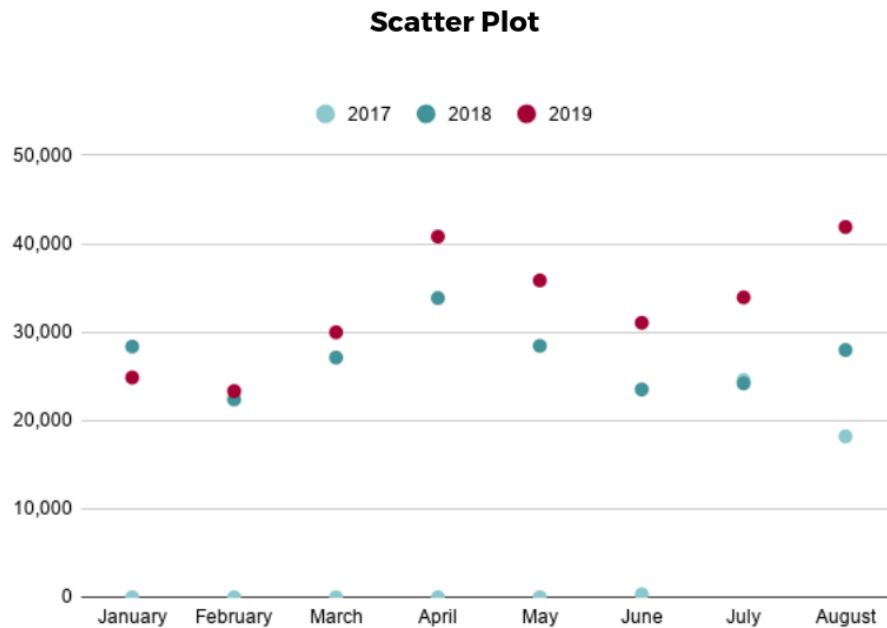
Scatter Plot

Another technique commonly used to display data is a scatter plot. A scatter plot displays data for two variables as represented by points plotted against the horizontal and vertical axis. This type of data visualization is useful in illustrating the relationships that exist between variables and can be used to identify trends or correlations in data.

Scatter plots are most effective for fairly large data sets, since it's often easier to identify trends when there are more data points present. Additionally, the closer the data points are grouped together, the stronger the correlation or trend tends to be.

10. Pictogram Chart
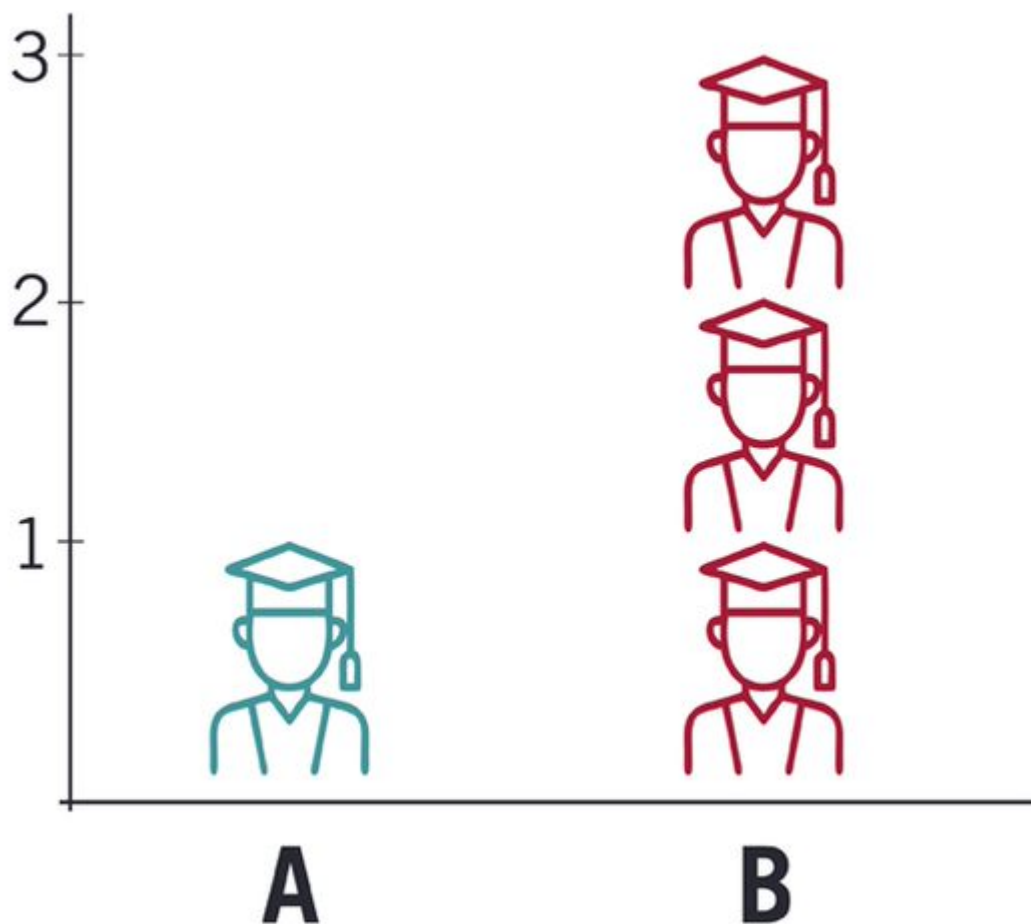
Pictogram charts, or pictograph charts, are particularly useful for presenting simple data in a more visual and engaging way. These charts use icons to visualize data, with each icon representing a different value or category. For example, data about time might be represented by icons of clocks or watches. Each icon can correspond to either a single unit or a set number of units (for example, each icon represents 100 units).

In addition to making the data more engaging, pictogram charts are helpful in situations where language or cultural differences might be a barrier to the audience's understanding of the data.

11. Timeline
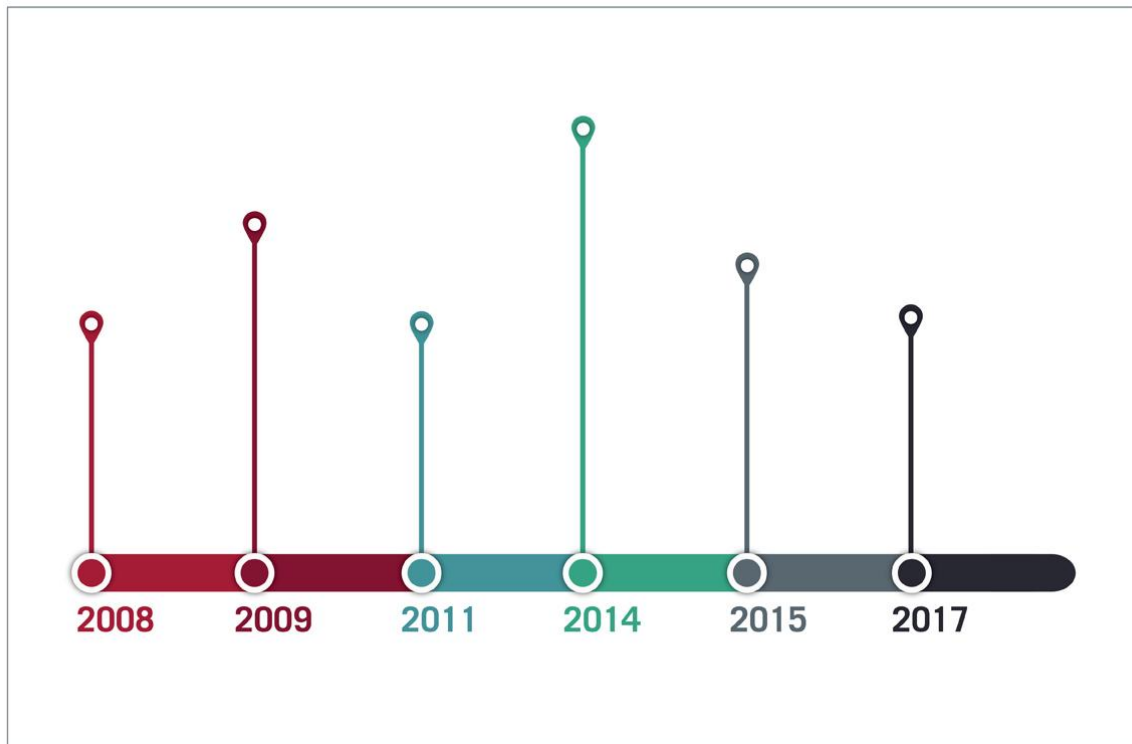
Timelines are the most effective way to visualize a sequence of events in chronological order. They're typically linear, with key events outlined along the axis. Timelines are used to communicate time-related information and display historical data.

Timelines allow you to highlight the most important events that occurred, or need to occur in the future, and make it easy for the viewer to identify any patterns appearing within the selected time period. While timelines are often relatively simple linear visualizations, they can be made more visually appealing by adding images, colors, fonts, and decorative shapes.

12. Highlight Table

Body Fat Percentage Chart for Men

Legend: Lean | Ideal | Average | Above Average

Age																	
18-20	2	3.9	6.2	8.5	10.5	12.5	14.3	16	17.5	18.9	20.2	21.3	22.3	23.1	23.8	24.3	24.9
21-25	2.5	4.9	7.3	9.5	11.6	13.6	15.4	17	18.6	20	21.2	22.3	23.3	24.2	24.9	25.4	25.8
26-30	3.5	6	8.4	10.6	12.7	14.6	16.4	18.1	19.6	21	22.3	23.4	24.4	25.2	25.6	26.5	26.9
31-35	4.5	7.1	9.4	11.7	13.7	15.7	17.5	19.2	20.7	22.1	23.4	24.5	25.5	26.3	27	27.5	28
36-40	5.6	8.1	10.5	12.7	14.8	16.8	18.6	20.2	21.8	23.2	24.4	25.6	26.5	27.4	28.1	28.6	29
41-45	6.7	9.2	11.5	13.8	15.9	17.8	19.6	21.3	22.8	24.7	25.5	26.6	27.6	28.4	29.1	29.7	30.1
46-50	7.7	10.2	12.6	14.8	16.9	18.9	20.7	22.4	23.9	25.3	26.6	27.7	28.7	29.5	30.2	30.7	31.2
51-55	8.8	11.3	13.7	15.9	18	20	21.8	23.4	25	26.4	27.6	28.7	29.7	30.6	31.2	31.8	32.2
56 & UP	9.9	12.4	14.7	17	19.1	21	22.8	24.5	26	27.4	28.7	29.8	30.8	31.6	32.3	32.9	33.3

A highlight table is a more engaging alternative to traditional tables. By highlighting cells in the table with color, you can make it easier for viewers to quickly spot trends and patterns in the data. These visualizations are useful for comparing categorical data.

Depending on the data visualization tool you're using, you may be able to add conditional formatting rules to the table that automatically color cells that meet specified conditions. For instance, when using a highlight table to visualize a company's sales data, you may color cells red if the sales data is below the goal, or green if sales were above the goal. Unlike a heat map, the colors in a highlight table are discrete and represent a single meaning or value.

13. Bullet Graph

2021 YTD
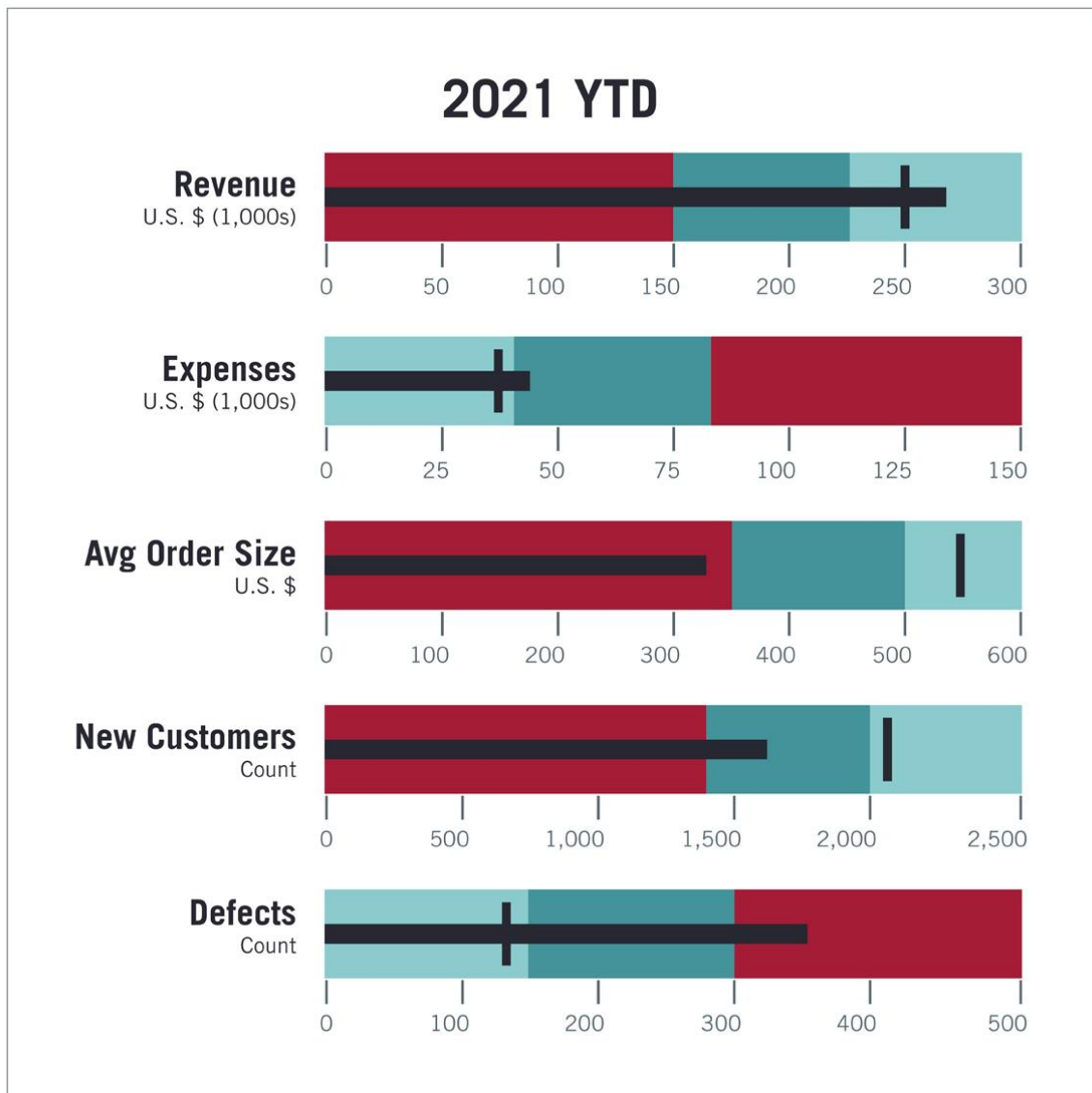
A bullet graph is a variation of a bar graph that can act as an alternative to dashboard gauges to represent performance data. The main use for a bullet graph is to inform the viewer of how a business is performing in comparison to benchmarks that are in place for key business metrics.

In a bullet graph, the darker horizontal bar in the middle of the chart represents the actual value, while the vertical line represents a comparative value, or target. If the horizontal bar passes the vertical line, the target for that metric has been surpassed. Additionally, the segmented colored sections behind the horizontal bar represent range scores, such as "poor," "fair," or "good."
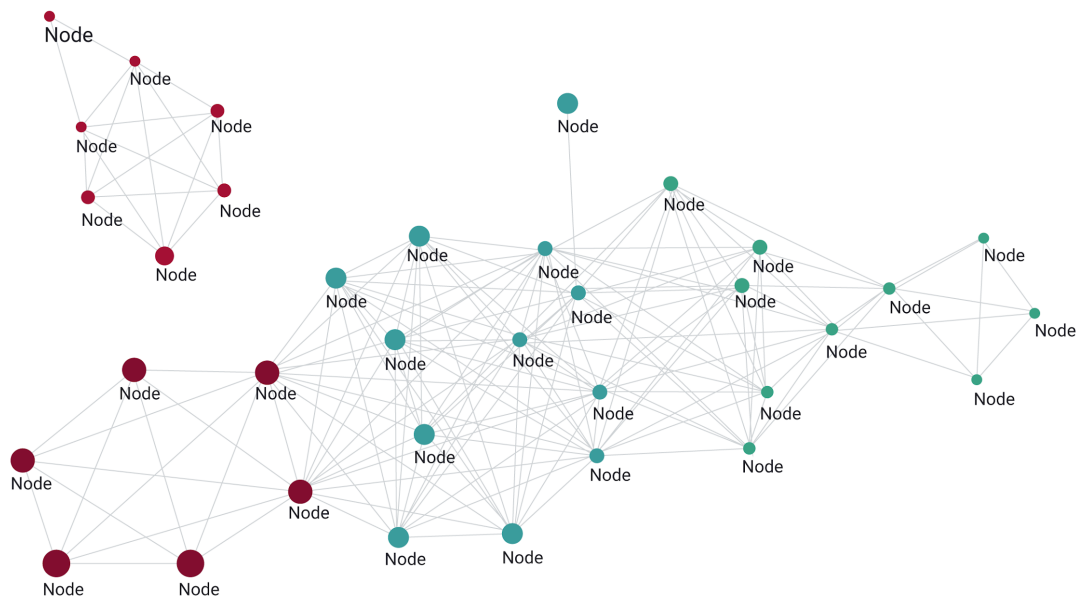
14. Choropleth Maps

REPORTED CASES

◯ None	● 1,001 to 5,000
◯ 1 to 100	● 5,001 to 10,000
● 101 to 1,000	● 10,001 or more
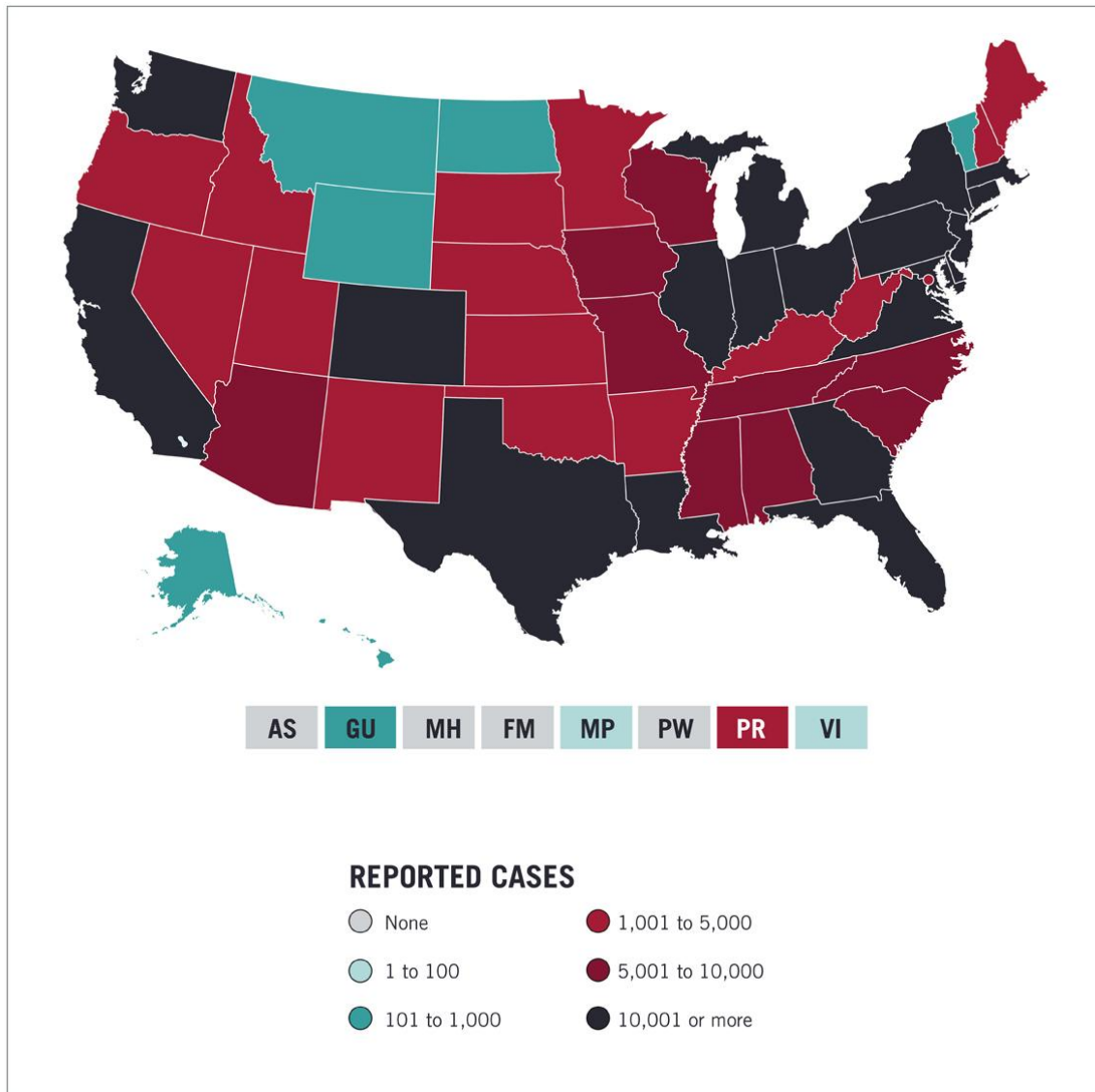
A choropleth map uses color, shading, and other patterns to visualize numerical values across geographic regions. These visualizations use a progression of color (or shading) on a spectrum to distinguish high values from low.

Choropleth maps allow viewers to see how a variable changes from one region to the next. A potential downside to this type of visualization is that the exact numerical values aren't easily accessible because the colors represent a range of values. Some data visualization tools, however, allow you to add interactivity to your map so the exact values are accessible.

15. Word Cloud

A word cloud, or tag cloud, is a visual representation of text data in which the size of the word is proportional to its frequency. The more often a specific word appears in a dataset, the larger it appears in the visualization. In addition to size, words often appear bolder or follow a specific color scheme depending on their frequency.

Word clouds are often used on websites and blogs to identify significant keywords and compare differences in textual data between two sources. They are also useful when analyzing qualitative datasets, such as the specific words consumers used to describe a product.

16. Network Diagram

Network diagrams are a type of data visualization that represent relationships between qualitative data points. These visualizations are composed of nodes and links, also called edges. Nodes are singular data points that are connected to other nodes through edges, which show the relationship between multiple nodes.

There are many use cases for network diagrams, including depicting social networks, highlighting the relationships between employees at an organization, or visualizing product sales across geographic regions.

17. Correlation Matrix
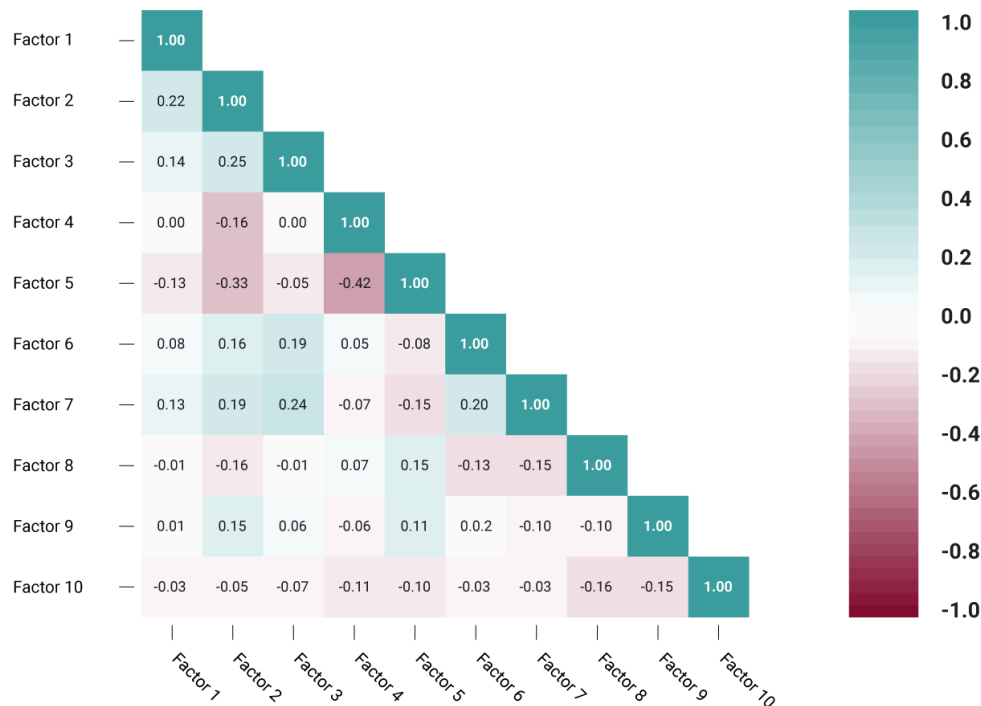
A correlation matrix is a table that shows correlation coefficients between variables. Each cell represents the relationship between two variables, and a color scale is used to communicate whether the variables are correlated and to what extent.

Correlation matrices are useful to summarize and find patterns in large data sets. In business, a correlation matrix might be used to analyze how different data points about a specific product might be related, such as price, advertising spend, launch date, etc.

OTHER DATA VISUALIZATION OPTIONS

While the examples listed above are some of the most commonly used techniques, there are many other ways you can visualize data to become a more effective communicator. Some other data visualization options include:

- Bubble clouds
- Cartograms
- Circle views
- Dendrograms
- Dot distribution maps

- Open-high-low-close charts
- Polar areas
- Radial trees
- Ring Charts
- Sankey diagram
- Span charts
- Streamgraphs
- Treemaps
- Wedge stack graphs
- Violin plots
-