Chapter 6: Improving your Visualizations

Data visualization is the representation and presentation of data that exploits our visual perception abilities in order to amplify cognition.

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“The human visual system is a pattern seeker of enormous power and subtlety. The eye and the visual cortex of the brain form a massively parallel processor that provides the highest bandwidth channel into human cognitive centers.”

Colin Ware, “Information Visualization”

In chapter 1, we briefly mentioned how data analysis is like how we imagine archeology to be: spending hour after hour with small tools in the hope of uncovering even the tiniest of insights in the dirt. That analogy can be extended into the shared desire to create a narrative. Archeologists attempt to recreate history by digging up parts of a story and it’s the same with data. There are stories buried in the data and it’s that narrative that we want to uncover, piece together and communicate to others. As with all good stories, we want to lay out the setting and context, identify the characters and walk through the relationships and events. The reader should be able to follow the story as it unfolds right through until all of the recipients questions and inconsistences are resolved and no lose ends remain. To put it simply, we want to wrap our discoveries in a narrative and thankfully that’s typically how we’ll store it in our own mind anyway.

This is then our challenge: how can we best communicate the stories within our data to others? The answer is held within the exploding field of data visualization and is the focus of this chapter. Our ability to visually process information is by far the most efficient path to human understanding. Like all good hackers, we want to learn about this system, understand how it functions and then exploit the functionality to achieve our goal. In this case, our goal here is effectively communicating the stories we find in our data.

Research into the science of perception has exploded in the past few decades. Psychologists, neuroscientists and others are chipping away at the mysteries of the human brain and slowly, the rules of how we visually process information have been emerging. Understanding these rules will be important. Knowing how the human brain visually processes input will help us produce better reports and presentations, but perhaps more important to our industry is to create better dashboards. Understanding concepts like pre-attentive processing and eye-tracking can greatly improve our dashboards

There are many advantages to using data visualization as a communication tool compared to other methods. To paraphrase Colin Ware (who we quoted to open this chapter), data visualization has the following advantages:

* **Data visualizations communicate complexity quickly.** Descriptive statistics (mean, median, variance, etc.) exist to describe and simplify data but tend to remove subtleties that may exist in the data. By visualizing the data, it’s possible to communicate millions of data points in seconds while minimizing the loss of resolution.
* **Data visualizations enable recognition of dormant patterns.** Often times, visualizing data enables us to see patterns that just are not apparent using statistical methods or scanning the data. By plotting the data, often times the patterns in both the data and relationship may leap off the screen at us.
* **Data visualizations enable quality control on our data.** By visualization the data, often times mistakes and errors with data collection or preparation become apparent. Data visualizations can serve as a good and quick sanity check on our work.
* **Data visualizations can serve as a muse**. It’s been said that most breakthroughs in science didn’t start with a “Eureka” but instead with a “Huh, that’s odd.” Laying out our data visually can help facilitate the thinking and discovery process.

But this does not mean that visualizations are the best answer to always communicate data. If the analysis can be summed up with a sentence, creating a visualization would be wasteful of everyones time.

the highest bandwidth to the human ability to understand something. We want to exploit the massive bandwidth offered by our visual perception.

exploit visual perception for the purpose of communicating our stories provides an extremely powerful and efficient path for getting our story across.

visual system has its own rules

“science of perception” psychologists, neuroscientists

“Visual displays provide the highest bandwidth channel from the computer to the human.” - colin ware