

# Visualizing Words and Knowledge: Arts of Memory for the Digital Age<sup>☆</sup>

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For data scientists, visualization is a modernist enterprise. Its purpose is to construct an accurate representation of numeric data which are themselves generated via equations designed to accurately model something about the world. “Graphical excellence,” proclaims Edward Tufte (2001), “begins with telling the truth about the data” (p. 53). This dual layering of representation—from world to numbers, from numbers to visualization—is of course rife with epistemological problematics, and most scientists readily admit it. When attempting to represent the world in numbers and to represent numbers in graphic form, everything is always a proxy for something else. Mediations will be necessary, distortions will occur. Nevertheless, the literature on data visualization poses these problems as challenges to be met, not inherent glitches that undermine the whole procedure. Here, again, is Tufte (1990) on the challenges and on the possibility of meeting them:

The world is complex, dynamic, multidimensional; the paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?... This book celebrates escapes from flatland, rendering several hundred superb displays of complex data... Our investigation yields general principles that have specific visual consequences, governing the design, editing, analysis, and critique of data representation. These principles help to identify and to explain design excellence—why some displays are better than others. (p. 9)

*Some displays are better than others*, meaning that certain abstractions come closer than others to the world itself. Tufte provides a simple equation—the “Lie Factor”—for testing the excellence of a graphical display. A graphic’s Lie Factor equals the size of an effect shown in a graphic divided by the size of the same effect in the data themselves (2001; p. 57). The lower the Lie Factor, the better the visualization. Despite the complications inherent in visual mediation and proxy operation, the goal for statisticians like Tufte is thus to work carefully and critically with each semiotic element in a visualization so that one comes as close to unmediated representation as mediated representation will allow.

Given these aspirations, it is no longer adequate for data scientists to advise against the misuses and abuses of visualization. Current scholarship in data science consequently focuses not on endless deception detection (Tufte 2001) but on the semiotic improvement of the graphical display of numeric information. Font, color contrast, line thickness, legend placement: every communicating element in a visualization becomes a moment to ask, “What choice represents the data most fairly?” or “How will an audience understand this choice as opposed to some other choice?” This sounds rhetorical, but the endgame of self-critique is the construction of a more accurate model of underlying

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numeric data and thus a more accurate model of something in the world. The bedrock assumption is that with rigor and method a visualization can approach—even if it can never attain—one-to-one correspondence with ontology.

The rhetorician, in contrast, is not interested (solely) in a visualization's accuracy. How does the rhetorician approach the work of data visualization? One obvious answer is that the rhetorician's task should be critical: to highlight the ideological implications of the selections and deflections inherent in any visualization. As Harroway (1988) reminds us, any object of purportedly objective, scientific knowledge—and a data visualization is surely such an object—is not an unbiased view from nowhere but a subjective, embodied view from somewhere. Drucker (2014) has recently applied this constructionist thinking to data visualization, as well, writing that the challenge for humanists utilizing visualization is “to break the literalism of representation” (p. 71). This critical response is an important one. However, I want to argue in this article that data visualization offers more than an opportunity for visual or social critique. It also offers possibilities as a tool for rhetorical invention. I argue that moving from *visualization-as-representation* to *visualization-as-invention* allows us to enact a constructionist critique of data visualization. Placed into a rhetorical paradigm, visualizations cease to function as reified representations of data and begin to function as analytical tools to aid textual critique and alteration. Further, I argue that claiming visualization as a tool for invention allows the field to reclaim a long discarded technique in the rhetorical tradition—the art of memory.

## 1. Visualization, Invention, and Memory

In the context of rhetoric and composition, the “data” we want to visualize will be primarily textual: the movement is not from world to numbers to visualization but from text to numbers to visualization. In this context, the goal of visualization is to provide writers with new textual perspectives not available with human eyes alone. Visualization acts as a novel interface between writer and words, providing access to patterns and potentials in a text that may have remained latent. Visualizing text means interfacing with it to discover something new about it, to analyze it, to think about it in a new way.

Even a statistician like Tufte recognizes that the value of envisioning information is not limited to the accurate reproduction of a complex three-dimensional world in two-dimensional “flatland” space. More importantly, he says, “we envision information in order to reason about it, communicate, document, and preserve that knowledge” (1990; p. 33). Elsewhere, Tufte (2001) declares succinctly that graphics are to be used “as instruments for reasoning about... information” (p. 53). Put another way, the purpose of visualizing data is to facilitate new thinking about and analysis of data. Text visualization should likewise be a tool to facilitate innovative thinking about a text. A visualization is not a final result but the beginning of analysis. Stephen Ramsay (2011) makes a similar point about visualization in his outline for “algorithmic criticism,” a computer-aided method by which fictional text is transformed into numbers or visual forms that enable a new criticism of it. The purpose of these transformations, Ramsay argues, is to spark generative conversations: If the text is put into *this form* and looked at in *this way*, what insights are discovered, what “potential readings” are enabled, and what critiques do the transformations suggest? When visually transformed, Ramsay tells us, a text “assumes a different organization than it had before. Once a new aspect/pattern has been discovered, one begins to test the viability of that pattern. How often does it appear? How generally does it apply? Further alteration of the text is unavoidable at this stage” (p. 48). Although Ramsay is concerned here with literary criticism, his ideas are clearly applicable to composition and rhetoric. Visualizing a text with digital interfaces (as a network, as a dispersion plot, as a concordance, and so on) provides a writer with a more tangible sense of its shape and patterns, prompting suggestions for further textual alteration.

Beyond providing innovative perspectives on a text, there is another motivation behind visualization that Tufte mentions: “to preserve knowledge.” Visualization, he argues, is a tool not only for critical reasoning but also for memory. This link between visualization, memory, and invention is ancient. Indeed, visualizing words and knowledge for mnemonic purposes is the rhetorical tradition's earliest precept, for it is a strategy mentioned in the *Dissoi Logoi*, which pre-dates Aristotle's *Rhetoric* by at least a century (Crowley, 1993). The method is known and still practiced today as the memory palace technique; it was known throughout history as artificial memory, or the art of memory (Yates, 1966), and was synonymous with rhetoric's fourth canon. It is first described in detail in *Ad Herennium* (1954) where the art is established from two primary ingredients: places and images (*ex locis et imaginibus*). The *locus* is like a background, a place easily remembered, such as a house, or a courtyard, or an intercolumnar space. Upon each background, one places an image, a manifestation of whatever needs to be remembered. *Ad Herennium* further describes the images as *formae*, *notae*, and *simulacra*. The backgrounds, once entrenched in the mind, are always available to

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