Data Viz 101:

Concepts and Tools

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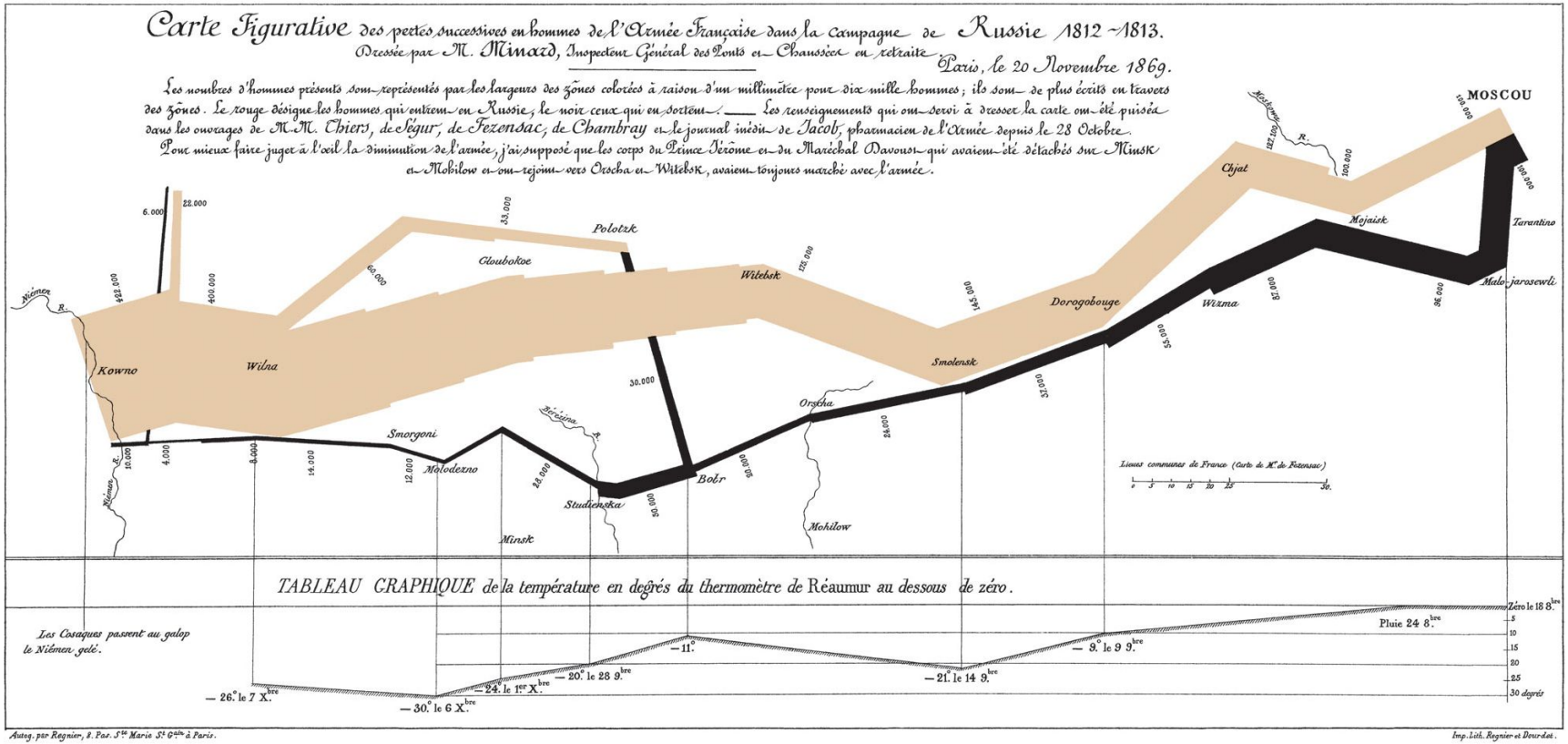


Charles Joseph Minard's Map (1869), https://commons.wikimedia.org/wiki/File:Minard.png

Edward Tufte likes it, "probably the best statistical graphic ever drawn", http://www.edwardtufte.com/tufte/posters

> Visualization allows people to offload cognition to the perceptual system, using carefully designed images as a form of external memory. The human visual system is a very high-bandwidth channel to the brain, with a significant amount of processing occurring in parallel and at the pre-conscious level. We can thus use external images as a substitute for keeping track of things inside our own heads.

Tamara Munzner, “Visualization,” in *Fundamentals of Computer Graphics* (3rd edition), ed. Peter Shirley, Michael Ashikhmin, and Steve Marschner (Natick, MA: A K Peters, 2009).

Data Visualization
Information Visualization
Visual Analytics

Matthew Ward, Georges G. Grinstein, and Daniel Keim. *Interactive data visualization : foundations, techniques, and applications, Second edition* (Boca Raton : CRC Press, 2015).

Colin Ware, *Visual thinking for design* (Burlington, MA : Morgan Kaufmann, 2008).

Colin Ware, *Information Visualization Perception for Design, 3rd ed* (Burlington : Elsevier Science, 2012).

“Visual analytics solutions provide technology that combines the strengths of human and electronic data processing. Visualization becomes the medium of a semi-automated analytical process, where humans and machines cooperate using their respective distinct capabilities for the most effective results.”

Daniel Keim, Gennady Andrienko, Jean-Daniel Fekete, Carsten Görg, Jörn Kohlhammer, and Guy Melan, “Visual Analytics: Definition, Process, and Challenges”, in *Information Visualization - Human-Centered Issues and Perspectives*, *LNCS,* ed. Andreas Kerren, John T. Stasko, Jean-Daniel Fekete, and Chris North (Springer, 2008), 154-175. Available at http://hal-lirmm.ccsd.cnrs.fr/lirmm-00272779/document

Visual Information Seeking Mantra:

Overview first, zoom and filter, then details-on-demand.

Type by Task Taxonomy (TTT):

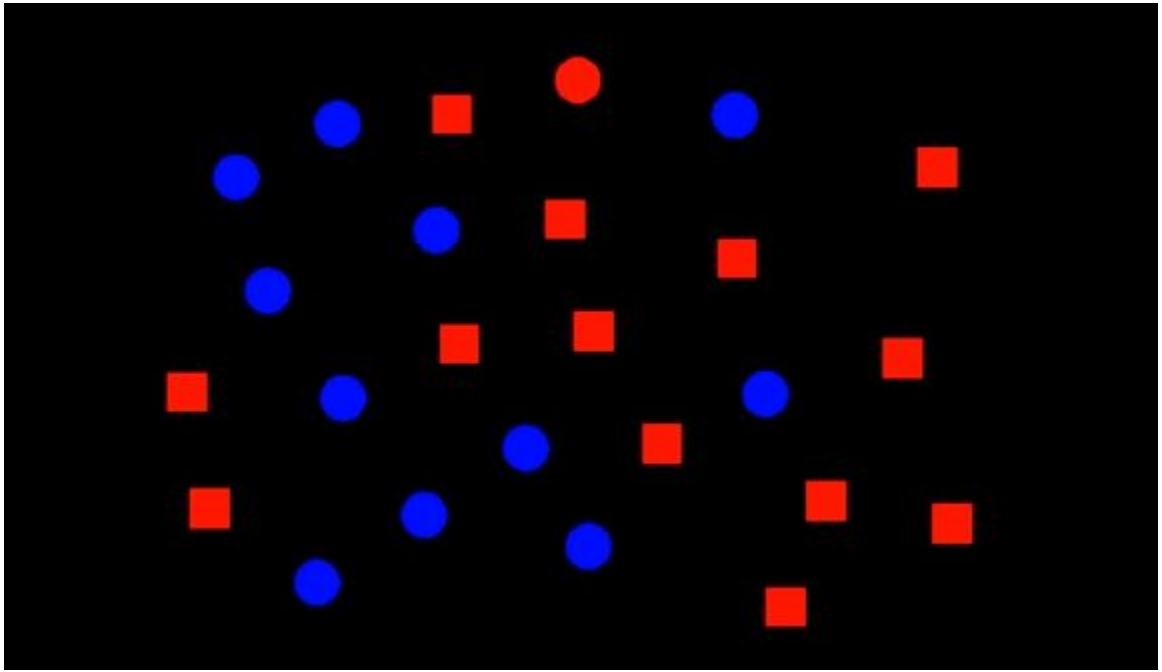
Seven data types

- 1-, 2-, 3-dimensional data, temporal and multi-dimensional data, and tree and network data

Seven tasks

- overview, zoom, filter, details-on-demand, relate, history, extract

Ben Shneiderman, "The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations", *Proceedings of the 1996 IEEE Symposium on Visual Languages* (1996): 336.
Available at http://www.interactiondesign.us/courses/2011_AD690/PDFs/Shneiderman_1996.pdf



Preattentive Features and Tasks (Healey)

https://youtu.be/wnvoZxe95bo

Christopher G. Healey, "Perception in Visualization", http://www.csc.ncsu.edu/faculty/healey/PP/

3 February Two Thousand and Sixteen, Dear journal today I saw four chickadees and heard two more calling from afar.

date	time	observer	type	species	number
2/3/2016	9:00am	evan	visual	Poecile atricapillus	4
2/3/2016	9:15am	evan	audio	Poecile atricapillus	2

Visualization Catalogues

- The Data Visualisation Catalogue, http://www.datavizcatalogue.com/
- Period Table of Visualization Methods, http://www.visual-literacy.org/periodic_table/periodic_table.html
- Grapic Continuum, http://visual.ly/graphic-continuum
- TimeViz Browser, http://survey.timeviz.net/
- A Visual Bibliography of Tree Visualization 2.0, https://treevis.net http://vcg.informatik.uni-rostock.de/~hs162/treeposter/poster.html

Viz Resources

- Flowingdata, http://flowingdata.com/
- Infovis Wiki, http://www.infovis-wiki.net/
- visualising data, http://www.visualisingdata.com/
- Gapminder, http://www.gapminder.org/

Negative Examples

- WTF Visualizations, http://viz.wtf/
- Spurious Correlations, http://www.tylervigen.com/spurious-correlations

Simple Web Based Tools

- Data Wrapper, https://datawrapper.de/
- Charted, http://www.charted.co/
- Raw, http://raw.densitydesign.org/
- Write your own:
  - D3 (html+js), http://d3js.org/
  - Bokeh (Python), http://bokeh.pydata.org/

Bigger Tools

- SAS (stats background), http://www.sas.com/en_us/software/university-edition.html
- RapidMiner (data mining background), https://rapidminer.com/

Tableau

- Academic program, http://www.tableau.com/academic
  - Free for students and teachers
  - Not free for administration, http://www.tableau.com/solutions/higher-ed
- Tableau Public, https://public.tableau.com/s/
- Tutorials:
  - training videos, https://www.tableau.com/learn/tutorials/on-demand/getting-started
  - short course, https://www.tableau.com/learn/starter-kit
  - gallery examples, http://www.tableau.com/learn/gallery
  - reference, http://www.dataplusscience.com/TableauReferenceGuide/index.html