

ITI0209: User Interfaces

14. Visualizations Continued.

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Data are facts.

Information is the meaning that human being assigns to these facts. It brings context to the data, turning what would otherwise be meaningless content into something comprehensible and usable.

Let's Recap:

Good graphs should tell a story and be memorable, but also have a low information to ink ratio and not mislead the viewer.

Choice of colour when designing charts and graphs is also important to allow for colour blindness and black and white printing.

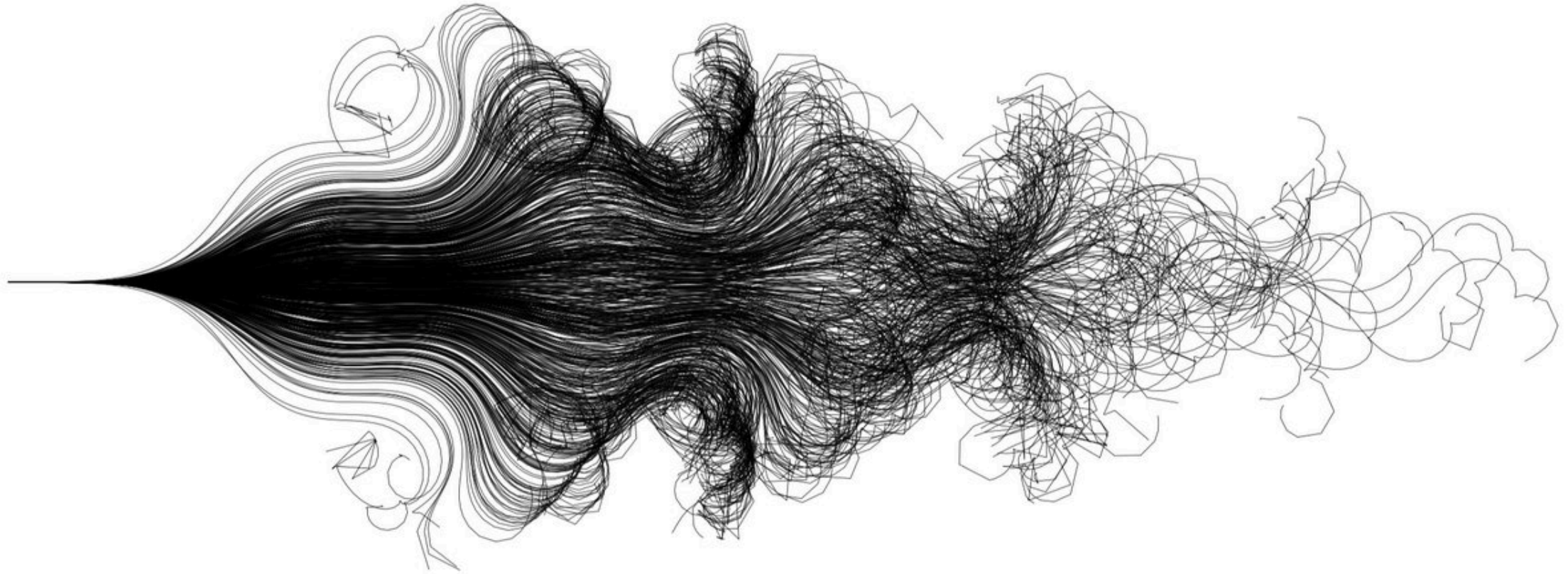


Figure 2: Instability of an unsteered bicycle. This shows 800 runs of a bicycle being pushed to the right. For each run, the path of the front wheel on the ground is shown until the bicycle has fallen over. The unstable oscillatory nature is due to the subcritical speed of the bicycle, which loses further speed with each oscillation.

Data Visualization Workflow: 1/6

Understand the context. Who? What? How?

Therefore, the first lesson is to understand the context and then embarking on your journey of utilizing the data as per the understood context.

LIVE PRESENTATION WRITTEN DOC OR EMAIL

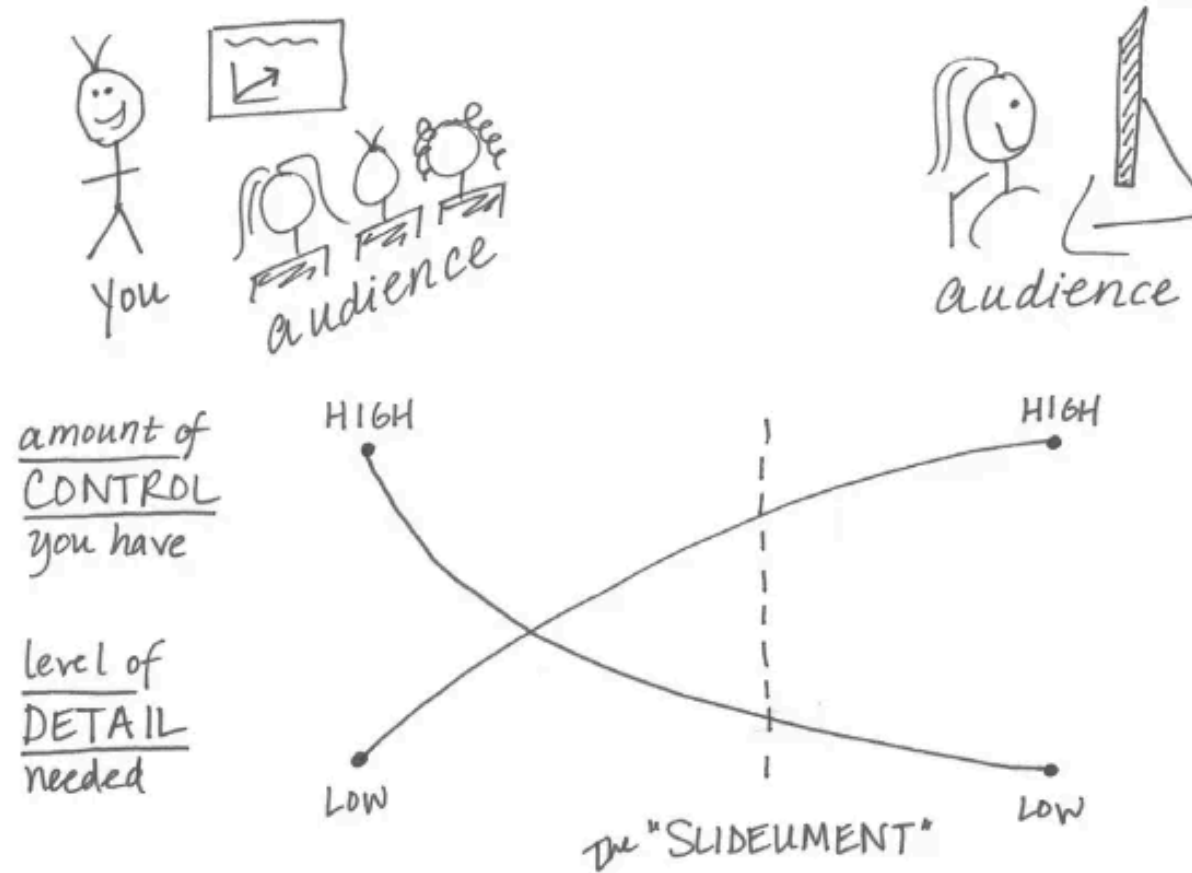


FIGURE 1.1 Communication mechanism continuum

Data Visualization

Workflow: 2/6

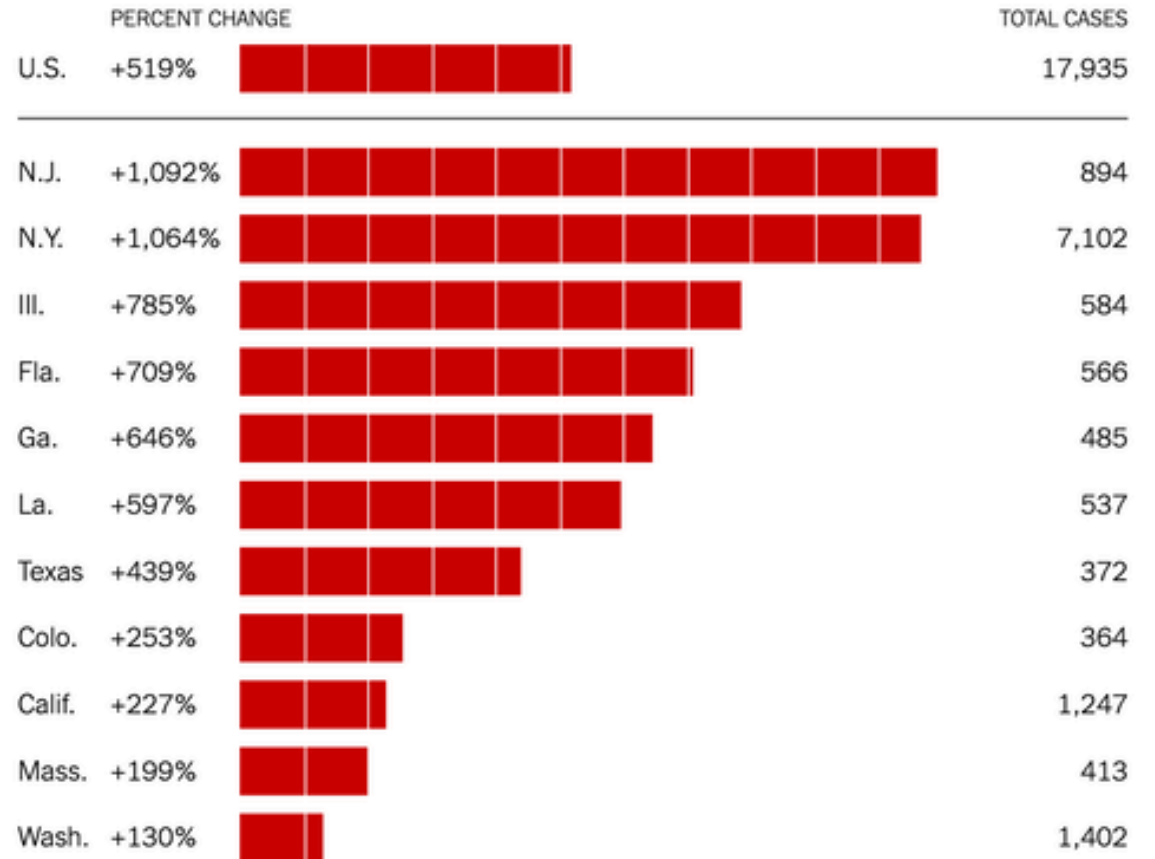
Choose an appropriate visual display

We covered it during the previous class :)

(Nussbaumer, p36)

Change in the Number of New Confirmed Cases

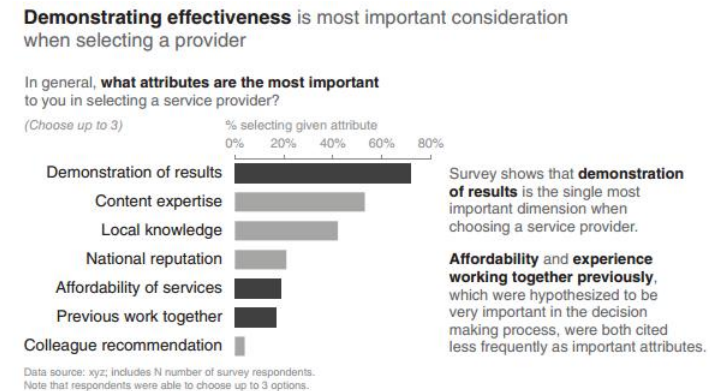
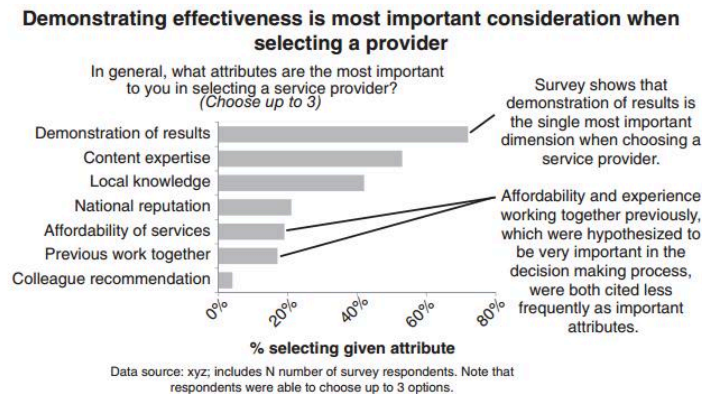
The chart shows the percent increase in confirmed cases from March 15 to 20. States with at least 50 cases on March 15 are shown.



Data Visualization Workflow: 3/6

Eliminate clutter

Clutter is visual elements that take up space but don't increase understanding.

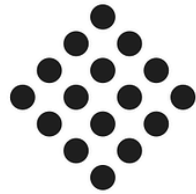


Data Visualization Workflow: 4/6

Focus attention where you want it

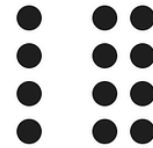
- **Proximity** is that human tendency to think physically close object as belonging to the same group.
- **Similarity** means that, objects that are of similar colour, shape, size, or orientation are perceived as related or belonging to part of a group.
- **Enclosure**: we think of objects that are physically enclosed together as belonging to part of a group. Furthermore, humans like simplicity rather than complexity:
- **Continuity** is the human tendency to seek the most smooth path and even create one even if explicitly no such continuity exists.

Gestalt Principles



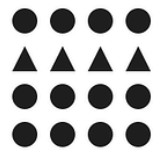
Good Figure

Objects grouped together tend to be perceived as a single figure. Tendency to simplify.



Proximity

Objects tend to be grouped together if they are close to each other.



Similarity

Objects tend to be grouped together if they are similar.



Continuation

When there is an intersection between two or more objects, people tend to perceive each object as a single uninterrupted object.



Closure

Visual connection or continuity between sets of elements which do not actually touch each other in a composition.



Symmetry

The object tend to be perceived as symmetrical shapes that form around their center.

Data Visualization Workflow: 5/6

Think like a designer .. and above all else show data.

Graphical elegance is often found in simplicity of design and complexity of data.

Think like a designer

- **Make it legible:** use a consistent, easy-to-read font (consider both typeface and size). *Make the visual accessible with text.*
- **Keep it clean:** make your data visualization approachable by leveraging visual affordances.
- **Use straightforward language:** choose simple language over complex, choose fewer words over more words, define any specialized language and spell out acronyms.
- **Remove unnecessary complexity:** when making a choice between simple and complicated, favor simple.
- **Align elements to improve aesthetics**

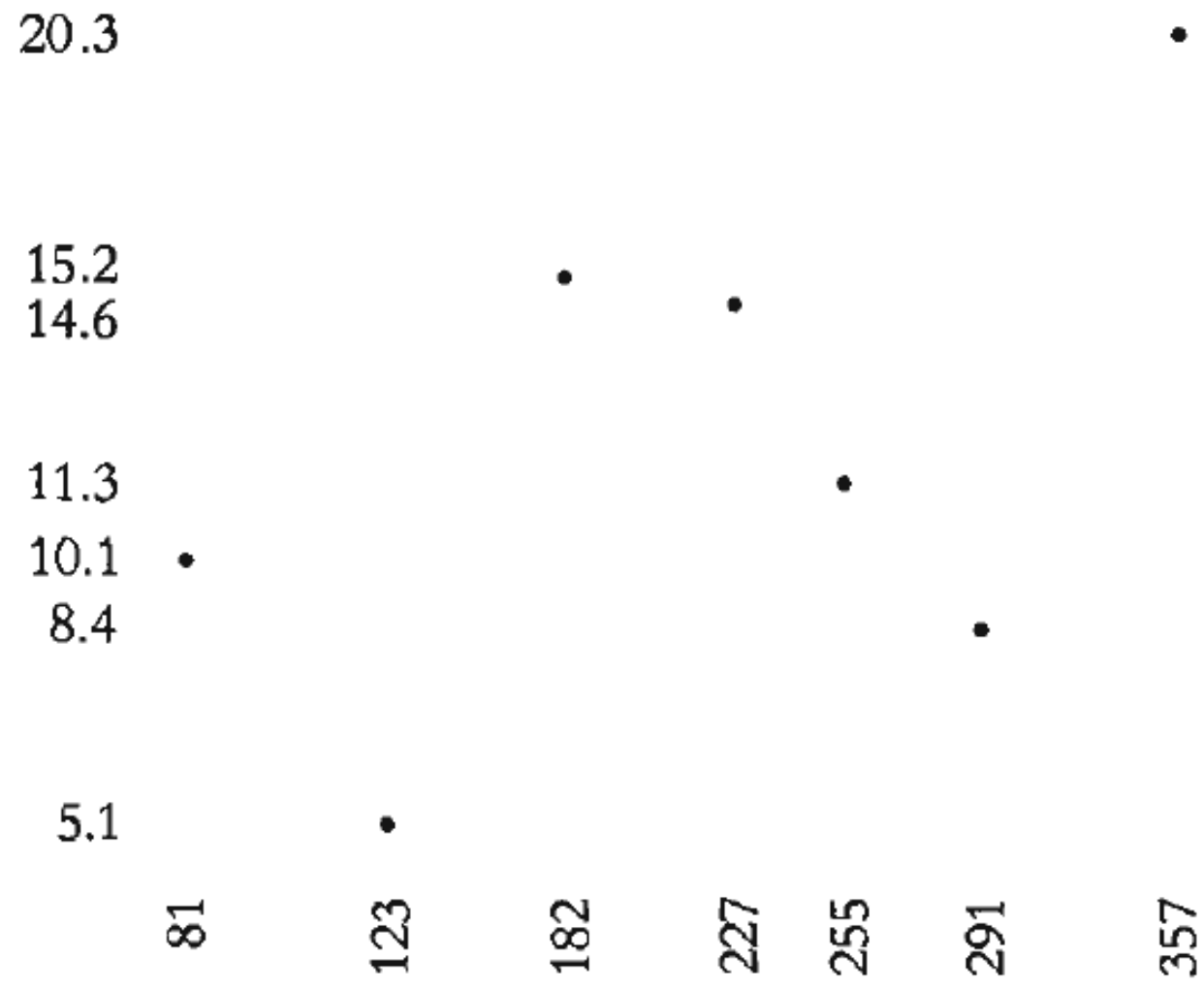
Data Visualization Workflow: 6/6

Tell a story

3-minute story: if you had only three minutes to tell your audience what they need to know, what would you say?’

Therefore it is important to understand the context and then embarking on your journey of utilizing the data as per the understood context.

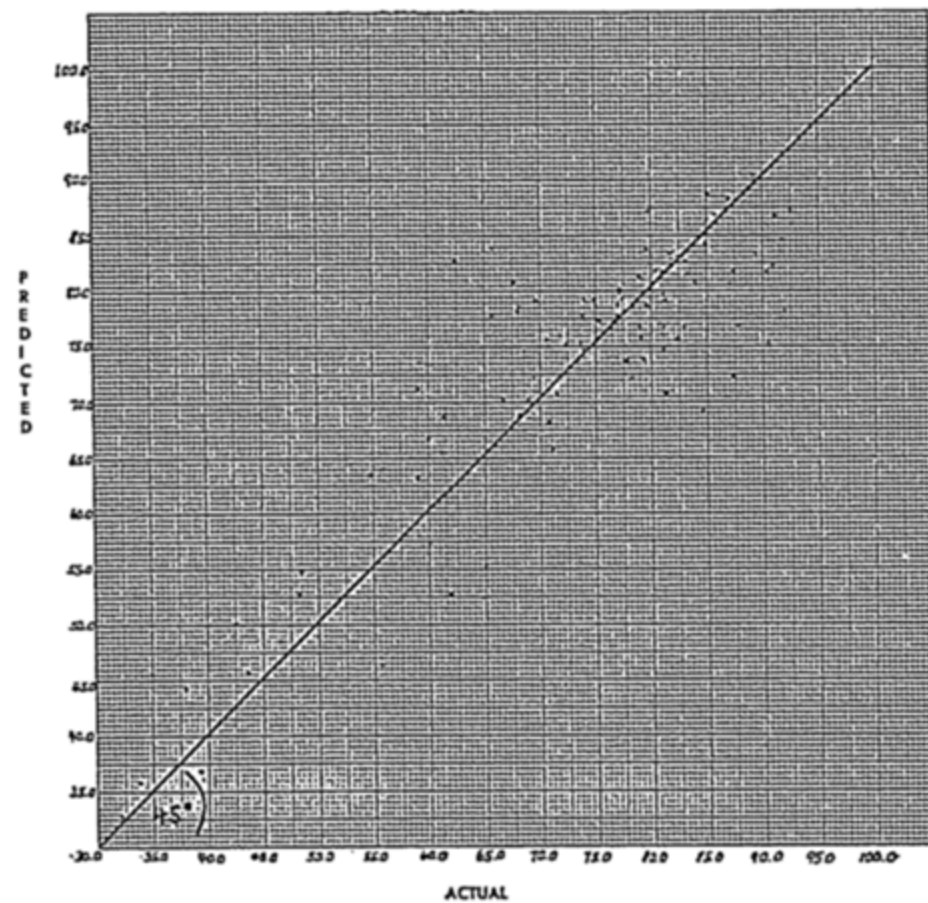
See also: <https://www.storytellingwithdata.com/blog/2014/02/the-3-minute-story>



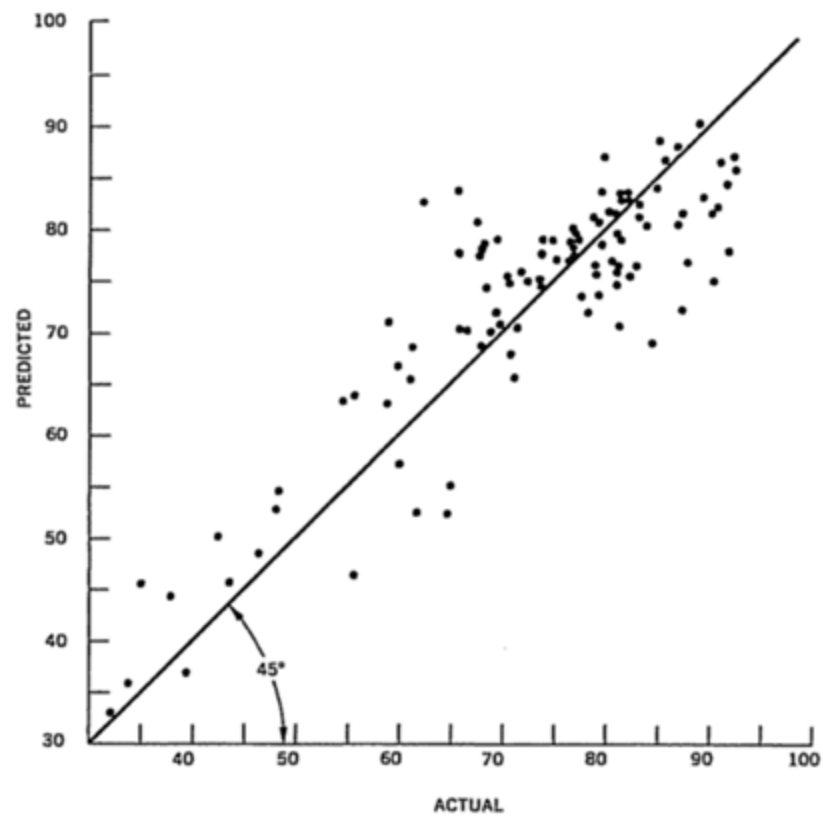
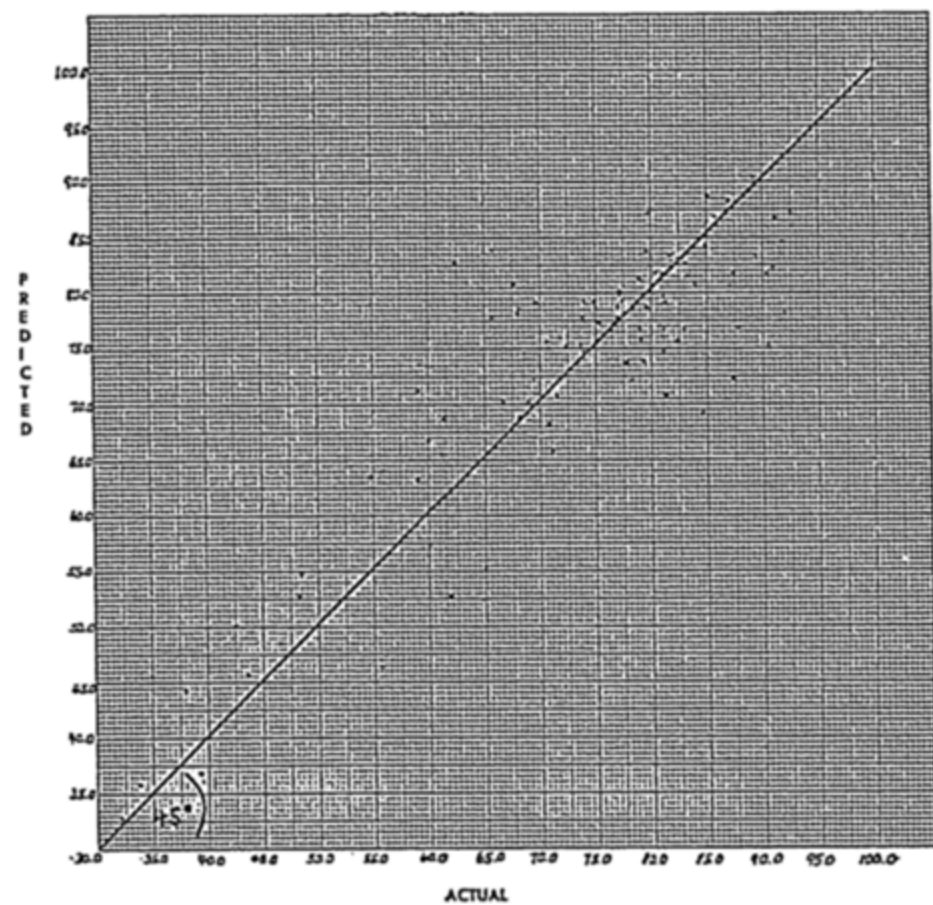
Friendly vs Unfriendly Data Graphics

(Tufte. p183, "Aesthetics and Technique in Data Graphical Design")

Relationship of Actual Rates of Registration to Predicted Rates
(104 cities 1960).



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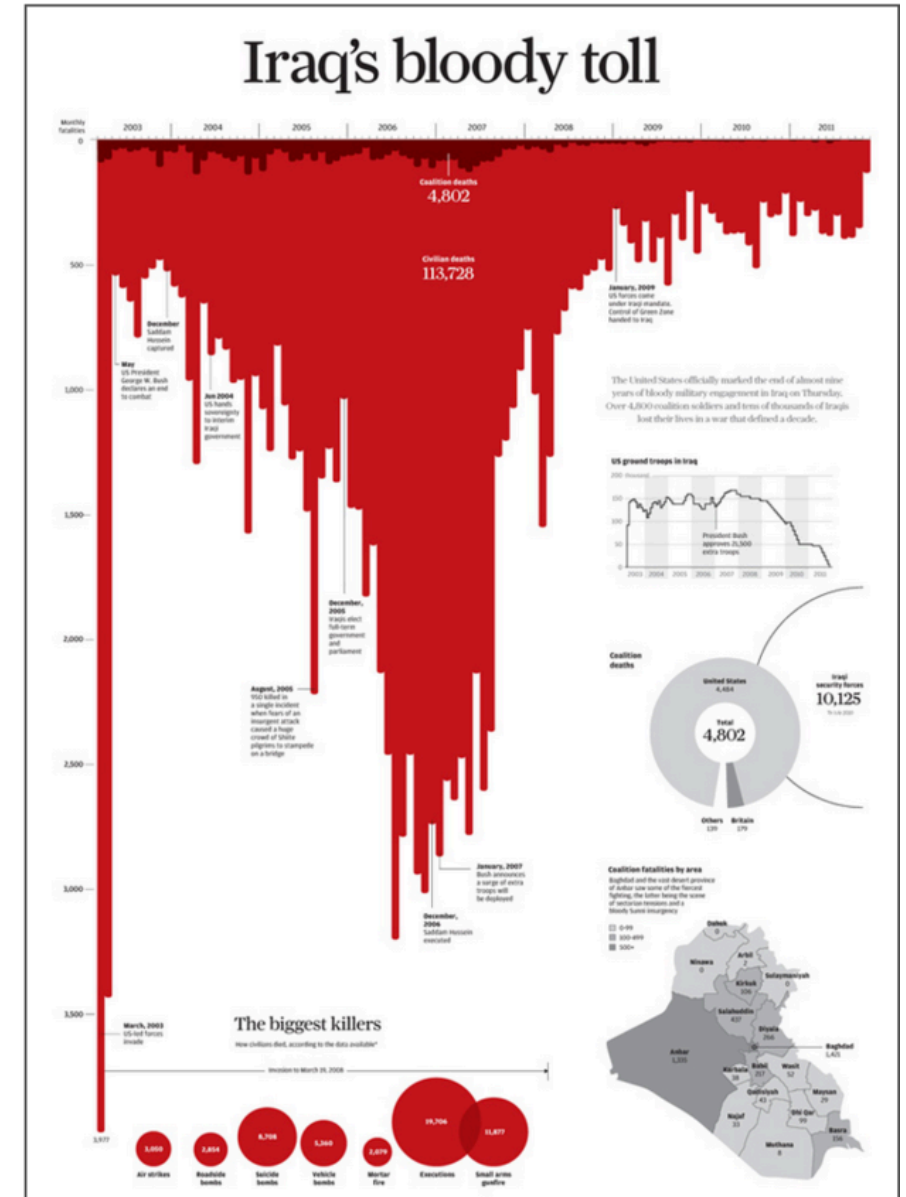
More Tips. Friendly Graphs

- Words are spelled out, no mysterious encodings
- Words run from left to right
- Little messages help explain data
- Shadings, hatches and colors are avoided.
- Labels are placed on graphics itself, so no legend is required
- Graphics attract viewers, provokes curiosity, every visual characteristic has meaning
- Colors are chosen so color blind can read them
- Type is clear and precise
- Type is upper and lowercase

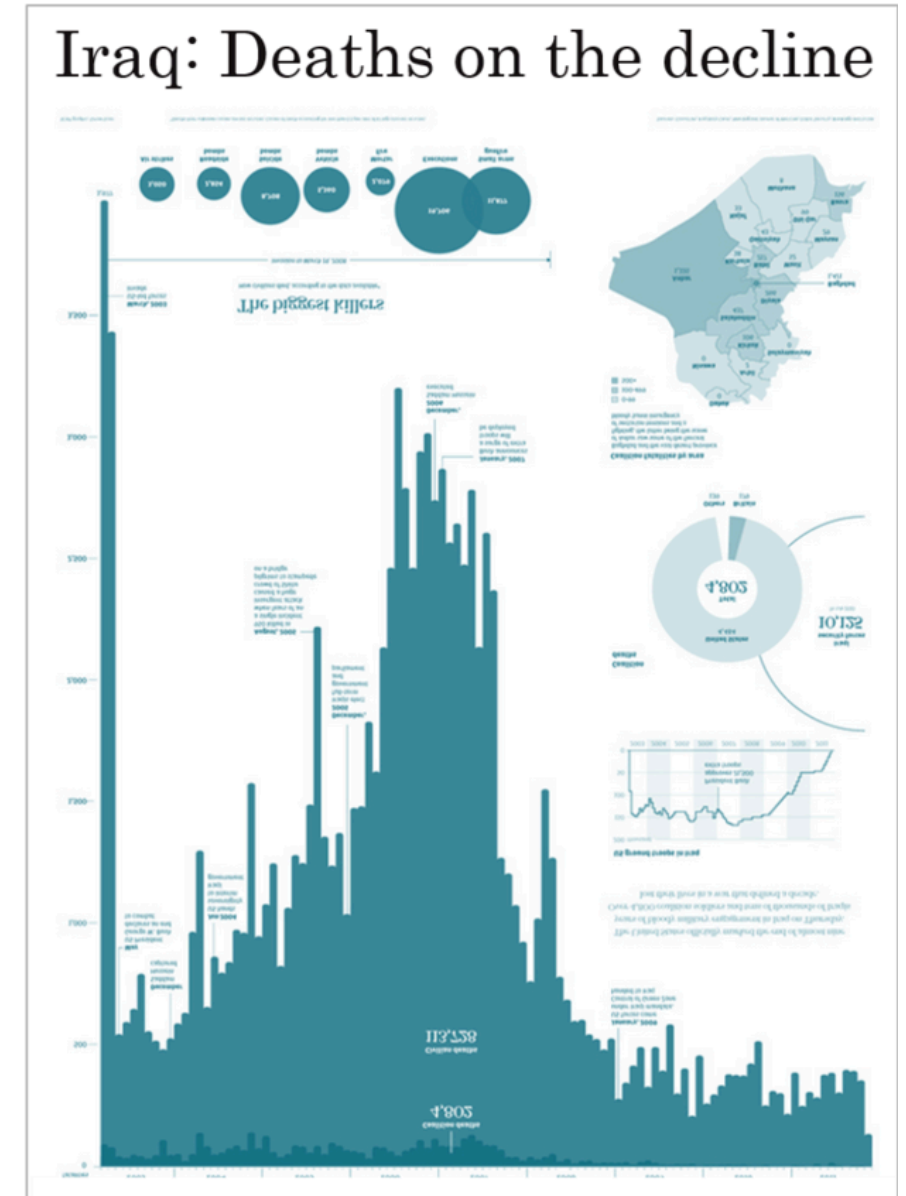
More tips. Unfriendly Graphs

- Use of abbreviations
- Words run vertically, particularly along y-axis. Words run in different directions
- Graphic is cryptic and needs repeated references to scattered text
- Obscure codings need to go back to legend and graphic
- Chartjunk
- Design insensitive to color defunct
- Type is overbearing
- Type is all capitals

“Iraq’s Bloody Toll” appeared in the South China Morning Post in late 2011, designed by Simon Scarr. It shows the number of deaths per month in Iraq from 2003 until the beginning of the US withdrawal of troops at the end of 2011.



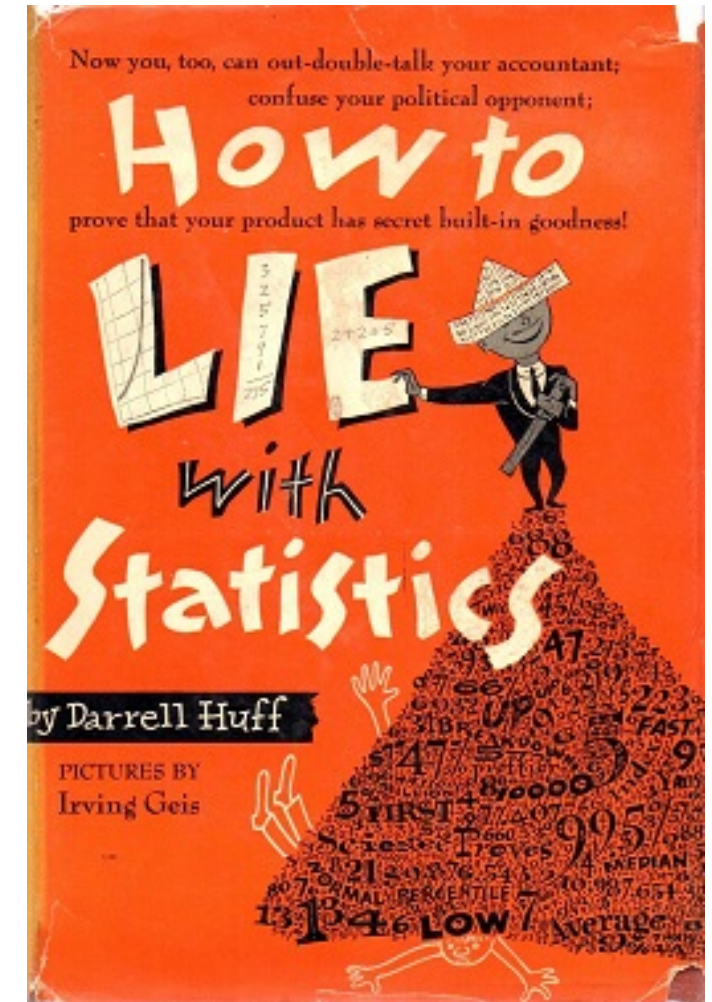
After the combat phase in 2003, deaths dropped. By 2006 and 2007, sectarian violence was ripping Iraq apart. After that, however, deaths again began to drop. Now, instead of “Iraq’s Bloody Toll” we could legitimately call it “Iraq: Deaths on the Decline.”



Common Mistakes

- Leaving gaps/changing the scale in vertical axes
- Uneven shading/colours
- Unfair emphasis on some sections
- Distorting areas in histograms (bar widths should always be equal)
- Use of 3-dimensions instead of two
- Misleading use of pictograms

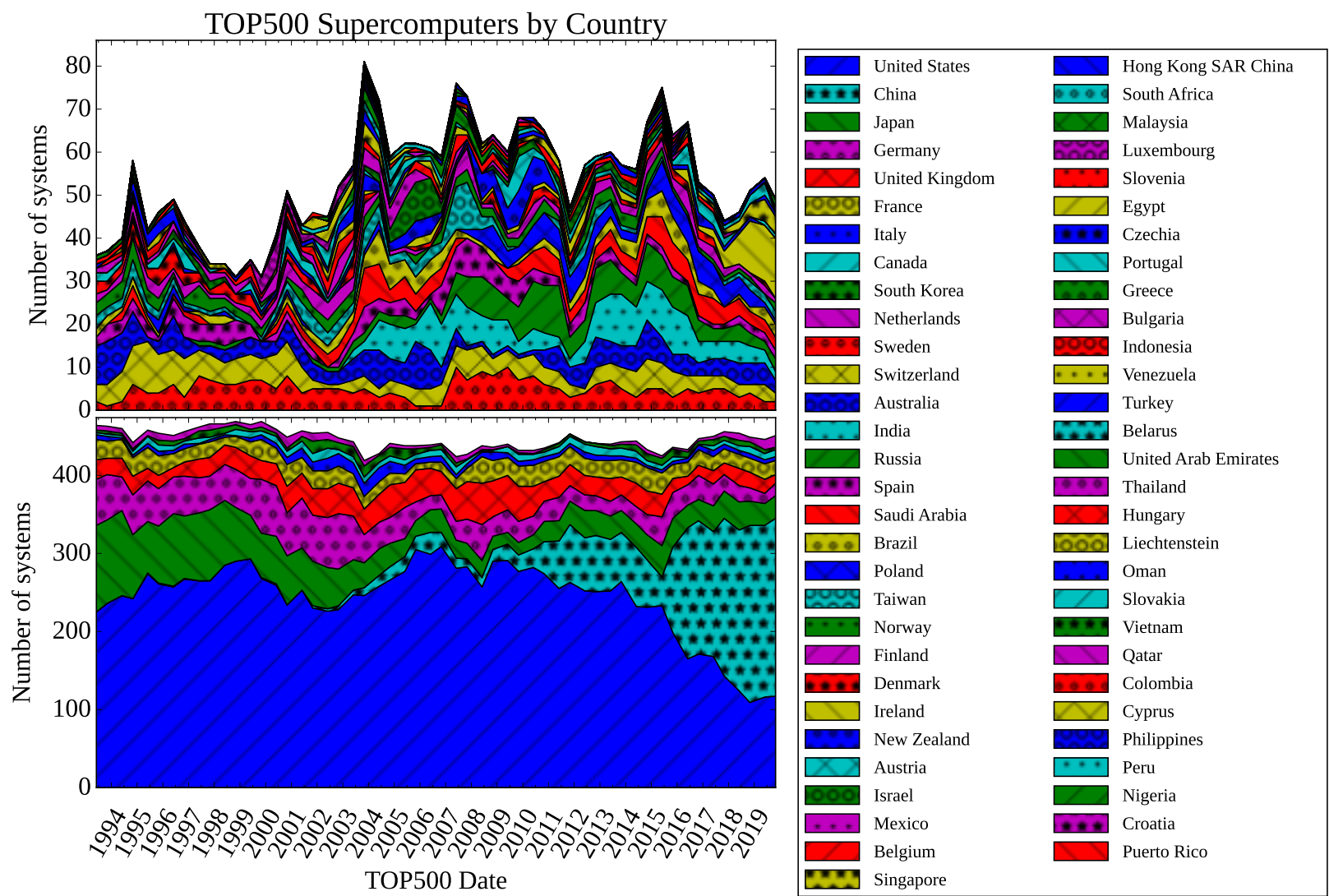
See also: <https://mathspace.co/textbooks/syllabuses/Syllabus-463/topics/Topic-8888/>



Dodgy Graphs: Gaps in vertical axes

Dodgy Graphs: Changing the scale in value axes

Dodgy Graphs: Uneven shading/colours

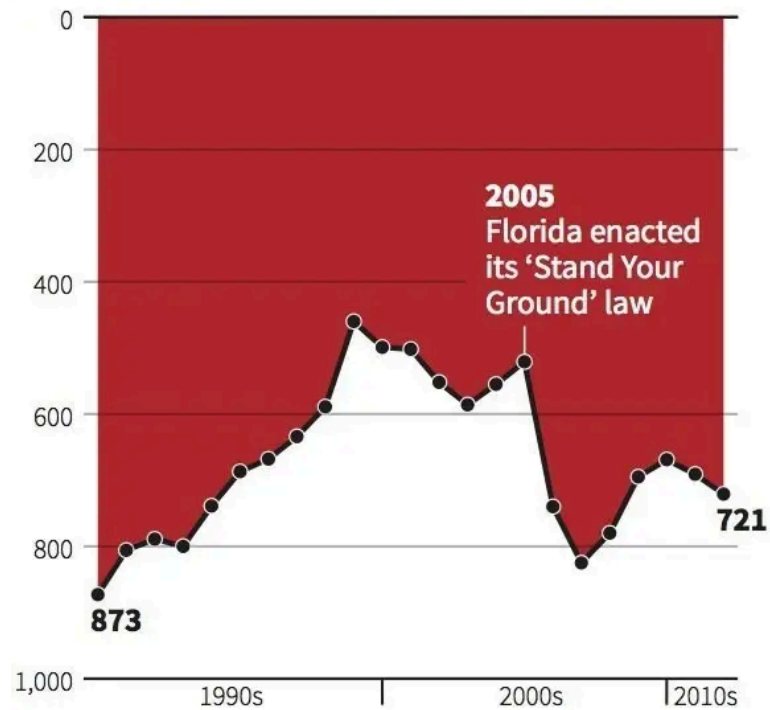


Dodgy Graphs: 3D

Dodgy Graphs: Unfair emphasis on some sections

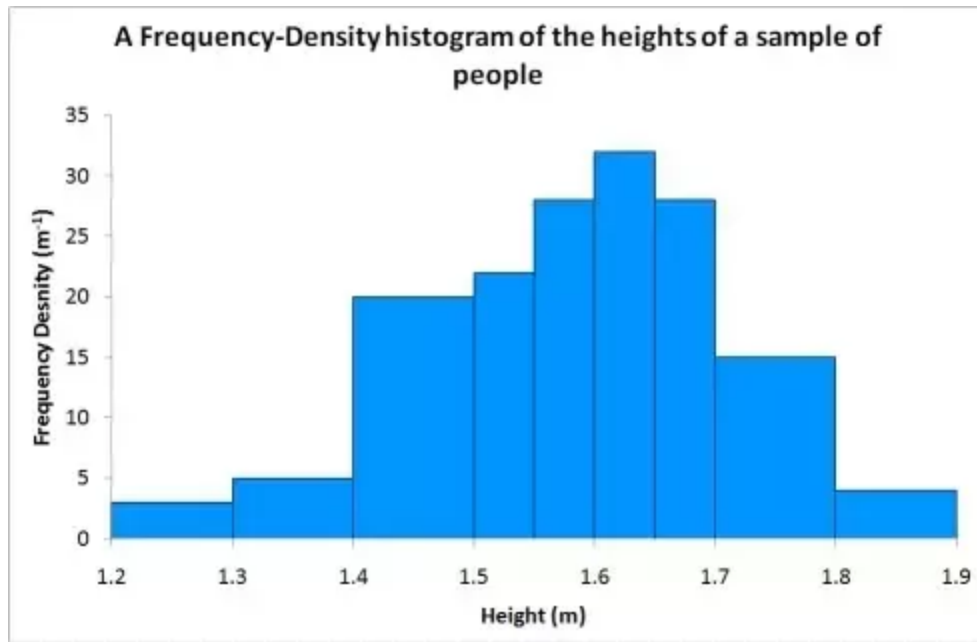
Gun deaths in Florida

Number of murders committed using firearms



Source: Florida Department of Law Enforcement

Dodgy Graphs: Distorting areas in histograms

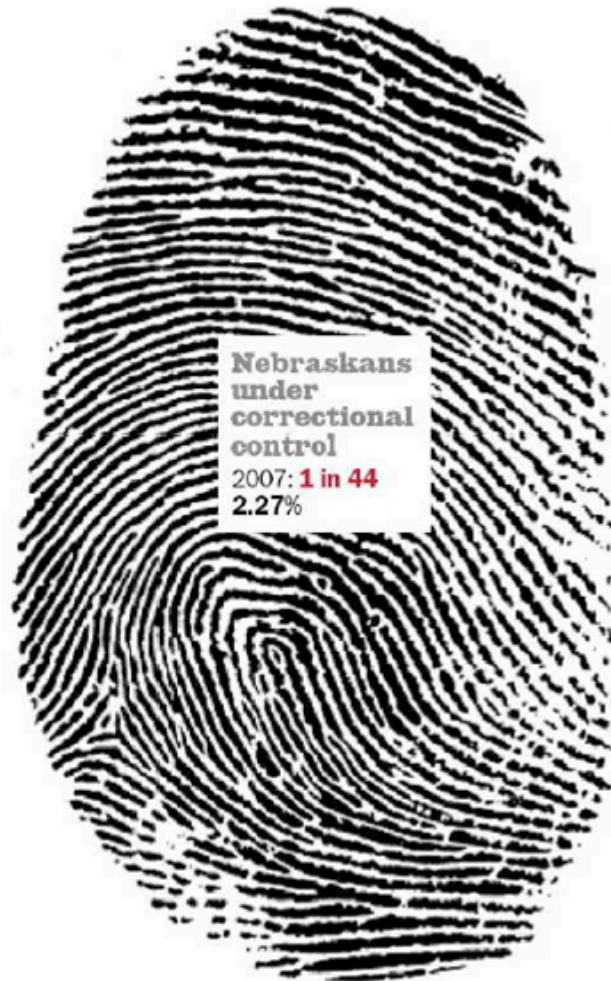


Dodgy Graphs: Misleading use of Pictograms

Cuts in
programs for
nonviolent
offenders may
end up costing
Nebraska



SOURCE: PBW Center on the States



Main Takeaways

- Simpler is most often better.
- More information is better than less information.
- Do not assume your audience is stupid.
- Tables usually outperform graphics in reporting on small data sets of 20 numbers or less.
- Graphical excellence is nearly always multivariate.
- Time-series is the most common graphical design.
- Data is plural for datum. Datum = 1 data point.

Inspiration

- Data is Beautiful Subreddit. <https://www.reddit.com/r/dataisbeautiful/>
- Visualization Subreddit. <https://www.reddit.com/r/visualization/>
- Information is Beautiful. <https://informationisbeautiful.net/>
- Beautiful News. <https://informationisbeautiful.net/beautifulnews/>
- 10 Of The Best Data Visualization Examples From History & Today.
<https://www.tableau.com/learn/articles/best-beautiful-data-visualization-examples>

De-Inspiration

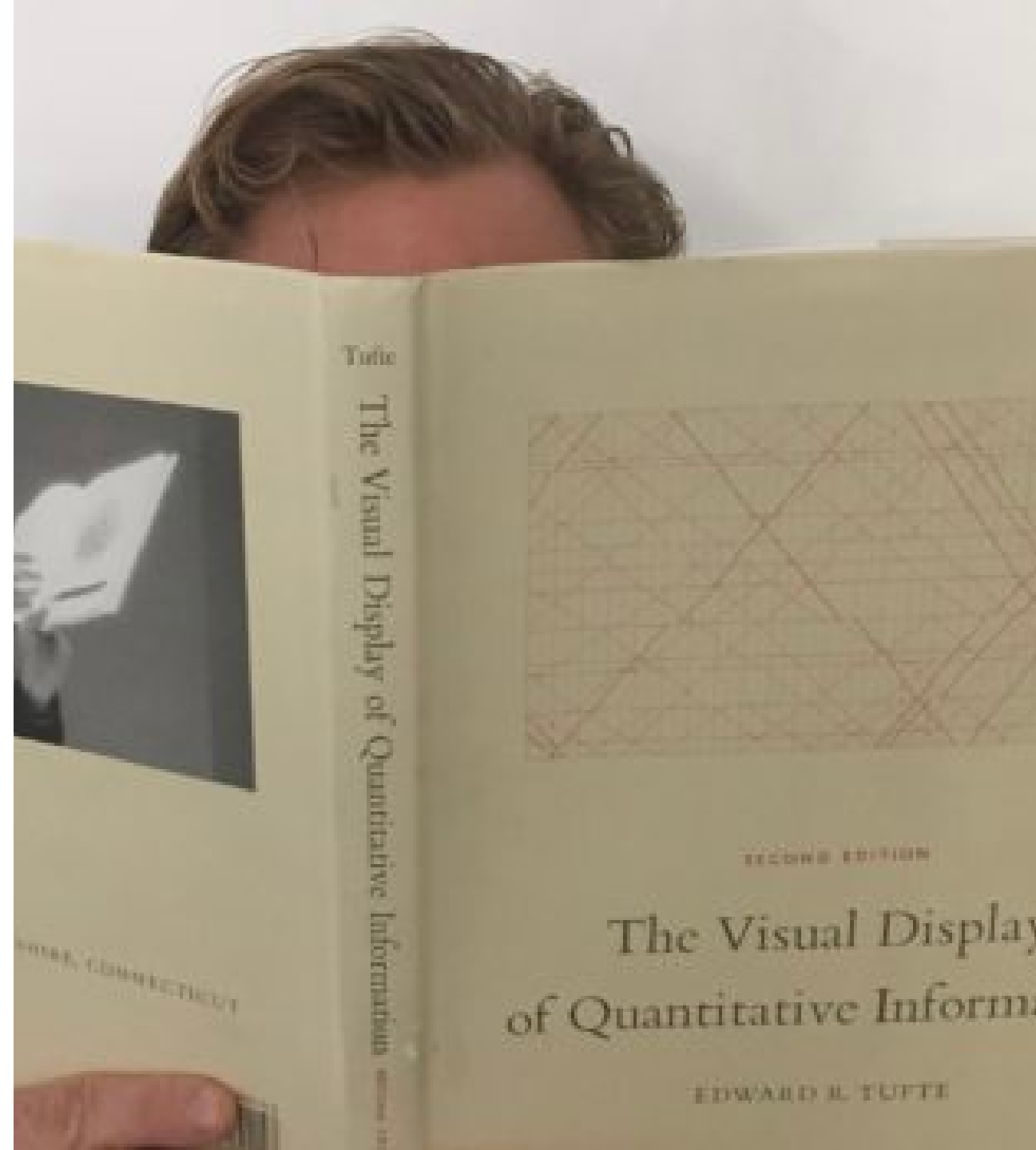
- Data is Ugly Subreddit. <https://www.reddit.com/r/dataisugly/>
- Bad Visualizations. <https://www.tumblr.com/badvisualisations>
- Bad Statistics. <https://www.reddit.com/r/badstats/>
- Shitty Graphs, Plots, and Charts. <https://www.reddit.com/r/shittydataisbeautiful/>

The Visual Display of Quantitative Information

Edward R. Tufte

2001

<https://www.goodreads.com/book/show/17744>

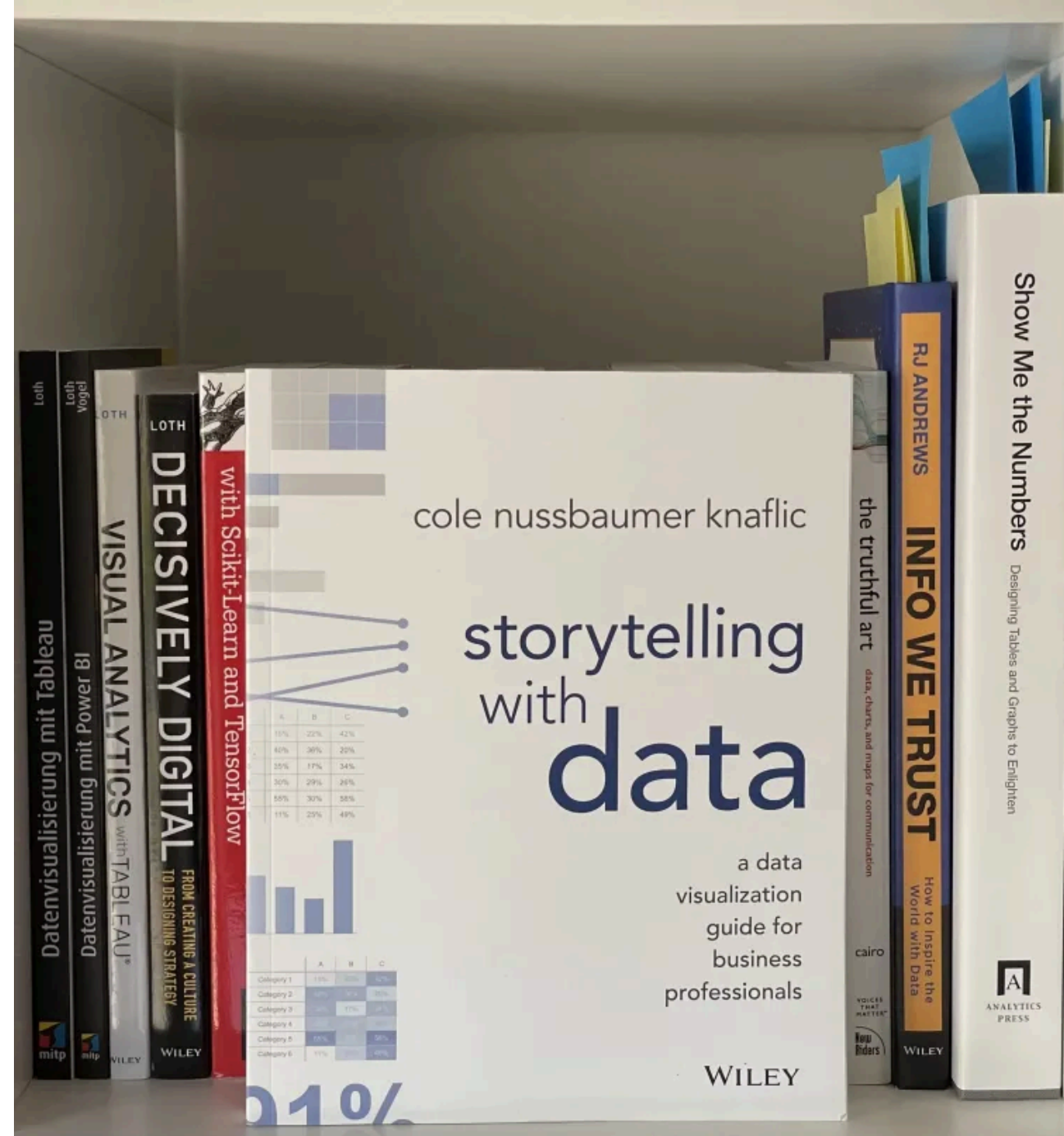


Storytelling with Data: A Data Visualization Guide for Business Professionals

Cole Nussbaumer Knaflic

2015

<https://www.goodreads.com/book/show/26535513>



References

- The beauty of data visualization - David McCandless.
<https://www.youtube.com/watch?v=5Zg-C8AaIGg>
- The Gospel According to Tufte. http://www-personal.umich.edu/~jpboyd/eng403_chap2_tuftegospel.pdf
- Graphical Integrity and Redesign.
<http://jcsites.juniata.edu/faculty/rhodes/ida/graphicalIntRedes.html>
- Easy Graph Mistakes to Avoid
So avoid them. https://nickch-k.github.io/DataCommSlides/Easy_Mistakes_to_Avoid.html

Thank you!