

Visualization Understanding and Memorability

Steve Rubin

**What really *matters* when
you look at a visualization?**

**What really *matters* when
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What really *matters* when you look at a visualization?

The data?

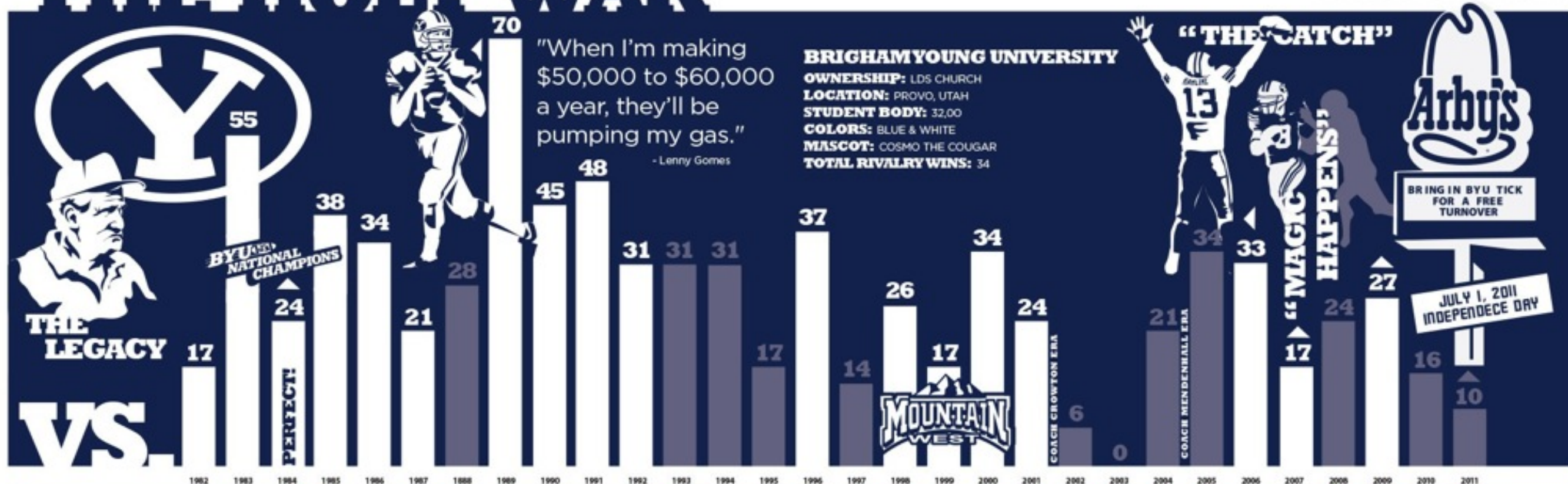
Pictures?

The trend?

Something else?

THE HOLY WAR

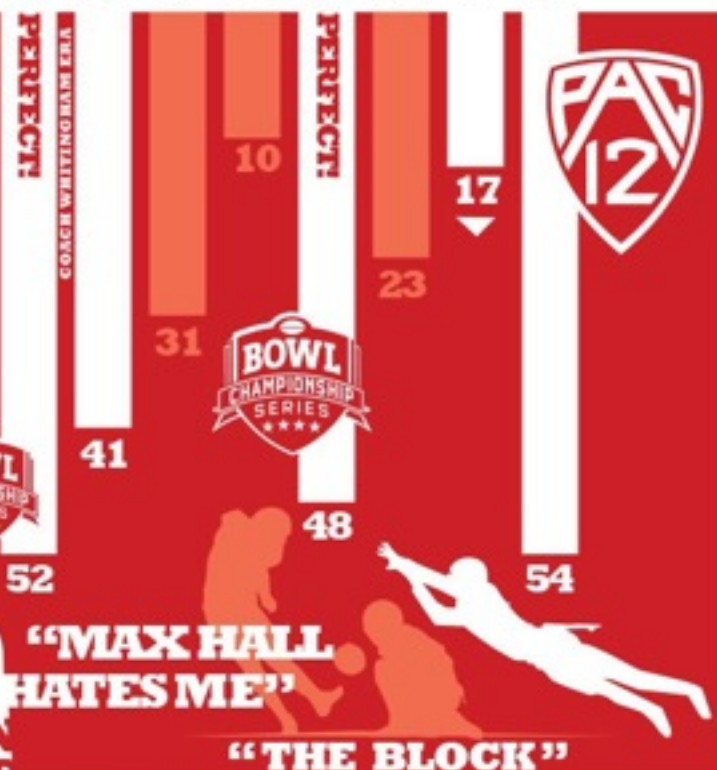
THE LAST 30 YEARS



The Holy War is one of America’s oldest and most heated college football rivalries dating back to 1896.



“Even our cheerleaders are kicking your butt.”
 - Steve Smith

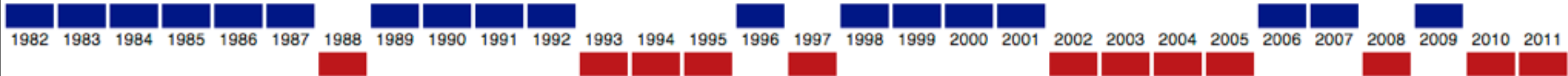


BYU



Utah

BYU



Utah

Perfect BYU record

.500 line

Perfect Utah record

What Makes a Visualization Memorable?

Borkin et al., InfoVis 2013

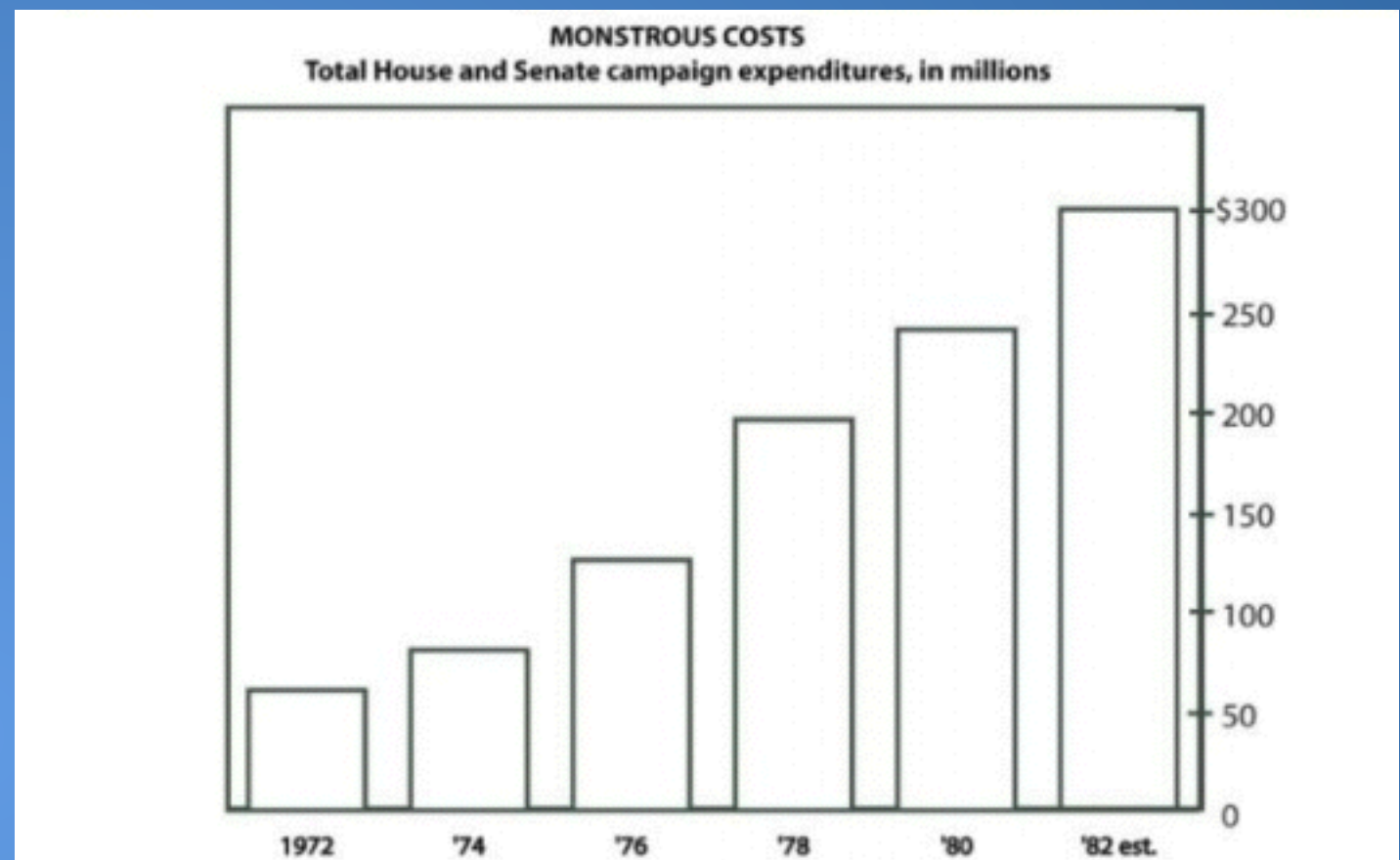
- Color & human recognizable objects
- Common graphs less memorable than unique visualization types

Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts

Bateman et al., CHI 2010

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In charts with visual embellishments (“chart junk”):

- Accuracy in reading data is no worse
- Recall is better

Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts

Bateman et al., CHI 2010

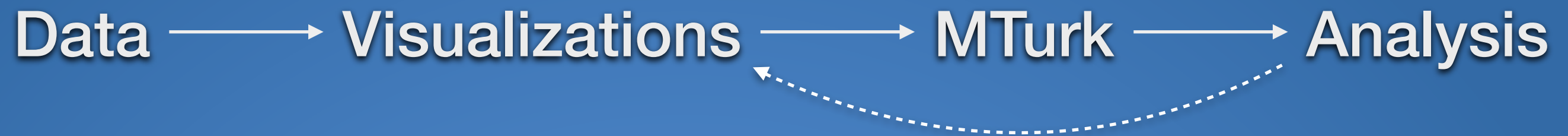
In charts with visual embellishments (“chart junk”):

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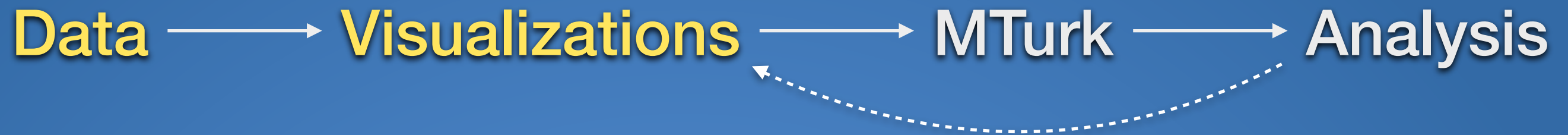
Project goal:

**Study how well someone can
understand the *main point* of a
visualization.**

Pipeline

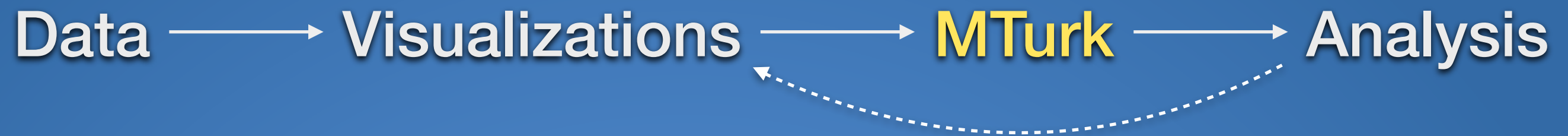


Pipeline

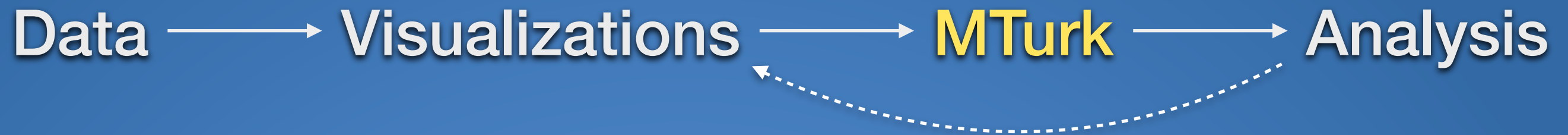


- Pew Research data & visualizations
- Corpus of visualizations like that of Borkin et al.
- Varying visualization parameters

Pipeline



Pipeline



Questions

- What are the main points of the visualization?
- What are the main trends of the visualization?

Pipeline



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- After removing visualization
- Significantly later in time (days? weeks?)

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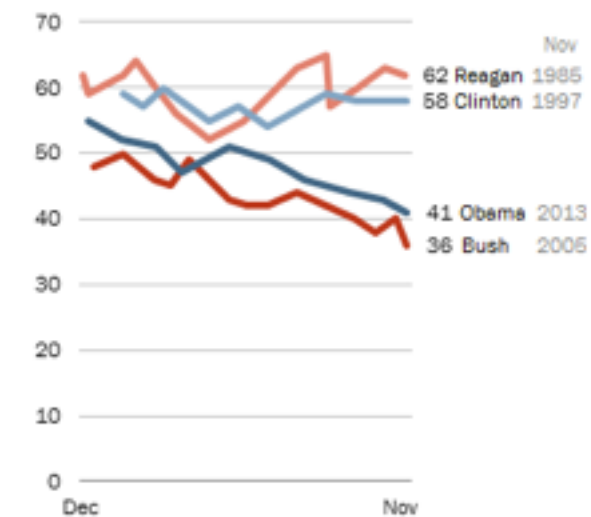
- Hand-coding & clustering responses
(or have turkers do it)
- Do they take away/recall different points and trends based on visualization type or style?
- Do they take away the *intended* point?

Progress

- **Data & Visualizations**
Hand-tuned to start
- **MTurk**
Software is done, and further changes to survey instrument are easy
Sample HIT
- **Analysis**
Hand-coded to start, and exploring clustering options

Second-Term Presidential Job Approval

Presidential approval in year following reelection



Source: Pew Research Center Oct. 30-Nov. 6, 2013.
Reagan approval data from Gallup.

PEW RESEARCH CENTER

Trial 1/2

Write complete sentences summarizing the main points of the visualization. Write as many points as you can, with each sentence in a new box. List the points in decreasing order of importance (that is, list the most important point first).

Milestones

- **Data & Visualizations**

Determine set of visualization types for the study

OR run the study with large, random corpus (soon!)

- **MTurk**

Modify to accomodate new survey types (as needed)

- **Analysis**

Based on preliminary results, identify the key questions to study

(also soon!)

Prior work

- 1. Bateman, S., Mandryk, R., and Gutwin, C. Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts. Proceedings of the ..., (2010).
- 2. Borkin, M. a, Vo, A. a, Bylinskii, Z., et al. What makes a visualization memorable? IEEE transactions on visualization and computer graphics 19, 12 (2013), 2306–15.
- 3. Cleveland, W.S. and McGill, R. Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods. Journal of the American Statistical Association 79, 387 (1984), 531.
- 4. Culbertson, H. and Powers, R. A study of graph comprehension difficulties. Educational Technology Research and ..., (1959).
- 5. Few, S. Data Art vs. Data Visualization: Why Does a Distinction Matter? <http://www.perceptualedge.com/blog/?p=1245>.
- 6. Few, S. The Chartjunk Debate: A Close Examination of Recent Findings. http://www.perceptualedge.com/articles/visual_business_intelligence/the_chartjunk_debate.pdf.
- 7. Few, S. Chart Junk: A Magnet for Misguided Research. <http://www.perceptualedge.com/blog/?p=1770>.
- 8. Friel, S., Curcio, F., and Bright, G. Making sense of graphs: Critical factors influencing comprehension and instructional implications. Journal for Research in mathematics ... 32, 2 (2001), 124–158.
- 9. Hullman, J., Adar, E., and Shah, P. Benefitting InfoVis with visual difficulties. IEEE transactions on visualization and computer graphics 17, 12 (2011), 2213–22.
- 10. Kosslyn, S. Understanding Charts and Graphs. Applied cognitive psychology, (1989).
- 11. Mackinlay, J. Automating the design of graphical presentations of relational information. ACM Transactions on Graphics (TOG) 5, 2 (1986), 110–141.
- 12. Tractinsky, N. and Meyer, J. Chartjunk or Goldgraph? Effects of Presentation Objectives and Content Desirability on Information Presentation. MIS Quarterly 23, 3 (1999), 397–420.
- 13. Wainer, H. How to display data badly. The American Statistician 38, 2 (1984), 137–147.

Thanks!