

Data Visualization

CS444/544

Instructor: Carlos Scheidegger

TA: Nathan Sema

Course website: <http://cscheid.net/courses/spr15/cs444>

Piazza: [https://piazza.com/arizona/spring2015/
csc444544/home](https://piazza.com/arizona/spring2015/csc444544/home)

email: spring15cs444@cs.arizona.edu

Office Hours: Tuesdays, 9-11:30AM, GS734
otherwise by appointment only

Three main themes

- **Mechanics:** how do I build a visualization?
 - Javascript, CSS, HTML, d3
- **Principles:** why should I build it in this way?
 - mathematical and perceptual arguments
- **Techniques:** how do I turn principles and mechanics into an actual visualization?
 - algorithms, software libraries

Assessment

- One **small assignment per week**, 50% weight
 - ~2 hours per assignment
- One **midterm**, 20% weight
 - hour-long
- One **final project**, 30% weight
 - as much work as all assignments combined. CS444/544 distinction: want to write a paper?
- **Class participation**, 10% weight
 - piazza counts

Grading

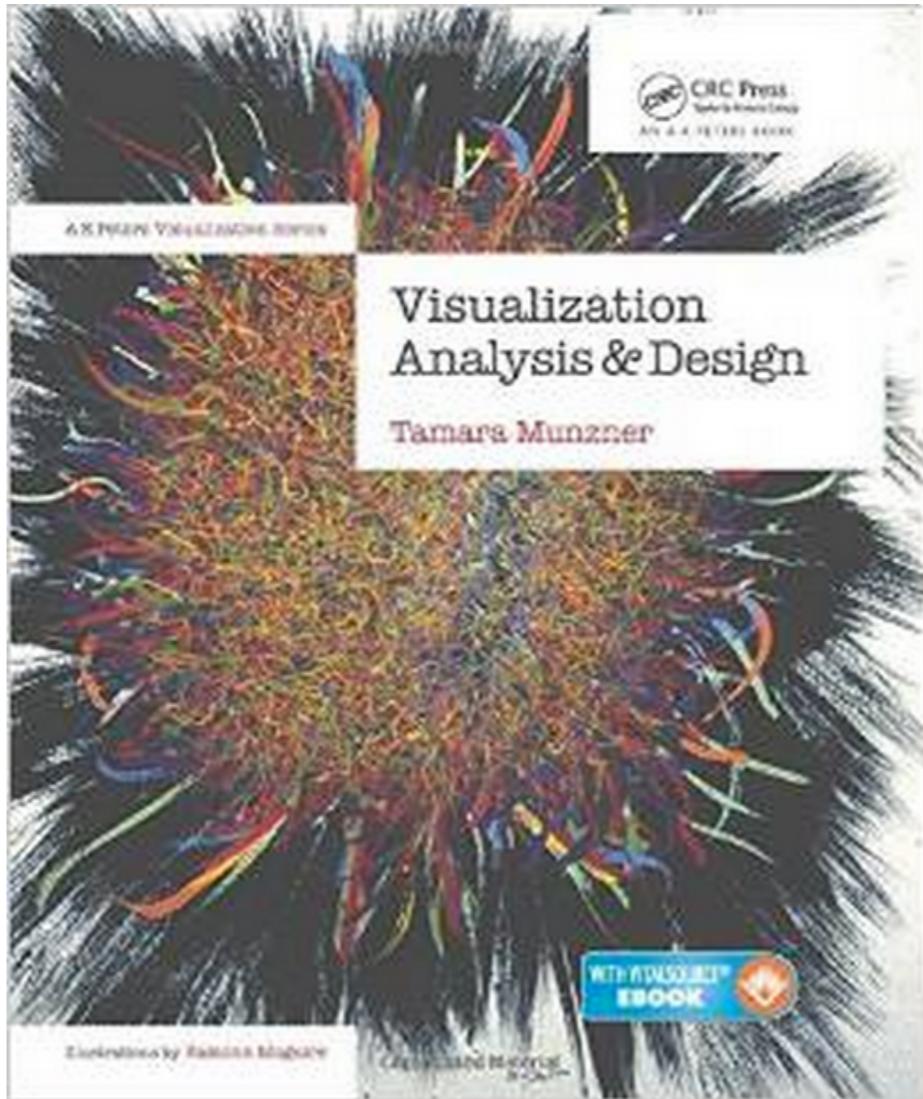
- Performance grade:
 - $\geq 90\%$: A, $\geq 75\%$: B, $\geq 60\%$: C, $\geq 40\%$: D, $< 40\%$: F
- Curve grade:
 - $\geq 15\%$: A, $\geq 30\%$: B, $\geq 45\%$: C, $\geq 60\%$: D, $< 40\%$: F
- Your final grade is the **best** of either curve or performance grades

Plagiarism and Academic Conduct Policy

- Unless I state otherwise, you are allowed to use any open source library you want in your projects, **provided that you give it credit.**
 - Most assignments will be small
 - If you pass off someone else's work as yours, **that's plagiarism.**
 - The penalty for plagiarism always includes a referral to the college, and ranges from an automatic zero in the assignment to an automatic F in the course to expulsion from the university.
 - Don't do it.

Textbook

- No required textbook, but you won't regret buying Munzner's "Visualization Analysis and Design"



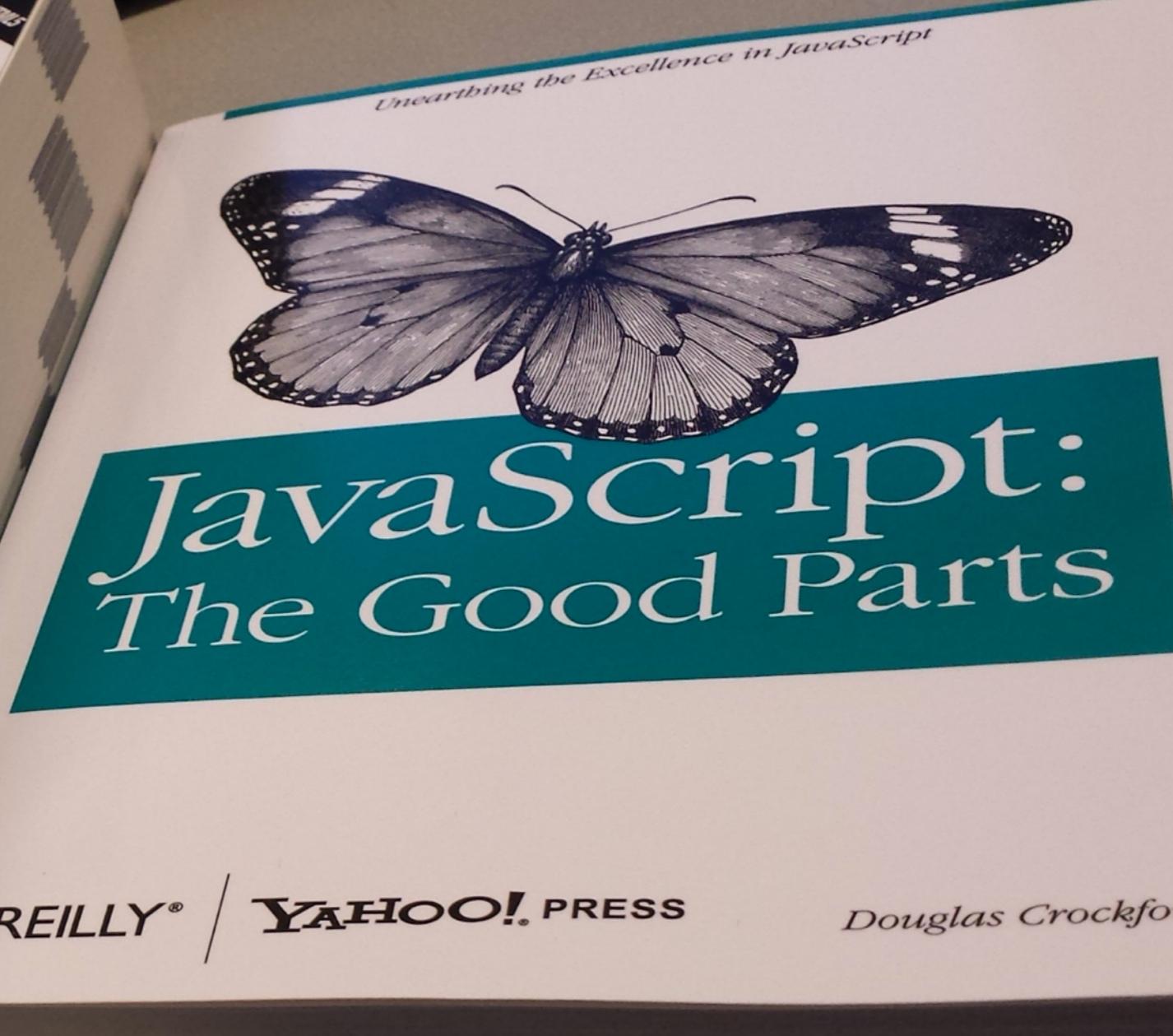
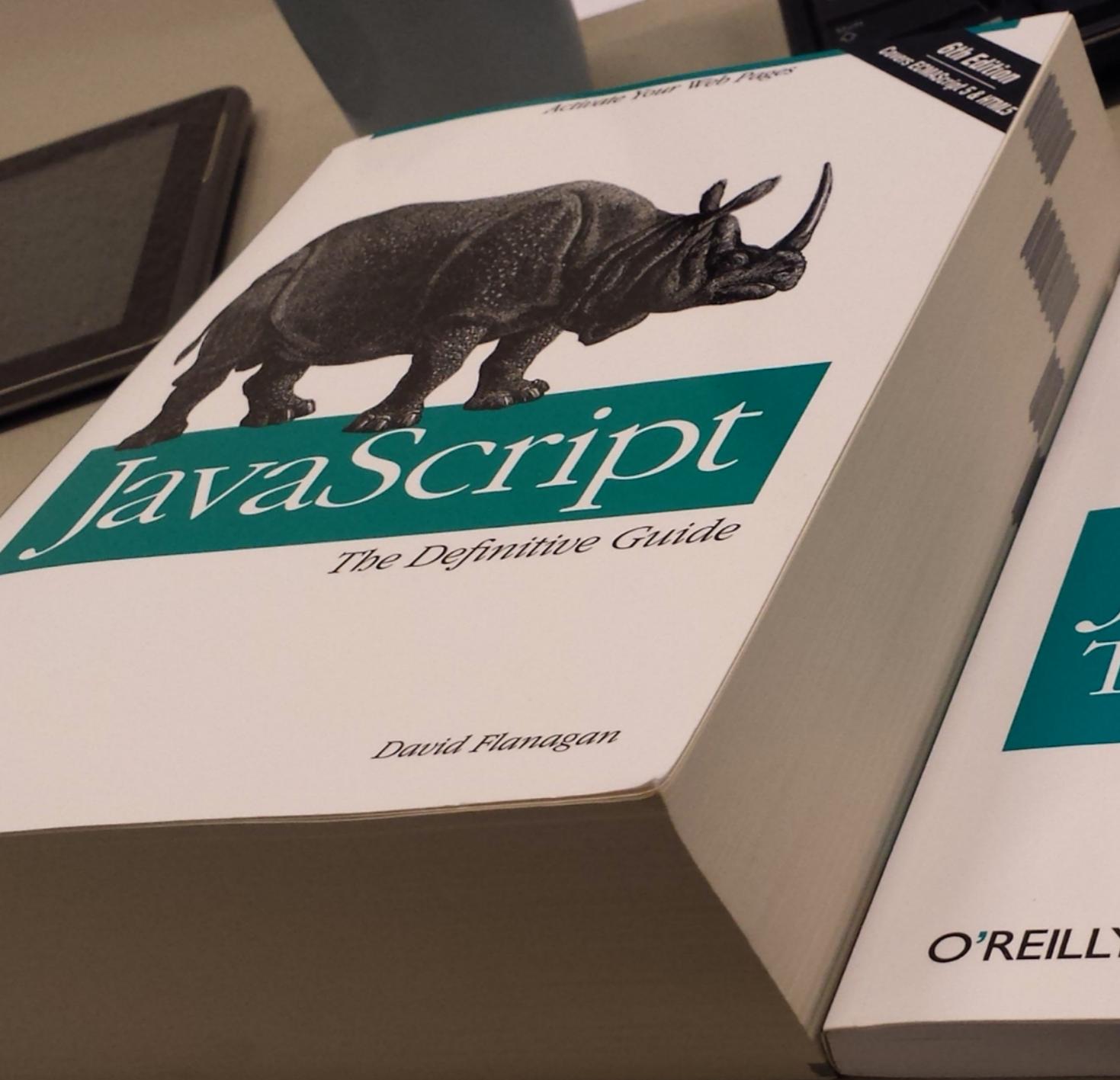
- All required reading material will be given in lecture notes, webpages, and research papers

Important Vis Books

- William Cleveland, **The Elements of Graphing Data, Visualizing Data**
- John W. Tukey, **Exploratory Data Analysis**
- Jacques Bertin, **Semiology of Graphics**
- Edward Tufte, **The Visual Display of Quantitative Information, Visual Explanations, Envisioning Information**
- Colin Ware, **Information Visualization**
- Come take a look at them during office hours if you're curious;
they're not cheap :(

Mechanics

- Writing programs: we will use the web technology stack
 - Javascript, SVG, CSS, HTML, d3

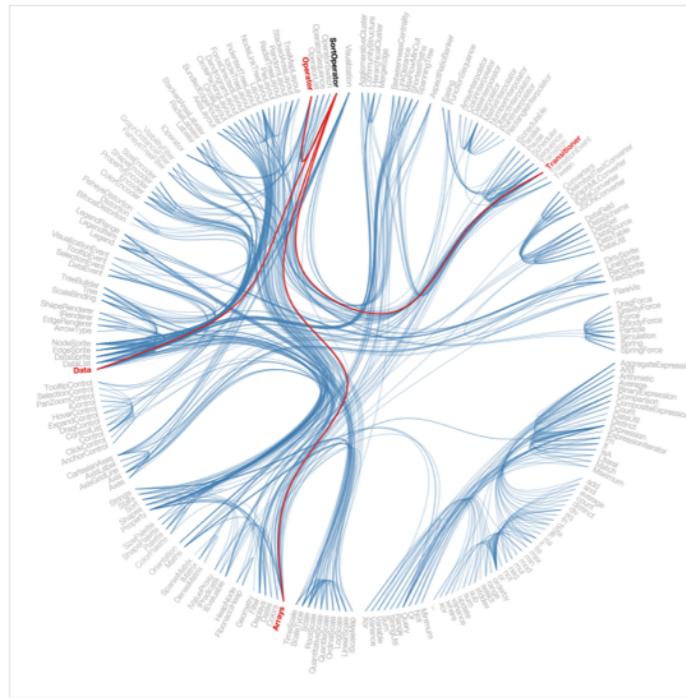


<http://bit.ly/1swfb5p>
<http://i.imgur.com/wR3ZxfB.jpg>

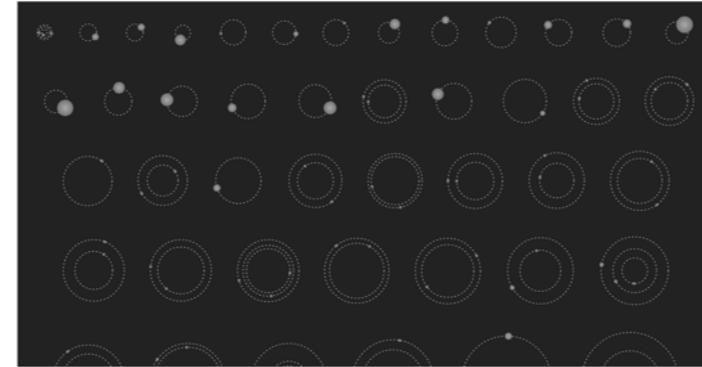
<https://www.destroyallsoftware.com/talks/wat>

Stick with it, though!

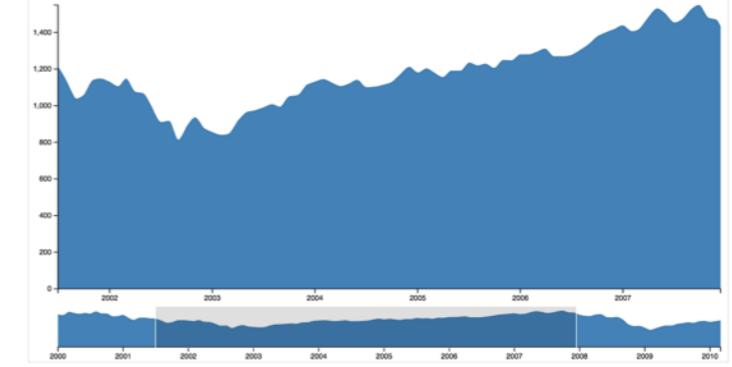
Hierarchical Edge Bundling



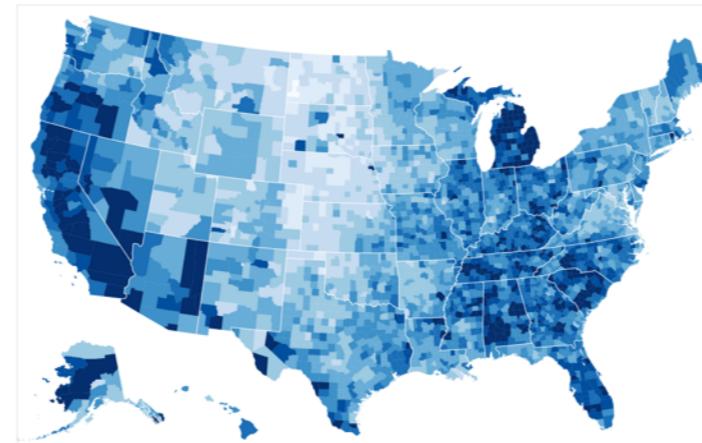
Kepler's Tally



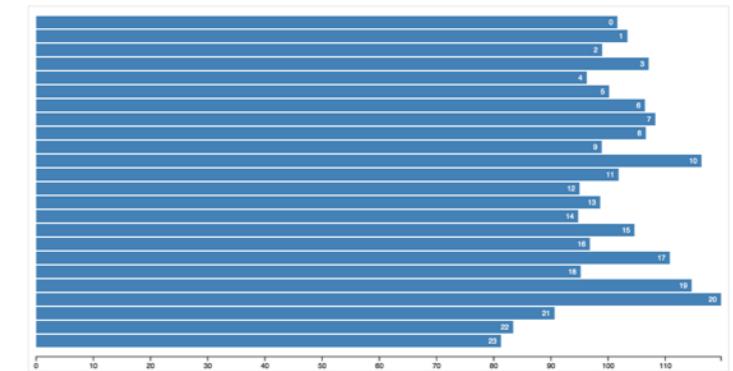
Focus+Context via Brushing



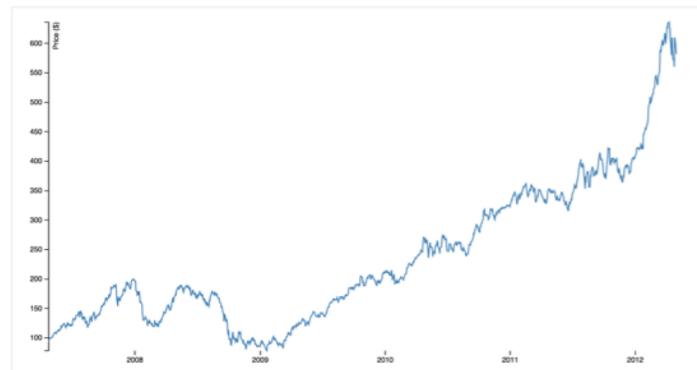
Choropleth



Sortable Bar Chart



X-Value Mouseover



<http://bl.ocks.org/mbostock>

Good reasons to choose the web stack:

It's ubiquitous

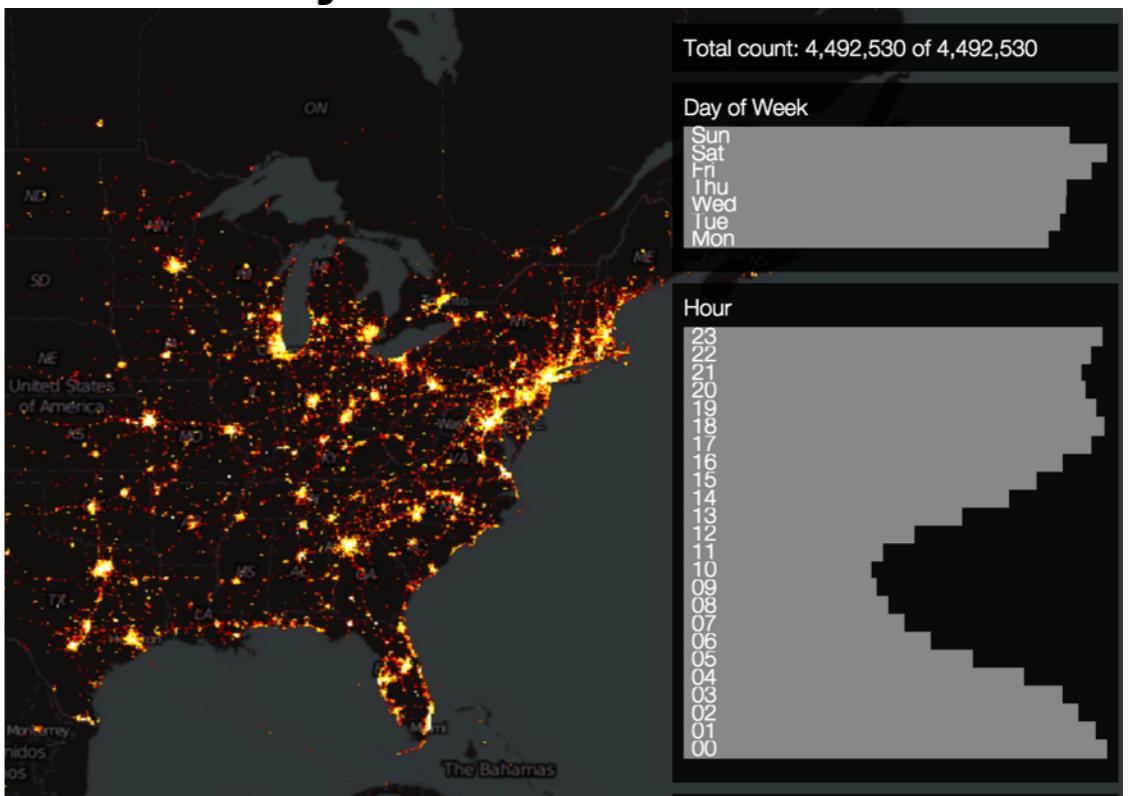


apple.com



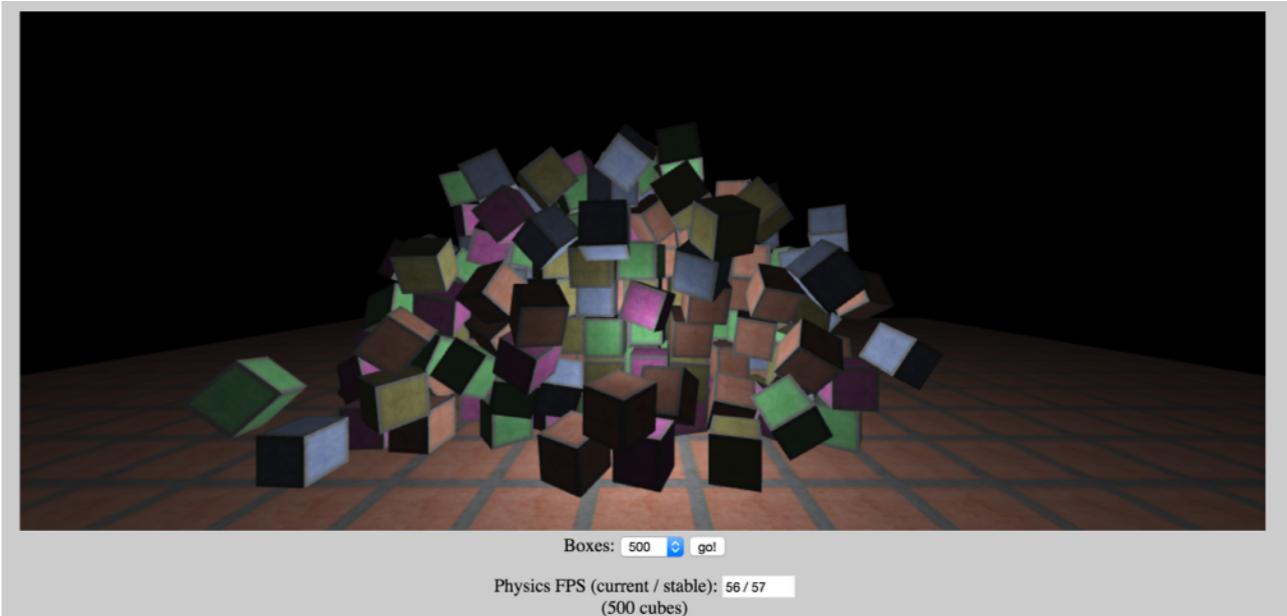
arstechnica.com

It's easy to talk to a server



nanocubes.net

It's fast!

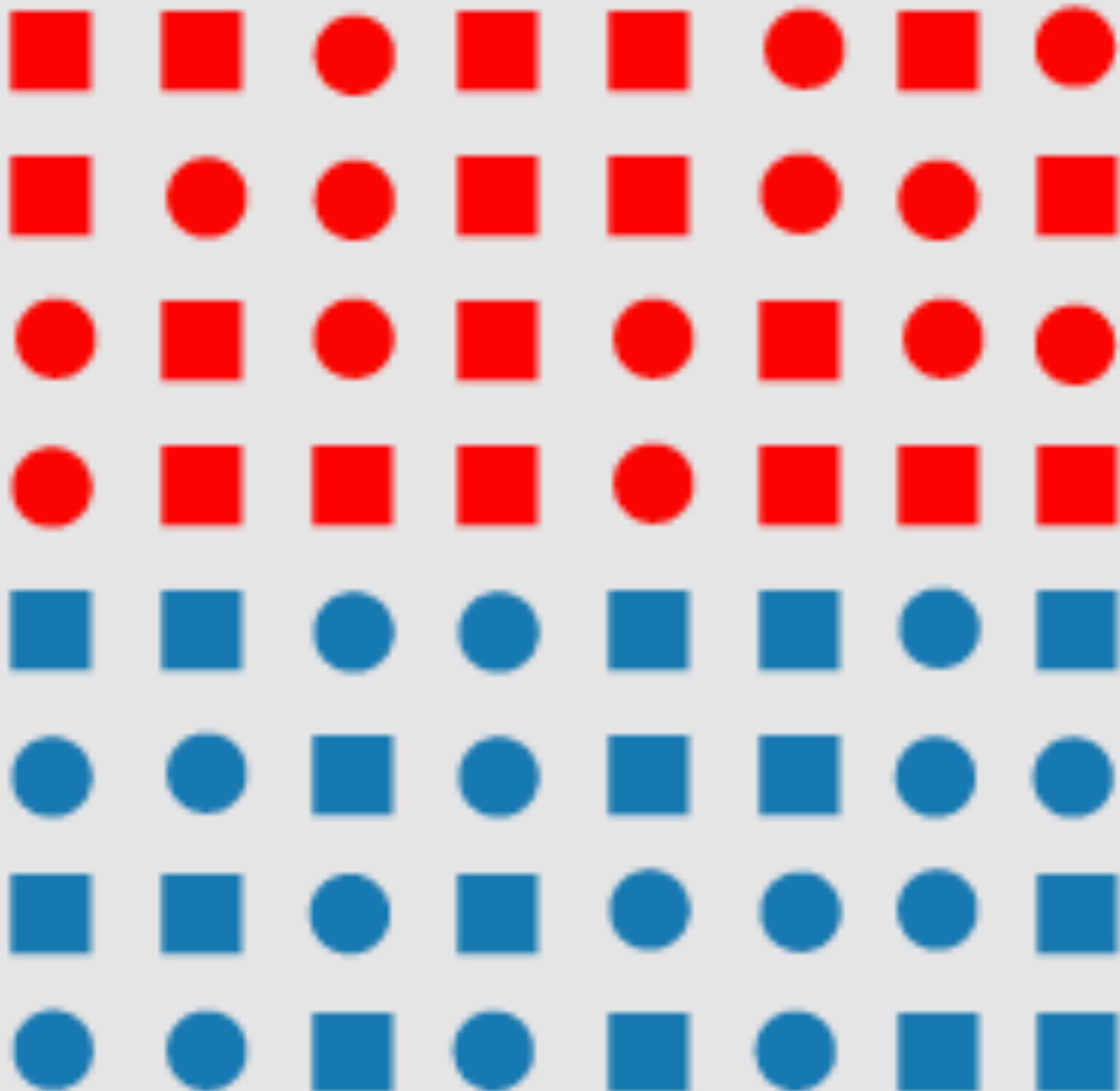


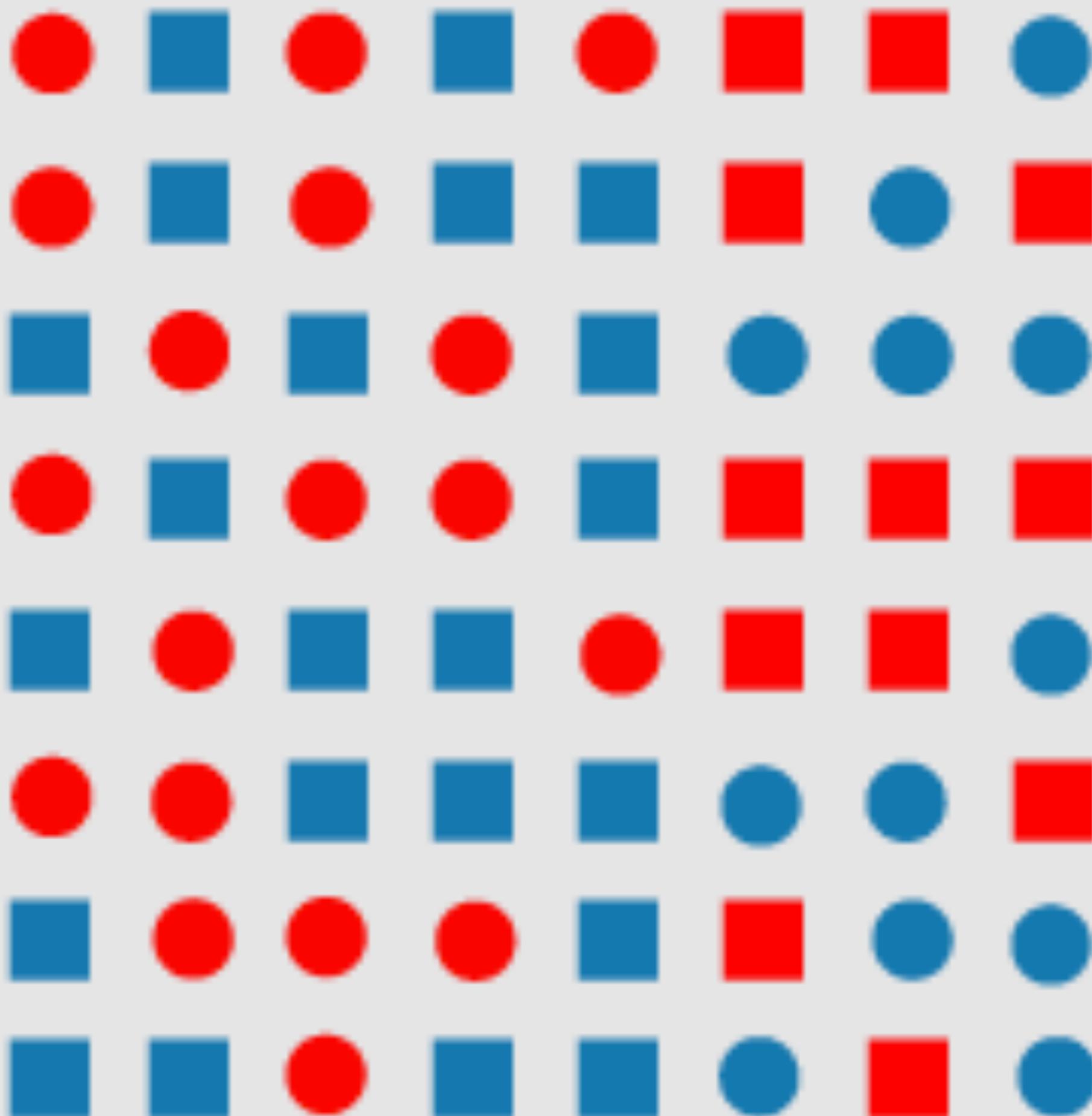
Principles

Building a visualization is fundamentally about tradeoffs. Principles help us understand these tradeoffs, and make informed decisions

Pre-attentive Processing

Examples from Christopher Healey's excellent resource
<http://www.csc.ncsu.edu/faculty/healey/PP/>





Change Blindness

(photosensitive epilepsy? please look away.)

<http://www.csc.ncsu.edu/faculty/healey/PP/>

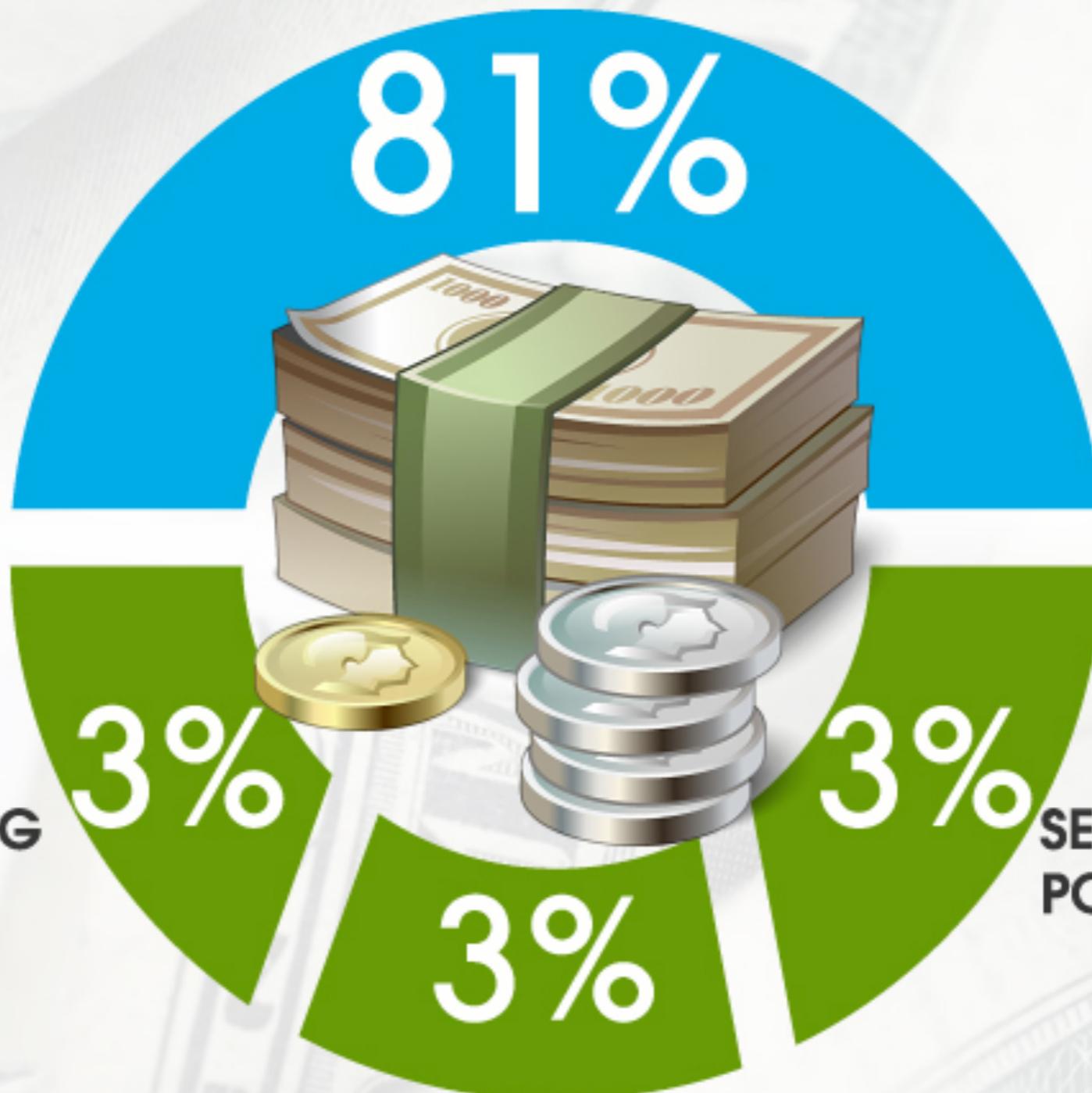
Respect the math in
the data

Not everything you can do with data makes sense

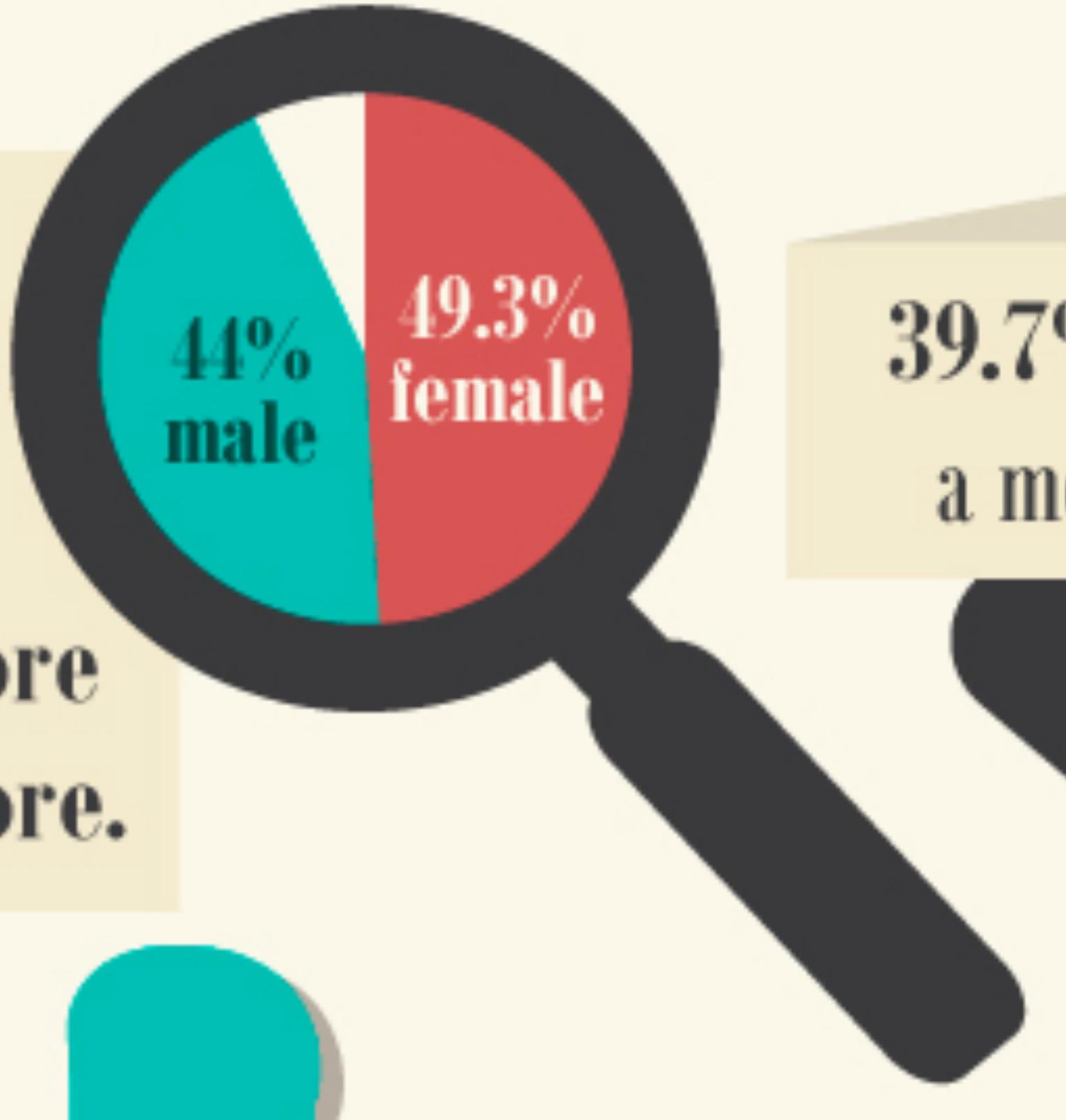
WHAT ACTUALLY BORROWERS DO DEVOID OF GETTING PAYDAY LOANS



CUT BACK ON DAILY EXPENDITURES



Almost half of all shoppers will research on their mobile device before purchasing in a store.



TOWN OF
Snowmass Village

ESTABLISHED

1967

ELEVATION

8388

POPULATION

2826

TOTAL

13,181

Techniques

How do we turn the mechanics and principles
into an actual, working visualization?

Linked views

demo: <http://square.github.io/crossfilter/>

Treemaps

demo: GrandPerspective

A tour of visualization and visual thinking

<http://cscheid.net/courses/spr14/cs444/lectures/week1.html>

CS 444/544 Summary

- 4 weeks of mechanics, 5 weeks of principles, 6 weeks of techniques
- ~1 small assignment a week, 1 midterm, 1 project

Course website: <http://cscheid.net/courses/spr15/cs444>

Today's lecture:

<http://cscheid.net/courses/spr15/cs444/lectures/week1.html>