

Overview of InfoVis



CS 4460 – Intro. to Information Visualization
Aug. 23, 2017
John Stasko

Learning Objectives



- Articulate definition and purpose of visualization
- Describe two main uses or applications of visualization
- List two primary components of visualizations
- Describe the different areas of academic visualization research
- Explain the infovis “pipeline” (process)

(Will carry over into next class)

Exercise



- Get out pencil and paper

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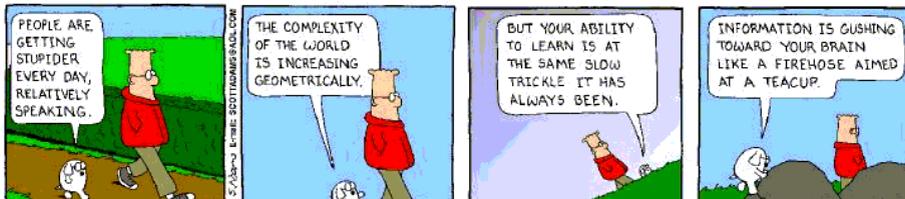
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Data Overload



- Confound: How to make use of the data
 - How do we make sense of the data?
 - How do we harness this data in decision-making processes?
 - How do we avoid being overwhelmed?



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The Challenge



- Transform the *data* into *information* (understanding, insight) thus making it useful to people



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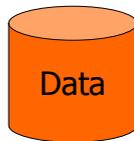
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The Problem



Web,
Books,
Papers,
Game scores,
Scientific data,
Biotech,
Shopping
People
Stock/finance
News



Data Transfer →

How?



Vision: 100 MB/s
Ears: <100 b/s
Haptic/tactile
Smell
Taste
Telepathy?

Two slides courtesy
of Chris North

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Human Vision



- Highest bandwidth sense
- Fast, parallel
- Pattern recognition
- Pre-attentive
- Extends memory and cognitive capacity
- People think visually



Impressive. Lets use it!

An Example

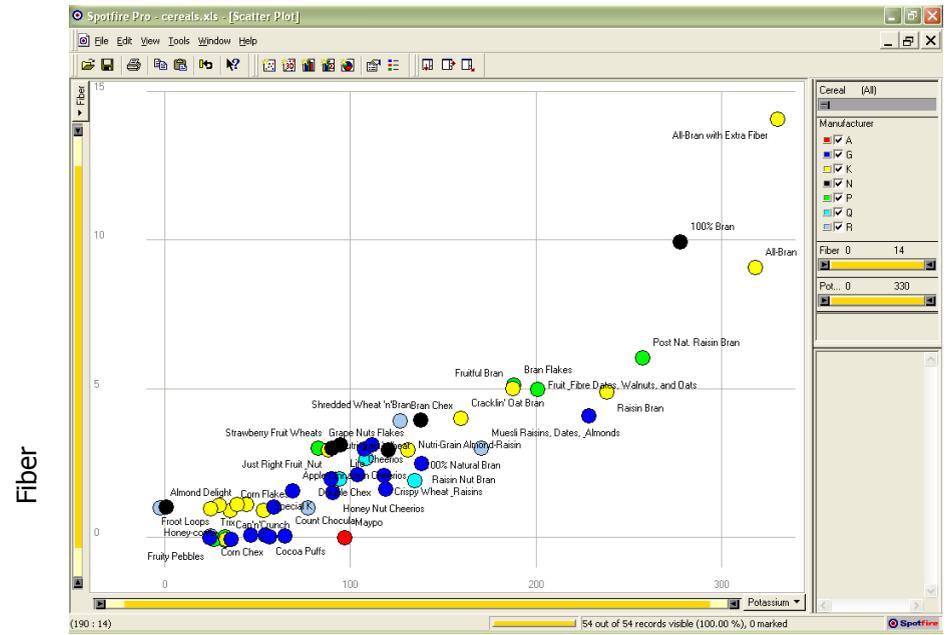


- Why visualization helps...

Questions: Which cereal has the most/least potassium?
 Is there a relationship between potassium and fiber?
 If so, are there any outliers?
 Which manufacturer makes the healthiest cereals?



	A	B	C	D					
1	Cereal	Manufacturer	Fiber	Potassium					
2	100% Bran	N	10	280	28	Honey-comb	P	0	35
3	100% Natural Bran	Q	2	135	29	Just Right Fruit & Nut	K	2	95
4	All-Bran	K	9	320	30	Life	Q	2	95
5	All-Bran with Extra Fiber	K	14	330	31	Lucky Charms	G	0	55
6	Almond Delight	R	1	0	32	Maypo	A	0	95
7	Apple Cinnamon Cheerios	G	1.5	70	33	Muesli! Raisins, Dates, &	R	3	170
8	Bran Chex	R	4	125	34	Multi-Grain Cheerios	G	2	90
9	Bran Flakes	P	5	190	35	Nutri-Grain Almond-Rais	K	3	130
10	Cap'n Crunch	Q	0	35	36	Nutri-grain Wheat	K	3	90
11	Cheerios	G	2	105	37	Oatmeal Raisin Crisp	G	1.5	120
12	Cocoa Puffs	G	0	55	38	Post Nat. Raisin Bran	P	6	260
13	Corn Chex	R	0	25	39	Product 19	K	1	45
14	Corn Flakes	K	1	35	40	Quaker Oatmeal	Q	2.7	110
15	Count Chocula	G	0	65	41	Raisin Bran	K	5	240
16	Cracklin' Oat Bran	K	4	160	42	Raisin Nut Bran	G	2.5	140
17	Cream of Wheat (Quick)	N	1	0	43	Rice Krispies	K	0	35
18	Crispy Wheat & Raisins	G	2	120	44	Shredded Wheat	N	3	95
19	Double Chex	R	1	80	45	Shredded Wheat 'n'Bran	N	4	140
20	Froot Loops	K	1	30	46	Shredded Wheat spoon	N	3	120
21	Frosted Flakes	K	1	25	47	Smacks	K	1	40
22	Fruit & Fibre Dates, Wal	P	5	200	48	Special K	K	1	55
23	Fruitful Bran	K	5	190	49	Strawberry Fruit Wheats	N	3	90
24	Fruity Pebbles	P	0	25	50	Total Corn Flakes	G	0	35
25	Golden Grahams	G	0	45	51	Total Raisin Bran	G	4	230
26	Grape Nuts Flakes	P	3	85	52	Total Whole Grain	G	3	110
27	Honey Nut Cheerios	G	1.5	90	53	Trix	G	0	25
					54	Wheaties	G	3	110
					55	Wheaties Honey Gold	G	1	60



Even Tougher?



- What if you could only see one cereal's data at a time? (e.g. some websites)
- What if I read the data to you?



Another Illustrative Example

Four Data Sets



- Mean of the x values = 9.0
- Mean of the y values = 7.5
- Equation of the least-squared regression line is: $y = 3 + 0.5x$
- Sums of squared errors (about the mean) = 110.0
- Regression sums of squared errors (variance accounted for by x) = 27.5
- Residual sums of squared errors (about the regression line) = 13.75
- Correlation coefficient = 0.82
- Coefficient of determination = 0.67

Anscombe's quartet

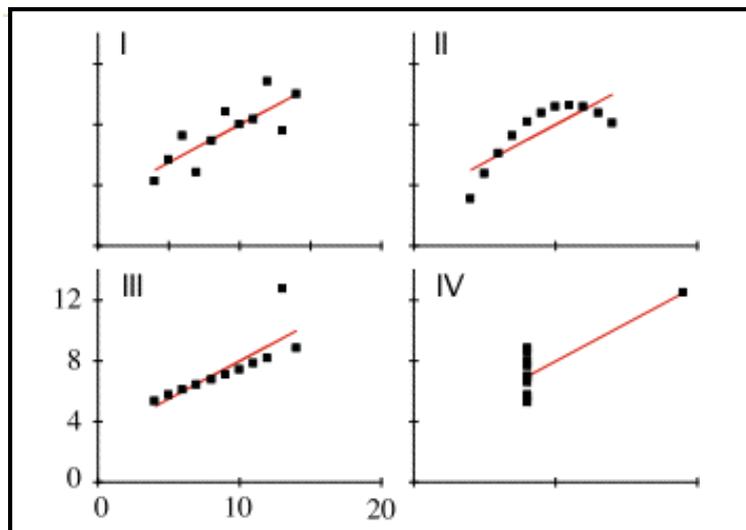
<http://astro.swarthmore.edu/astro121/anscombe.html>

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The Data Sets



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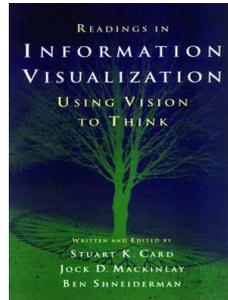
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Visualization



- Definition
 - “The use of computer-supported, interactive visual representations of data to amplify cognition.”

From



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Visualization



- Often thought of as process of making a graphic or an image
- Really is a cognitive process
 - Form a mental image of something
 - Internalize an understanding
- “The purpose of visualization is insight, not pictures”
 - Insight: discovery, decision making, explanation

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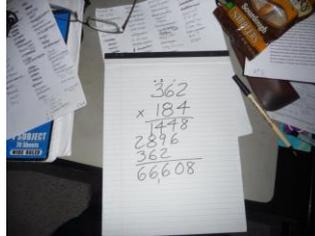
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Visuals Help Us Think



- Provide a frame of reference, a temporary storage area
- Cognition → Perception
- Pattern matching
- External cognition aid
 - Role of external world in thinking and reason



Larkin & Simon '87
Card, Mackinlay, Shneiderman '98

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Expressed Well



"Contained within the data of any investigation is information that can yield conclusions to questions not even originally asked. That is, there can be surprises in the data...To regularly miss surprises by failing to probe thoroughly with visualization tools is terribly inefficient because the cost of intensive data analysis is typically very small compared with the cost of data collection."

W. Cleveland
The Elements of Graphing Data

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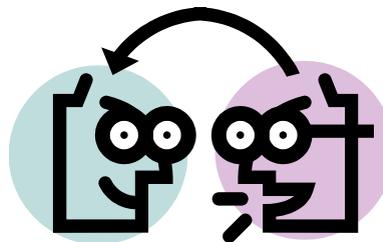
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Part of our Culture



- “I see what you’re saying”
- “Seeing is believing”
- “A picture is worth a thousand words”



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Admin Intermission



- Course policies
- Grading
- Overloads
- Surveys
- More...

Pause

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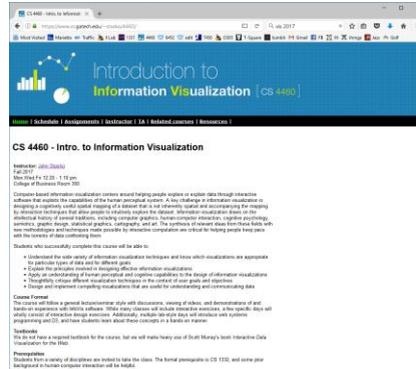
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Administratia



- Get it all from class website
 - Policies
 - Schedule
 - Assignments
 - Instructor & TAs
 - Related Courses
 - InfoVis Resources



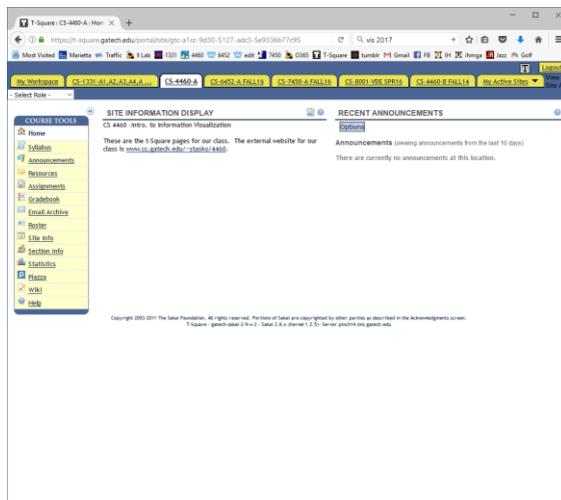
<http://www.cc.gatech.edu/~stasko/4460>

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T-Square Site



Should've seen an announcement

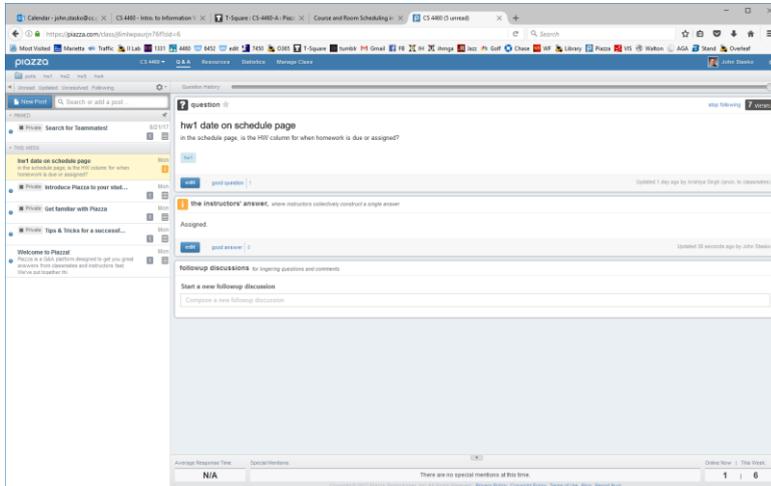
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Piazza

https://piazza.com/gatech/fall2017/cs4460



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Responsibility



- You are responsible for examining and staying up-to-date with information on the class website and t-square website

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Course Policies



- Most on class homepage or Assignments page
 - Format
 - Book
 - Attendance
 - Electronics
 - Academic Integrity
 - Grading
 - ...

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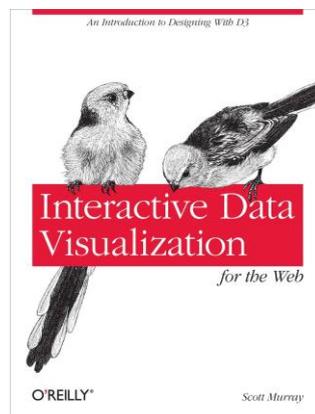
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Books



None required



Will use

Ebook free at <http://chimera.labs.oreilly.com/books/1230000000345/>

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Colored Pencils



Please get some and bring to class when requested

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Attendance



- Expected
 - Part of your grade
- Will start promptly at 12:20 and end by 1:10
- Eating (quietly) is OK

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Academic Integrity



- Do your own work, unless told otherwise
- Absolutely OK to consult me or Tas
- More to come on programming HWs...

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Electronics



- This is now a **NO** laptops/cellphones class
- Exceptions will be noted (labs, etc)
- Note-takers, see me



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Grading



- Pop quizzes/Attendance 10%
 - Start of class, 5 minutes
- HW Assignments (5) 20%
- Programming Assignments (5) 28%
 - Last one bigger
- Midterm Exam 20%
- Final Exam 22%
 - At worst 60-70-80-90 for final grades

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Schedule

Info central



3 types classes
Lecture/Discuss
Design
Lab

Date	Session	Topic	Material	Resources HW
Week 1				
Aug 21	Lecture	Introduction	Tufts course	
Aug 22	Lecture	InfoVis Overview	CMS Intro chapter Link	
Aug 25	Design	The Basics		
Week 2				
Aug 28	Lecture	Multivariate Data & Tables	Link	HW 1
Aug 30	Lecture	Graphs & Charts	Link	
Sep 1	Lab	HTML & CSS	Link	
Week 3				
Labor Day Holiday				
Sep 6	Design	CSV data		HW 2
Sep 8	Lab	JavaScript	Link	
Week 4				
Sep 11	Lecture	Visual Perception	Link	
Sep 13	Lecture	Case Study: Jigsaw	Link	HW 3
Sep 15	Lab	SVG	Link	
Week 5				
Sep 18	Lecture	Multivariate Visual Reprs. 1	Link	
Sep 20	Lecture	Multivariate Visual Reprs. 2	Link	
Sep 22	Design	Multivariate Data	Link	
Week 6				
Sep 25	Lecture	InfoVis Systems & Toolkits	Link	HW 4

Prep material for next class

Link to more info

HW links

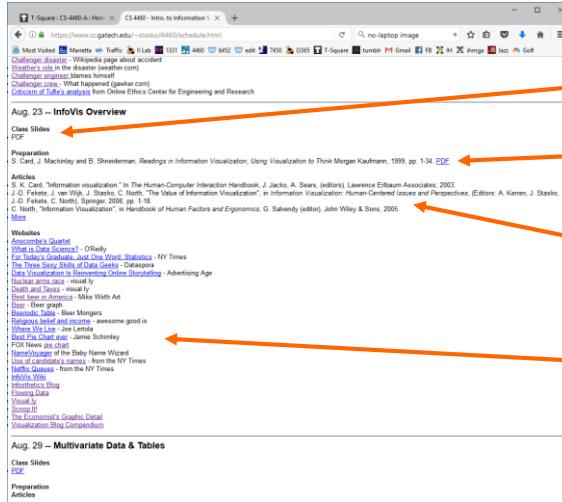
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Schedule

Lower on page



Slides from class

Prep material

Related papers

Links from class
(websites, videos,
demos, etc.)

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Class Preparation



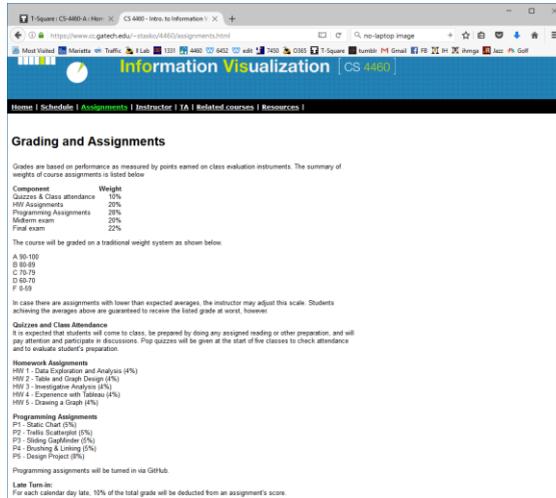
- Paper, video, website to review for the next class
 - Multiple links from Schedule page
 - Potential pop quiz at start of next class

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Assignments



Recaps weights

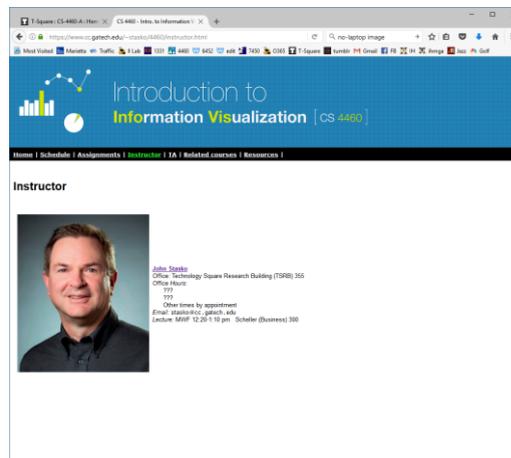
Will have links to HWs

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Instructor



Office number out of sequence with others (in corner of building)

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About Me



CS PhD, 1989, Brown University

Researcher in information visualization,
visual analytics, and HCI

Active in those academic research
communities

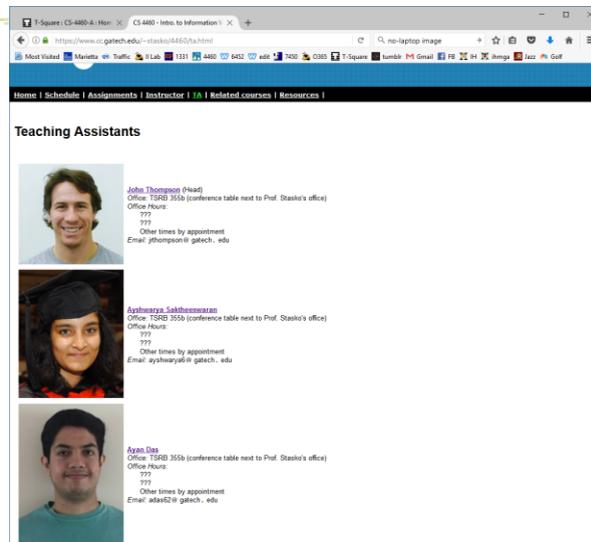


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Teaching Assistants



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*** **CAVEAT** ***



- This course is quite a bit of work. If you're just looking for some easy grade, I would advise you to drop now
- Graduating seniors: It's on you now to do the work so no problems later
- If you are sincerely interested in this topic, I hope you will enjoy the course and learn a lot

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Registration



- Will be able to add some students
 - Room has a little more capacity
 - More if there are drops
 - Cannot go too large
- Not a fan of "seat squatting"
- **Please** drop the class by Thursday noon

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Survey



- Who wasn't here on Monday and didn't fill out a survey?
 - Please fill out even if on waitlist



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Purpose



- Two main uses of infovis
 - Analysis – Understand your data better and act upon that understanding
 - Communication – Communicate and inform others more effectively

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1. Analysis



- Given all the data, then
 - understand, compare, decide, judge, evaluate, assess, determine, ...
- Ultimately, about solving problems



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When to Apply?



- Many other techniques for data analysis
 - Statistics, DB, data mining, machine learning
- Visualization most useful in **exploratory data analysis**
 - Don't know what you're looking for
 - Don't have a priori questions
 - Want to know what questions to ask

"A graphic display has many purposes but it achieves its highest value when it forces us to see what we were not expecting."

H. Wainer

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EDA example?

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EDA Example



- Airlines
 - What are the key factors causing flight delays in the US?
 - Are delays worse in the summer or winter?
 - Is the seasonal effect influenced by geographic location?
 - How does competition at an airport affect flight delays?

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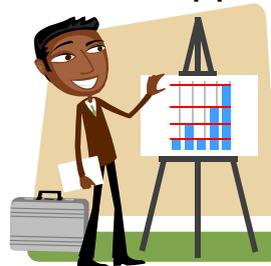
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2. Communication



- Use visualization to communicate ideas, present, influence, explain, persuade
- Visuals can serve as evidence or support



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When to Apply?

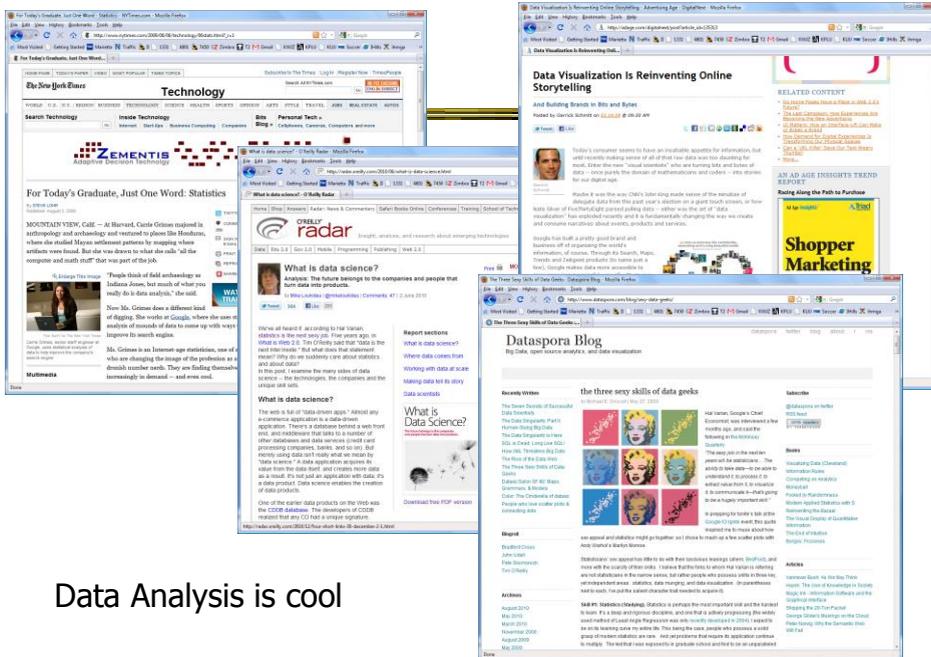


- Visuals can frequently take the place of many words
- Visuals can summarize, aggregate, unite, explain, ...
- Sometimes words are needed, however

Key Benefits of Visualization



- Facilitating awareness and understanding
- Helping to raise new questions and supply answers
- Generating insights
- Telling a story and making a point



Data Analysis is cool

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Information Visualization



- 1. What is "information"?
 - Non-spatial data: Items, entities, things which do not have a direct physical correspondence
 - Notion of abstractness of the entities is important too
 - Examples: baseball statistics, stock trends, connections between criminals, car attributes...

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Information Visualization



- 2. What is “visualization”?
 - The use of computer-supported, interactive visual representations of data to amplify cognition.
From [Card, Mackinlay Shneiderman '98]

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Information Visualization



- Characteristics:
 - Taking things without a direct physical correspondence (non-spatial) and mapping them to a 2-D or 3-D physical space
 - Giving information a visual representation that is useful for analysis and presentation
 - “A key challenge in information visualization is designing a cognitively useful spatial mapping of a dataset that is not inherently spatial and accompanying the mapping by interaction techniques that allow people to intuitively explore the dataset. Information visualization draws on the intellectual history of several traditions, including computer graphics, human-computer interaction, cognitive psychology, semiotics, graphic design, statistical graphics, cartography, and art.”

<http://conferences.computer.org/infovis/>

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Constituents



- Two key aspects of infovis
 - Representation
 - Interaction (too often overlooked)

“The effectiveness of information visualization hinges on two things: its ability to clearly and accurately represent information and our ability to interact with it to figure out what the information means.”

S. Few, Now you see it

Two Key Challenges



- Scale
 - Challenge often arises when data sets become large
- Diversity
 - Data of data types, forms, sizes

Example Domains for Info Vis



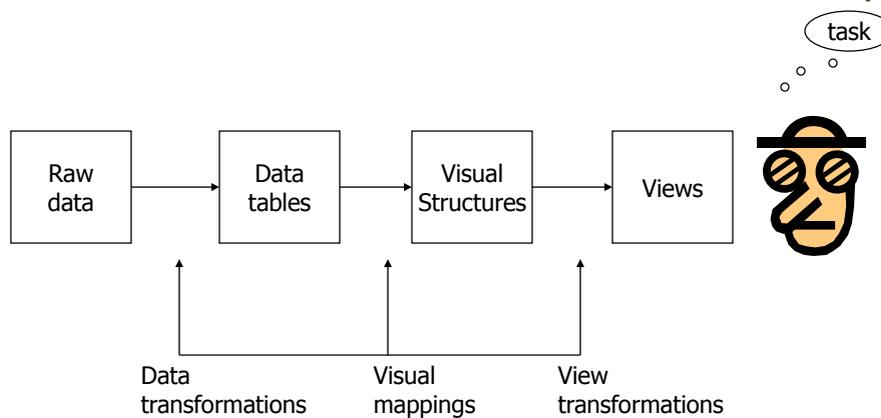
- Text
- Statistics
- Financial/business data
- Internet information
- Software
- ...

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InfoVis Process Model



From: Card, Mackinlay, Shneiderman '99

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Back to InfoVis (Examples)



- Start with static pictures (InfoGraphics)
 - Very popular on the web
 - But are they information visualizations?

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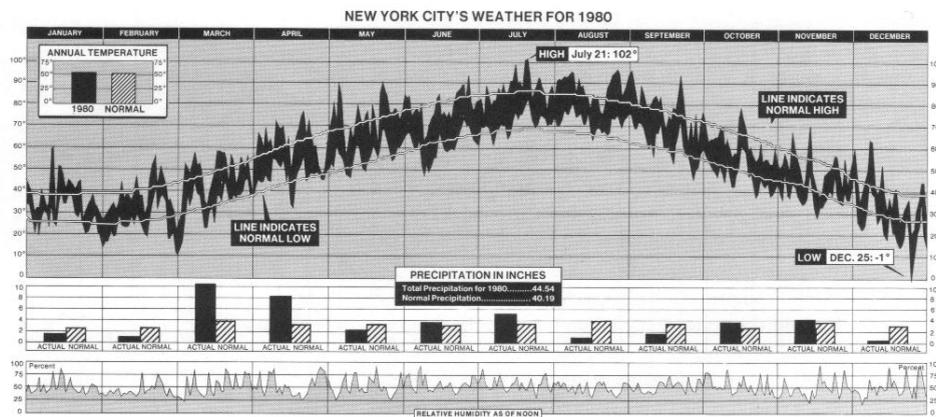
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NYC Weather



2220 numbers



New York Times, January 11, 1981, p. 32.

Tufte, Vol. 1

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Data Values



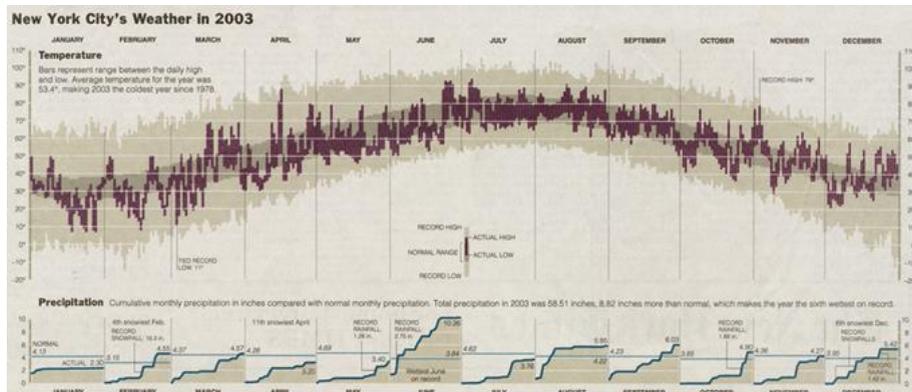
- 365 High temp for each day
- 365 Low temp for each day
- 365 Avg high temp for each day
- 365 Avg low temp for each day
- 365 Precipitation for each day
- 365 Humidity for each day
- 12 Precipitation for each month
- 12 Avg precipitation for each month
- 1 Precipitation for the year
- 1 Avg precipitation per year
- 1 Highest temp (& day) for the year
- 1 Lowest temp (& day) for the year
- 1 Avg daily temp for the year
- 1 Avg daily temp per year

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Updated Version

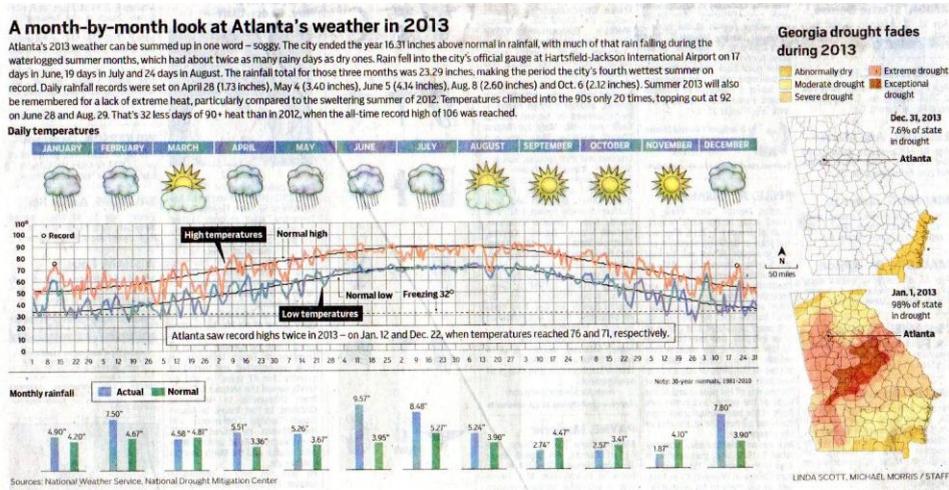


http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=00014g

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Atlanta Journal Constitution Jan. 3, 2014

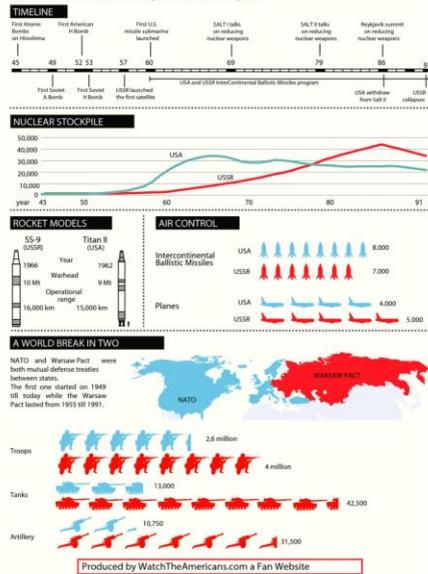
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THE NUCLEAR ARMS RACE

It was the main issue in the Cold War when both America and Russia challenging each other to increase their stockpiles of nuclear weapons.



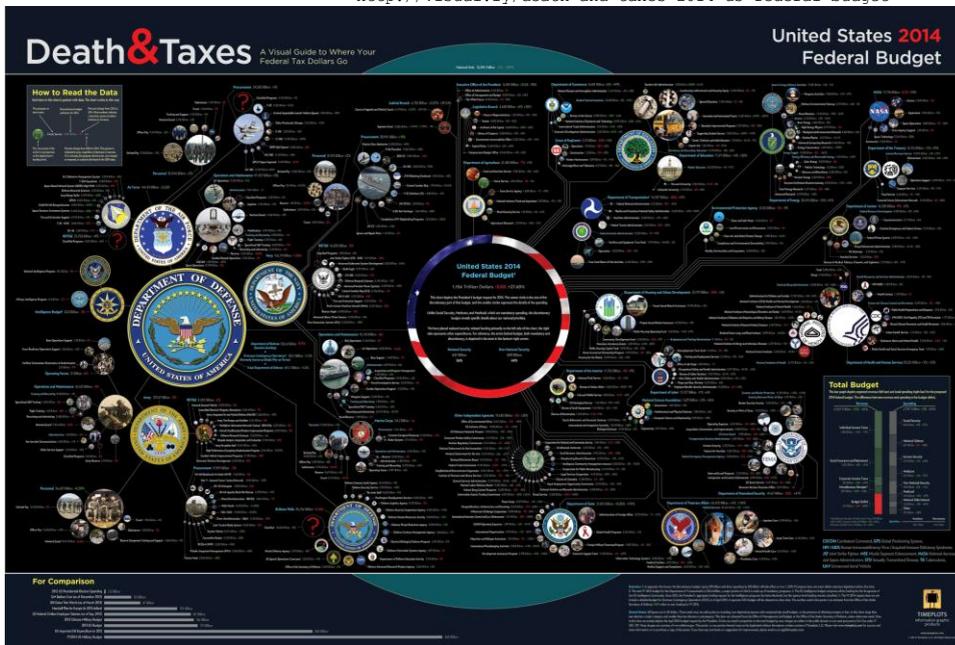
<http://visual.ly/nuclear-arms-race>

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<http://visual.ly/death-and-taxes-2014-us-federal-budget>



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<http://www.mikewirthart.com/?cat=3>

Beer

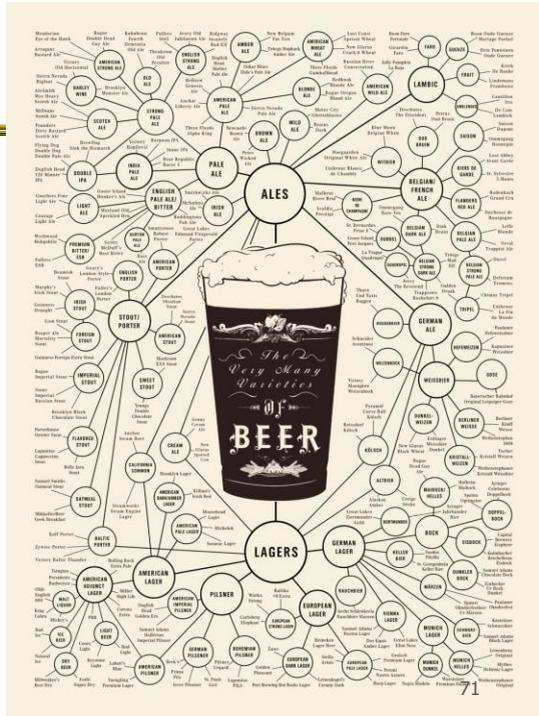


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Beer!



http://images.fastcompany.com/upload/poster_beer_1300.jpg

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More Beer!

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Events

MONGERS

Beers
Contact us

Click on any image below to see full description

The Beerionic Table

<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 01 1000-1000 Berliner Weisse 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 02 1000-1000 Belgian Wit 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 03 1000-1000 American Wheat 4.5% - 5.5% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 04 1000-1000 Weizen 4.5% - 5.5% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 05 1000-1000 Dunkelweizen 4.5% - 5.5% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 06 1000-1000 Weizenbock 5.5% - 6.5% ABV 0.05% - 0.10% IBU </div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 07 1000-1000 Belgian Gueuze 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 08 1000-1000 Faro 4.5% - 5.5% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 09 1000-1000 Fruit beer 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 10 1000-1000 Oud Bruin 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 11 1000-1000 Belgian Strong Pale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 12 1000-1000 Belgian Pale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 13 1000-1000 Biere de Garde 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 14 1000-1000 Dubbel 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 15 1000-1000 Flanders Red 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 16 1000-1000 Belgian Strong Dark 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 17 1000-1000 Tripel 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 18 1000-1000 India Pale Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 19 1000-1000 ABT 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 20 1000-1000 Quadruple 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 21 1000-1000 Pale Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 22 1000-1000 American Pale Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 23 1000-1000 Imperial IPA 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 24 1000-1000 Al. Red & Amber Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 25 1000-1000 English Pale Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 26 1000-1000 Bitters 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 27 1000-1000 Oide Ale/Strong Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 28 1000-1000 Barleywine 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 29 1000-1000 Scottish Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 30 1000-1000 American Brown 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 31 1000-1000 English Drown 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 32 1000-1000 Robust Porter 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 33 1000-1000 Brown Porter 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 34 1000-1000 Imperial Stout 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 35 1000-1000 Dry Stout 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 36 1000-1000 Kölsch 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 37 1000-1000 Foreign Stout 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 38 1000-1000 Cream Ale 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 39 1000-1000 California Common 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 40 1000-1000 American Lager 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 41 1000-1000 Basic Porter 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 42 1000-1000 American Light 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 43 1000-1000 American Dark 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 44 1000-1000 Bohemian Pilsener 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 45 1000-1000 Helles Lager 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 46 1000-1000 Helles Bock 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 47 1000-1000 Dunkel 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 48 1000-1000 Schwarzbier 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 49 1000-1000 Vienna, Marzen, Oktoberfest 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 50 1000-1000 Helles Bock 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 51 1000-1000 Bock 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 52 1000-1000 Doppel Bock 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> 53 1000-1000 Eisbock 3.5% - 5.0% ABV 0.05% - 0.10% IBU </div>
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— ALE
— HYBRID
— LAGER

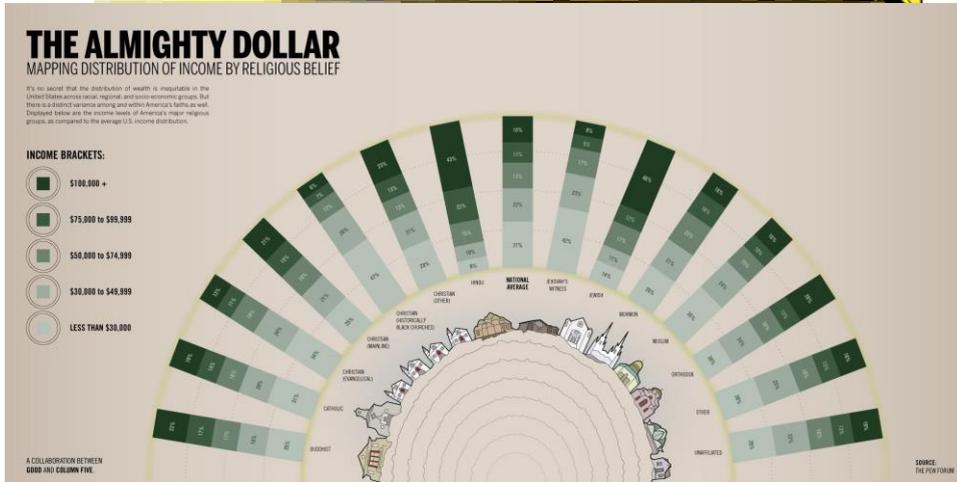
<http://thebeermongers.com/beers/>

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Income and Religion

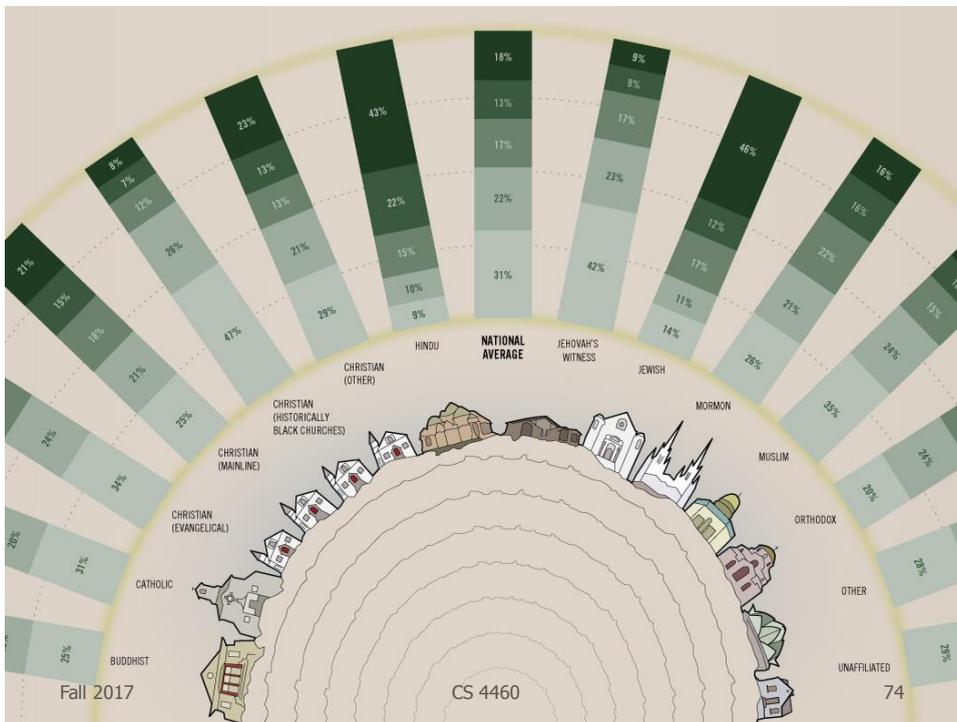


<http://awesome.good.is/transparency/web/1002/almighty-dollar/transparency.jpg>

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Population

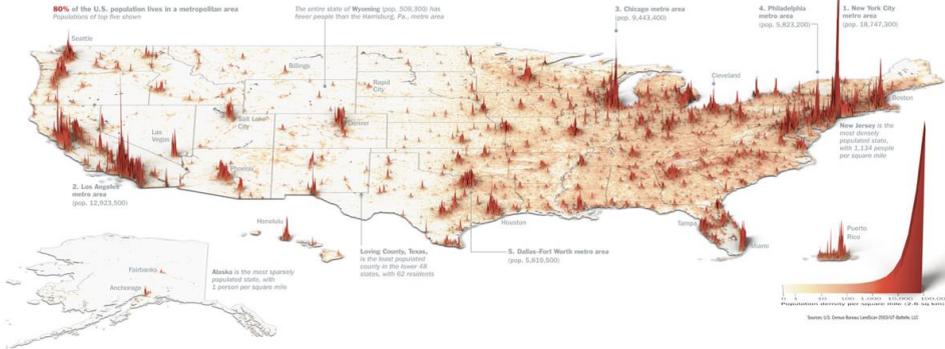


Where We Live...

Unlike many developed countries, the U.S. keeps growing. We are also moving south and west. But compared with China or India, the nation is a vast prairie

Our families are getting smaller—with one vital exception. Compared with those of Europe and Japan, the U.S. population is younger and more colorful because of the continued arrival of immigrants and their higher-than-average birthrates. Of the 280 million Americans who will join us in the next 27 years, half will be immigrants or their children. In the next few decades, 97% of the world's population growth will occur in the developing world; the U.S. is the largest developed country in the world that is still growing at a healthy clip. That matters, strategically, economicall-

Ala.: Primm, Tenn. Ky.; or Louisville, N.Y. But they are all probably close to someone's idea of paradise. —By Nancy Jans



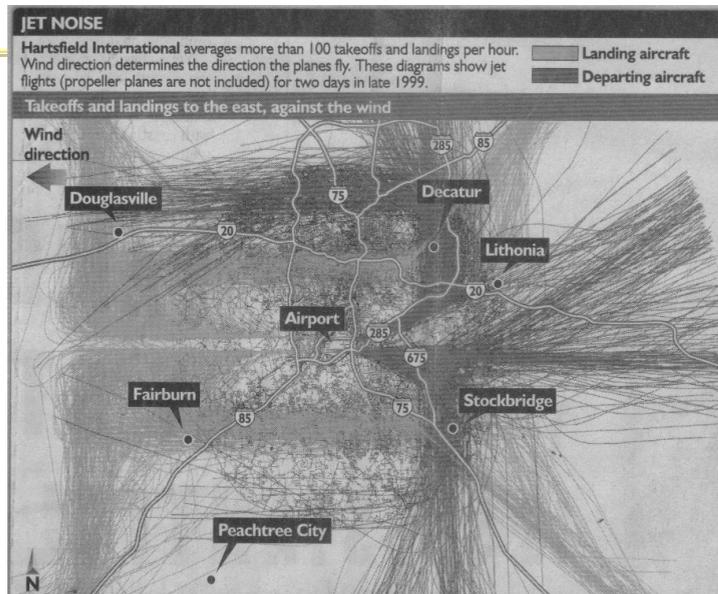
<http://infographicsnews.blogspot.com/2009/04/mantras-joe-lertolas-maps.html>

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Atlanta Flight Traffic



Atlanta Journal
April 30, 2000

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Country Music



Figure 14. States Mentioned in Country-Music Lyrics
 Source: Ben Marsh, "A Rose-Colored Map," *Harper's*, July 1977, 80. Used by permission.
 Note: The size of each state is proportional to the number of times it is mentioned.

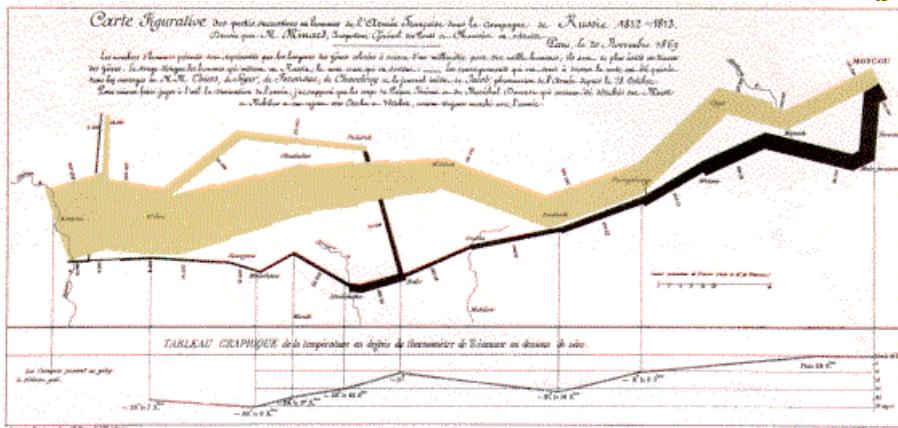
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Napoleon's March

From E. Tufte
The Visual Display of Quantitative Information



Minard graphic

size of army
 direction

latitude
 longitude

temperature
 date

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Or, for fun...

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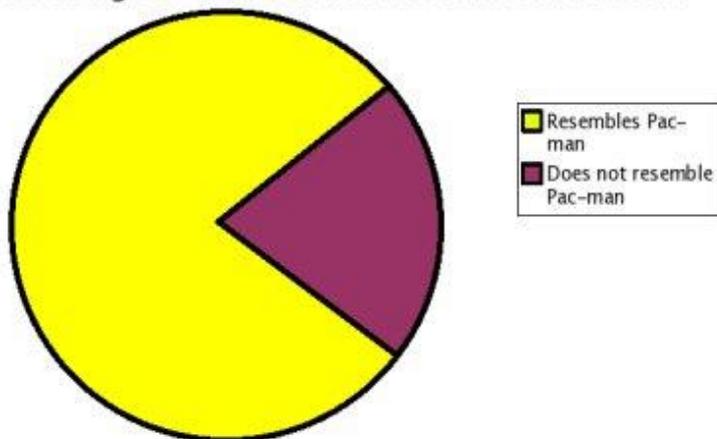
http://infosthetics.com/archives/2008/09/funniest_pie_chart_ever.html

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Percentage of Chart Which Resembles Pac-man

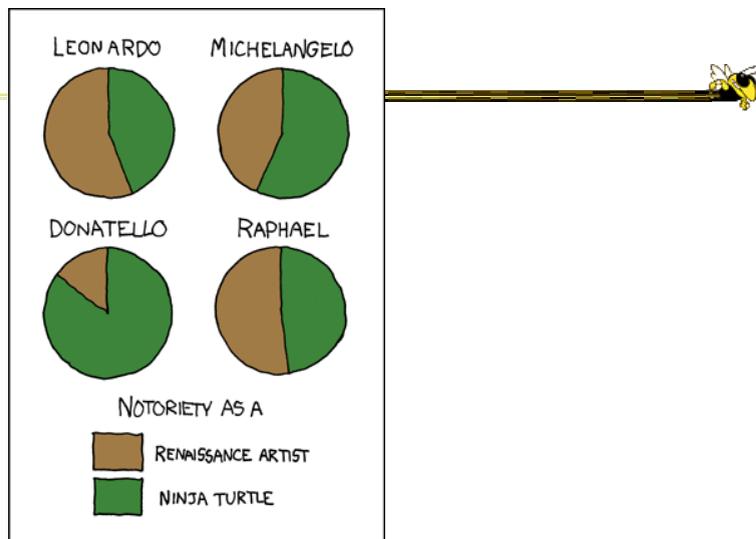


<http://www.boingboing.net/2006/11/02/hilarious-piechartvi.html>

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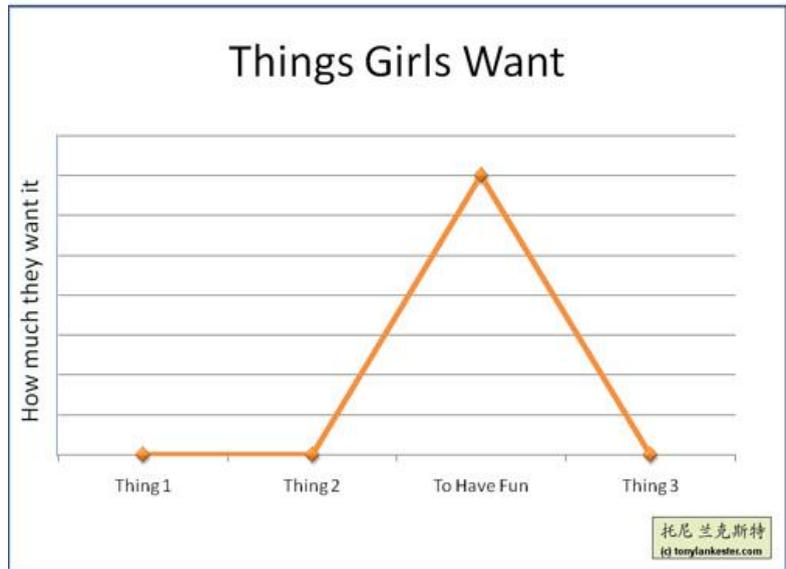


<http://xkcd.com/197/>

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<http://www.flickr.com/photos/91884218@N00/3108768440/in/pool-songchart>





But Don't Do This

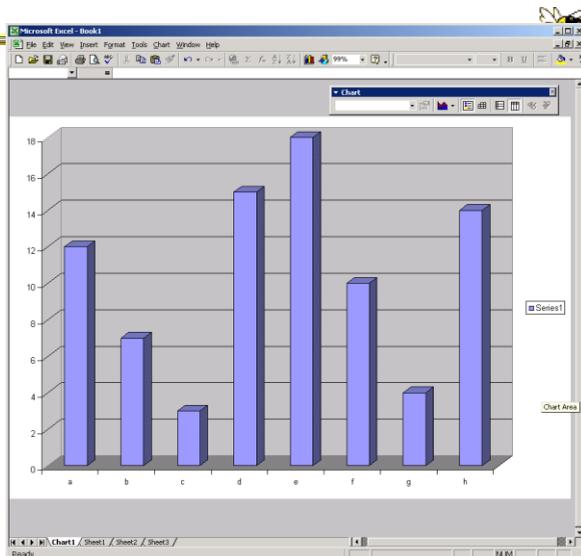
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Excel

Get rid of those darn 3D bars!



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USA Today Graphics



Or worse yet...



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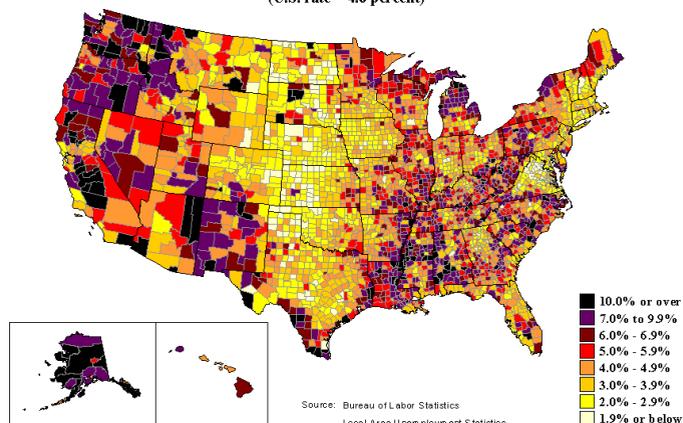
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Unemployment Rates



Unemployment rates by county,
December 2000 - November 2001 averages
(U.S. rate = 4.6 percent)

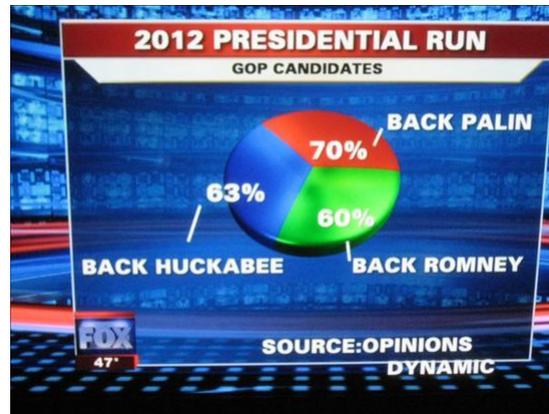


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FOX "News"



<http://wonkette.com/412361/all-193-of-republicans-support-palin-romney-and-huckabee>

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Examples



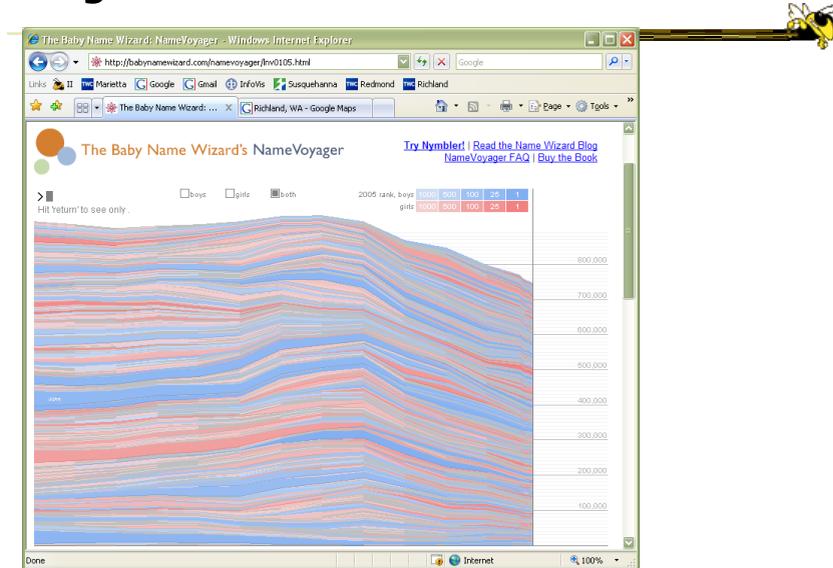
- Tools/Systems
 - Now interaction becomes important...

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Baby Name Wizard



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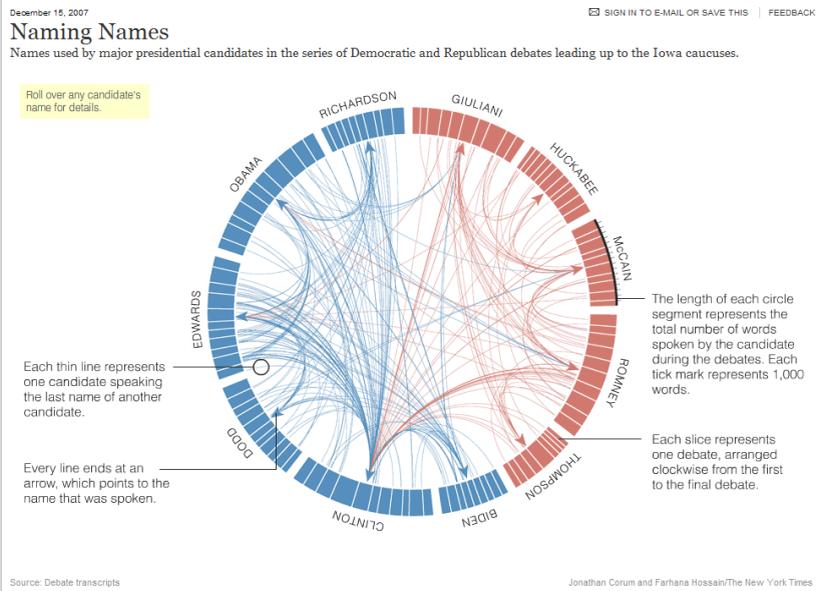
NY Times

- Has been a wonderful source of interactive data visualizations
- Some examples...

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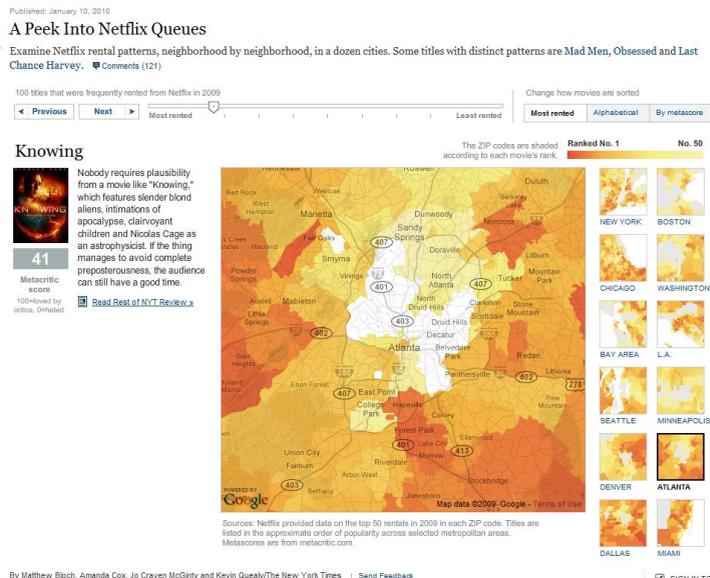
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Good Resources



- Some places to look for more information

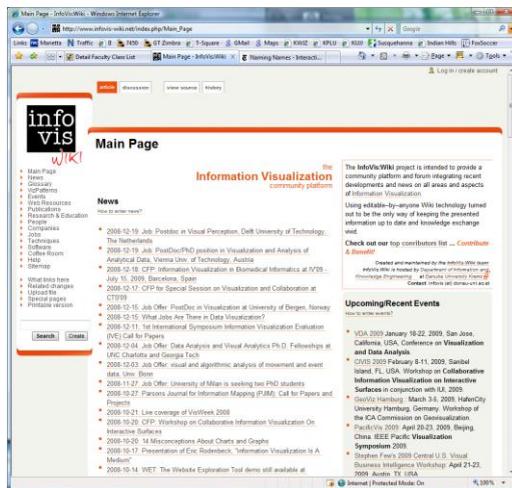
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<http://www.infovis-wiki.net>

InfoVis Wiki



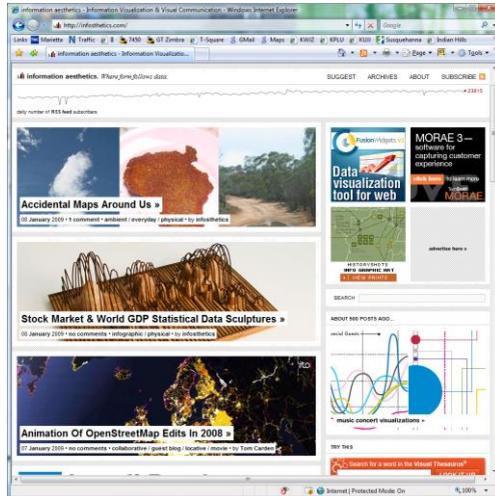
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Infosthetics Blog

<http://infosthetics.com/>



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Visualizing.org

<http://www.visualizing.org>



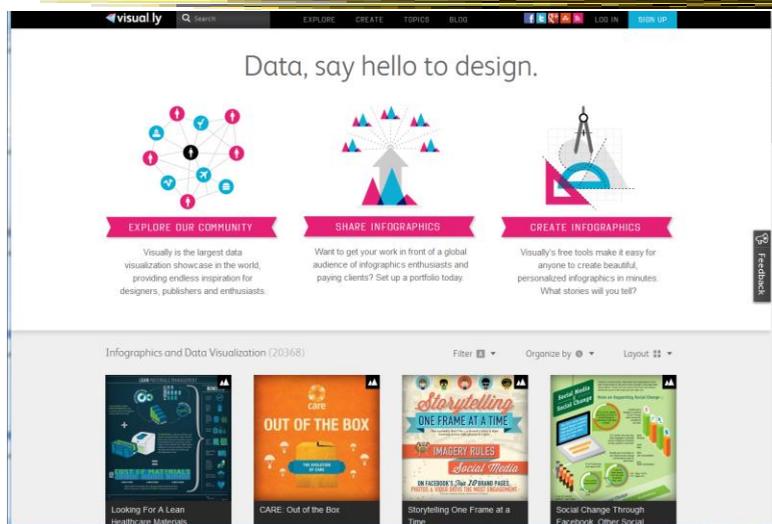
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Visual.ly

<http://visual.ly/>



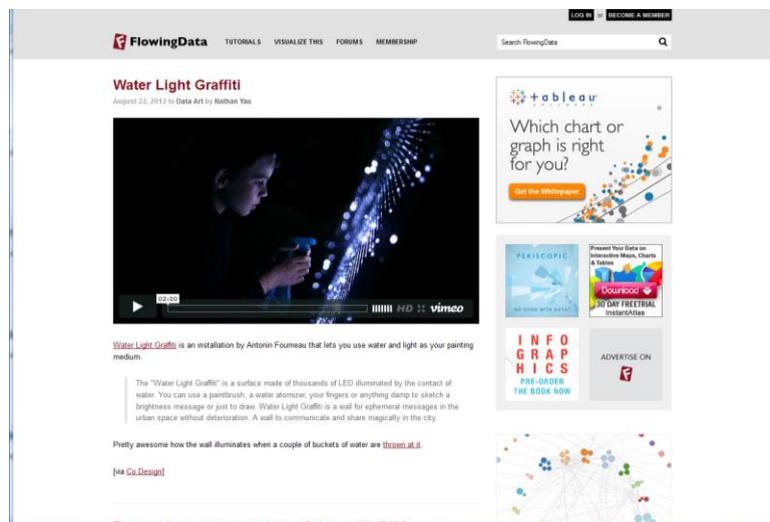
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Flowing Data

<http://flowingdata.com/>

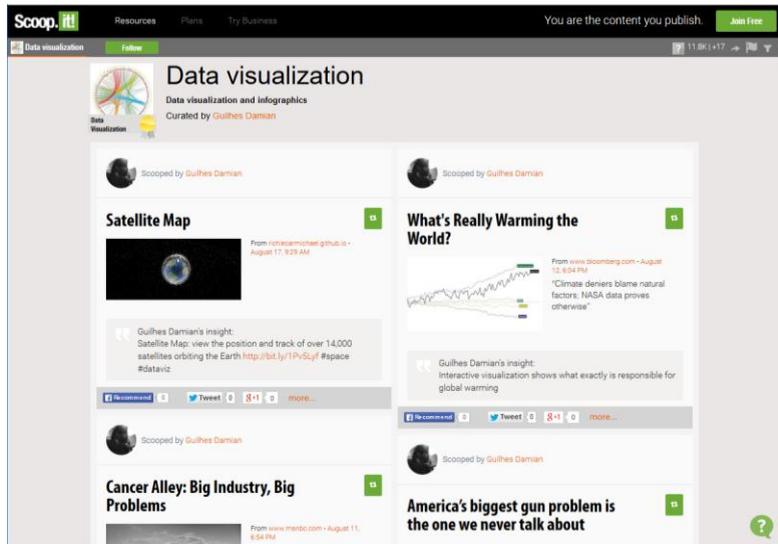


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Scoop.It!

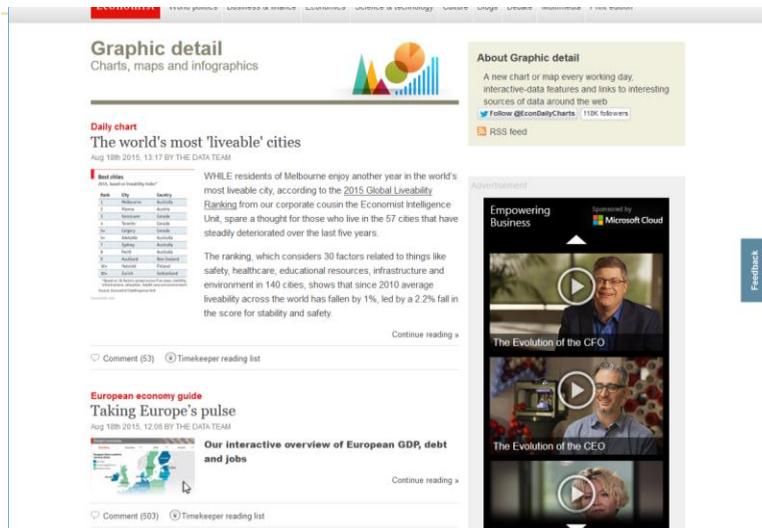


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Graphic Detail - Economist

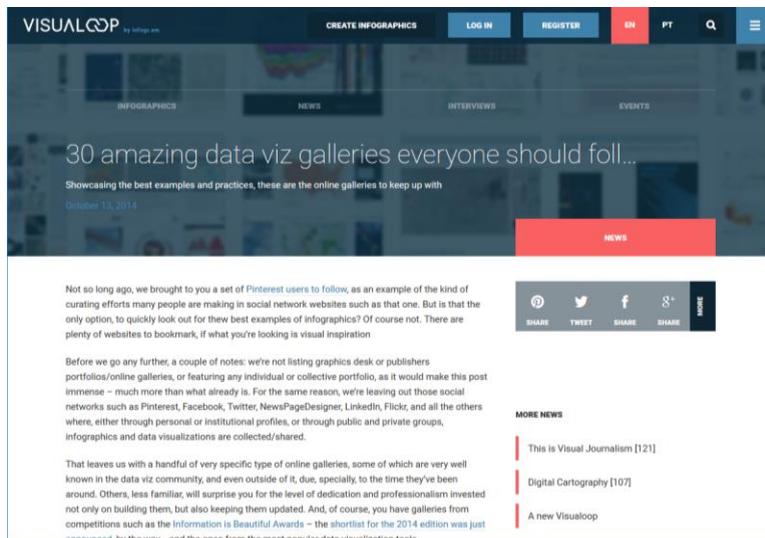


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A Compendium



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Upcoming

- Design Exercise
 - Bring colored pencils
- Data & Tables

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