

INFM 603: Information Technology and Organizational Context

Session 9: Visualization



Jimmy Lin
The iSchool
University of Maryland

Thursday, October 31, 2012

Visualization

- Why visualizations?
 - Human perceptual skills are remarkable
 - Human image storage storage is fast and vast
- What are visualizations for?
 - A good visualization tells a story
 - A great visualization delivers insight
- Science as well as an art...

Raw Ingredients

- Types of data
 - Categorical data
 - Ordinal data
 - Numerical data
- Ways of representing data
 - Height
 - Width
 - Thickness
 - Area
 - Angles
 - Size
 - Shape
 - Color



Panda Viewing
Sun - 5:30pm

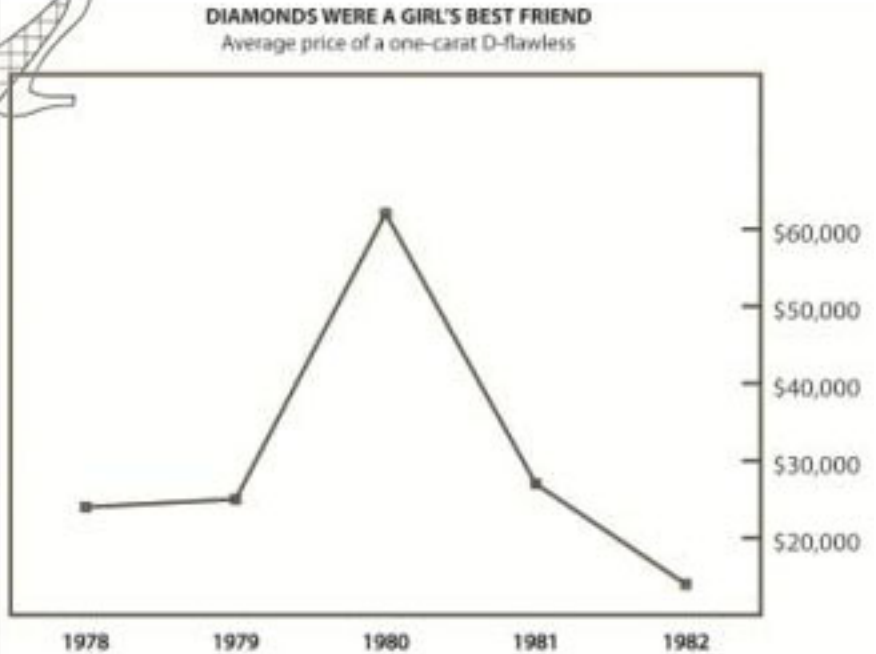
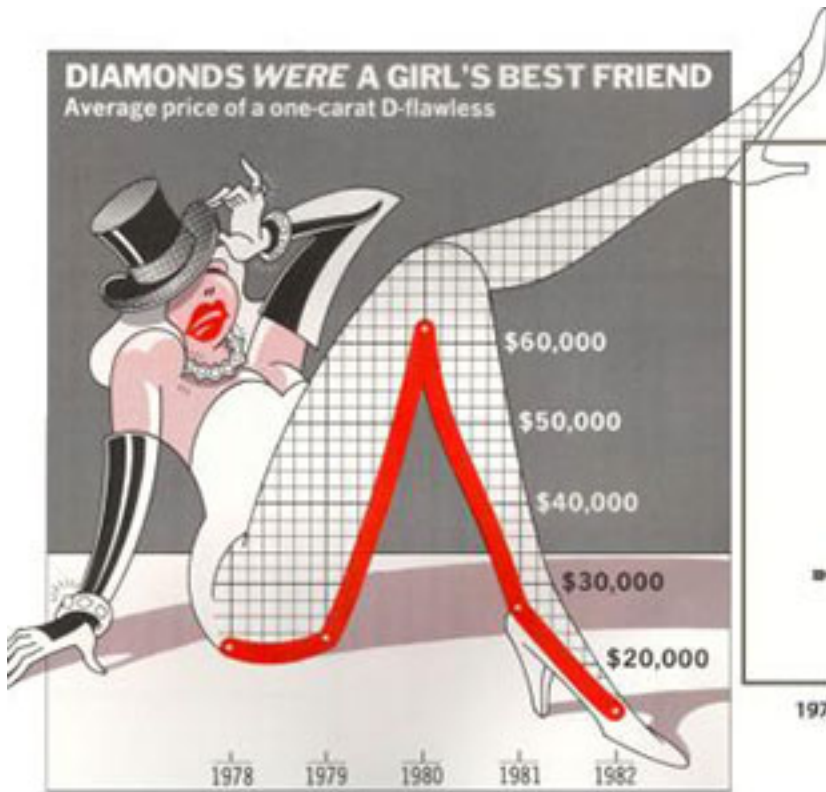


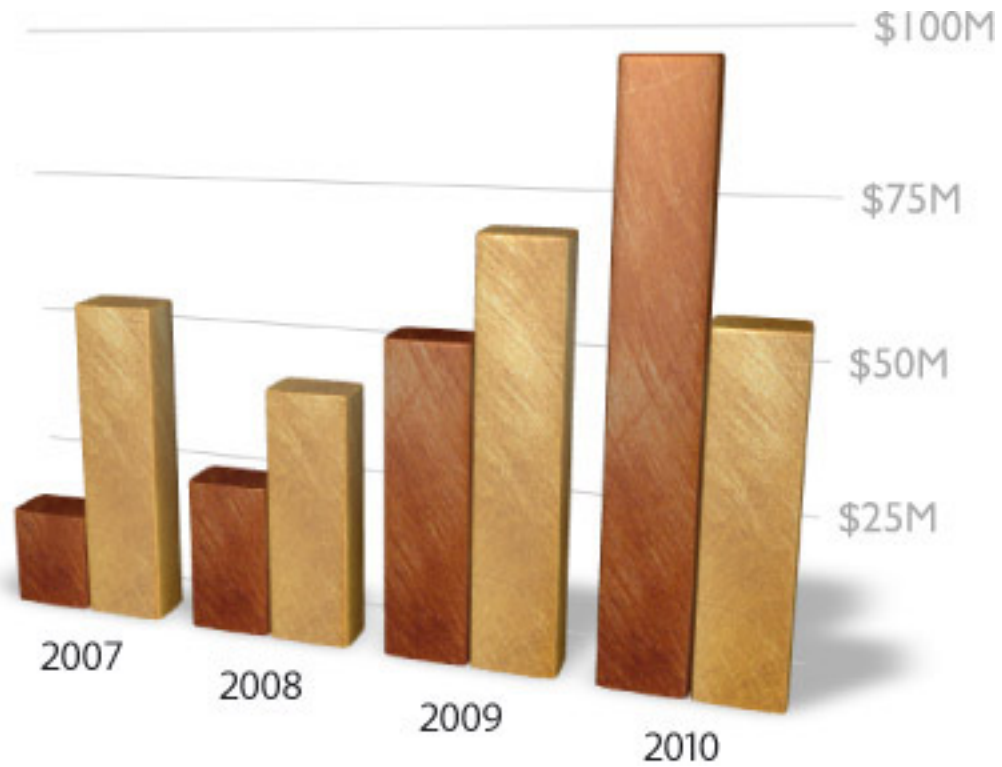
Static vs. Interactive

- Interactive visualizations allow users to “explore” the data
 - Overview
 - Zoom and filter
 - Details-on-demand
- Brushing and linking is a powerful technique

Info Porn

- Informative visualizations vs. info porn
- Beware of infographics and chart junk

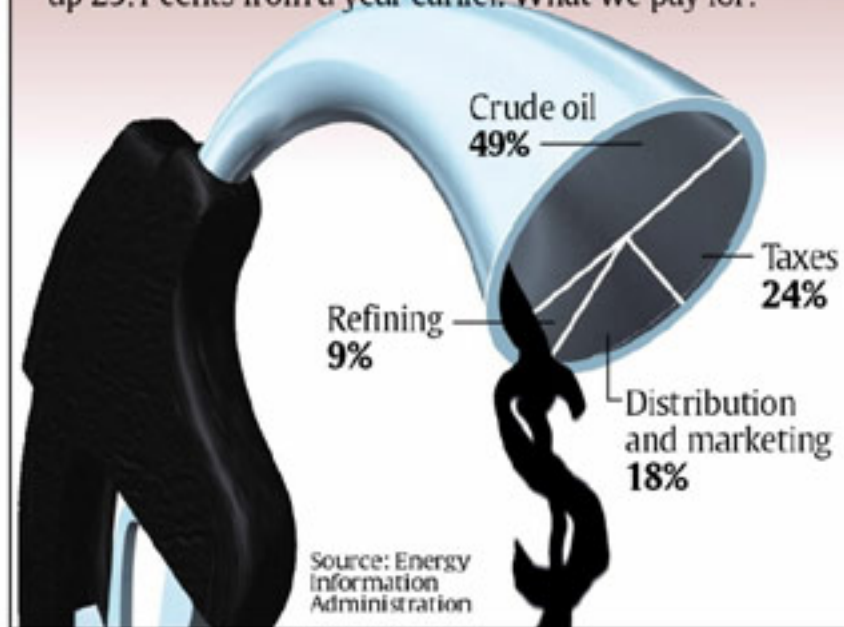




USA TODAY Snapshots®

What gas bucks buy

The average price of regular gas climbed to \$1.85 per gallon as of Jan. 24, up 3.4 cents from a week earlier and up 23.1 cents from a year earlier. What we pay for:



By Shannon Reilly and Marcy E. Mullins, USA TODAY

TRACK & FIELD: THE BEST RESULTS

Technical innovations, rule changes and the professionalization of sports brought new records in the 20th century. How much longer can athletes keep improving?

100 METERS

+19%
+11%

THE LAST RECORD WAS SET IN 1999 BY FLORENCE GRIFFITH-JOYNER

USAIN BOLT PULVERIZED RECORDS IN 2009. WILL HIS RECORD EVENTUALLY BE BEATEN?

140's
130's
120's
110's
100's
90's

RACE TIME

THE GRAPHIC SHOWS THE EVOLUTION OF THE 10 BEST 100M PERFORMANCES

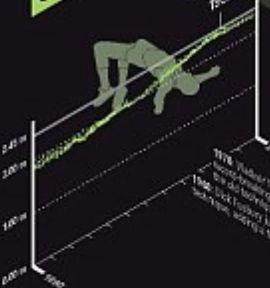


HIGH JUMP

+30%

PERFORMANCE HAS LEVELLED SINCE THE 1990s

2.45m
JAVIER SOTOMAYOR
CUB
1993

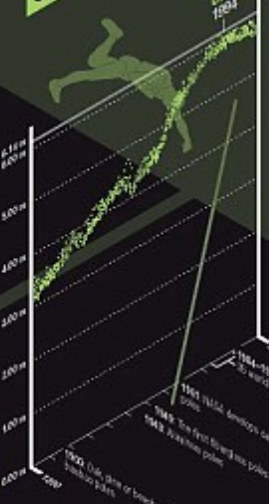


POLE VAULT

+71%

PERFORMANCES HAVE DECLINED SINCE 2000

6.14m
SERGEY BUBKA
UKR
1984



10.65s
DONALD LIPPINCOTT
USA
1912

13.69s
FLORENCE GRIFFITH-JOYNER
USA
1988

9.95s
JIM THOMAS
USA
1966

9.85s
BEN JOHNSON
USA
1988

9.79s
MAURICE GREEN
USA
1993

9.74s
ASAFU POWELL
JAM
2007

9.58s
USAIN BOLT
JAM
2009

1900-1910: The first 100m race was held in 1900. The first 100m pole vault was held in 1912.

1911-1912: American nation first.

1913-1914: Sergey Bubka set the world record.

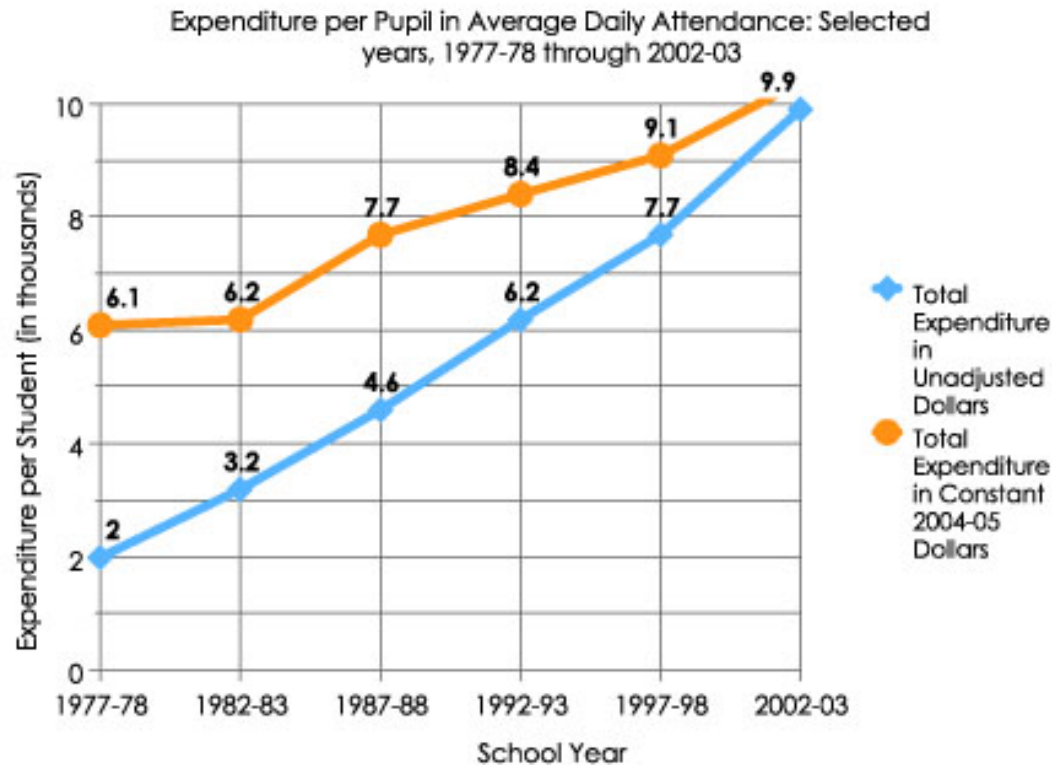
1988: The first 100m pole vault was held in 1988.

100M: DONALD LIPPINCOTT, JAMES HANNA | HIGHER JUMP: JAVIER SOTOMAYOR | POLE VAULT: SERGEY BUBKA

http://junkcharts.typepad.com/junk_charts/music/
Compare: New York Times interactive visualization

Line Graphs (+ Variants)

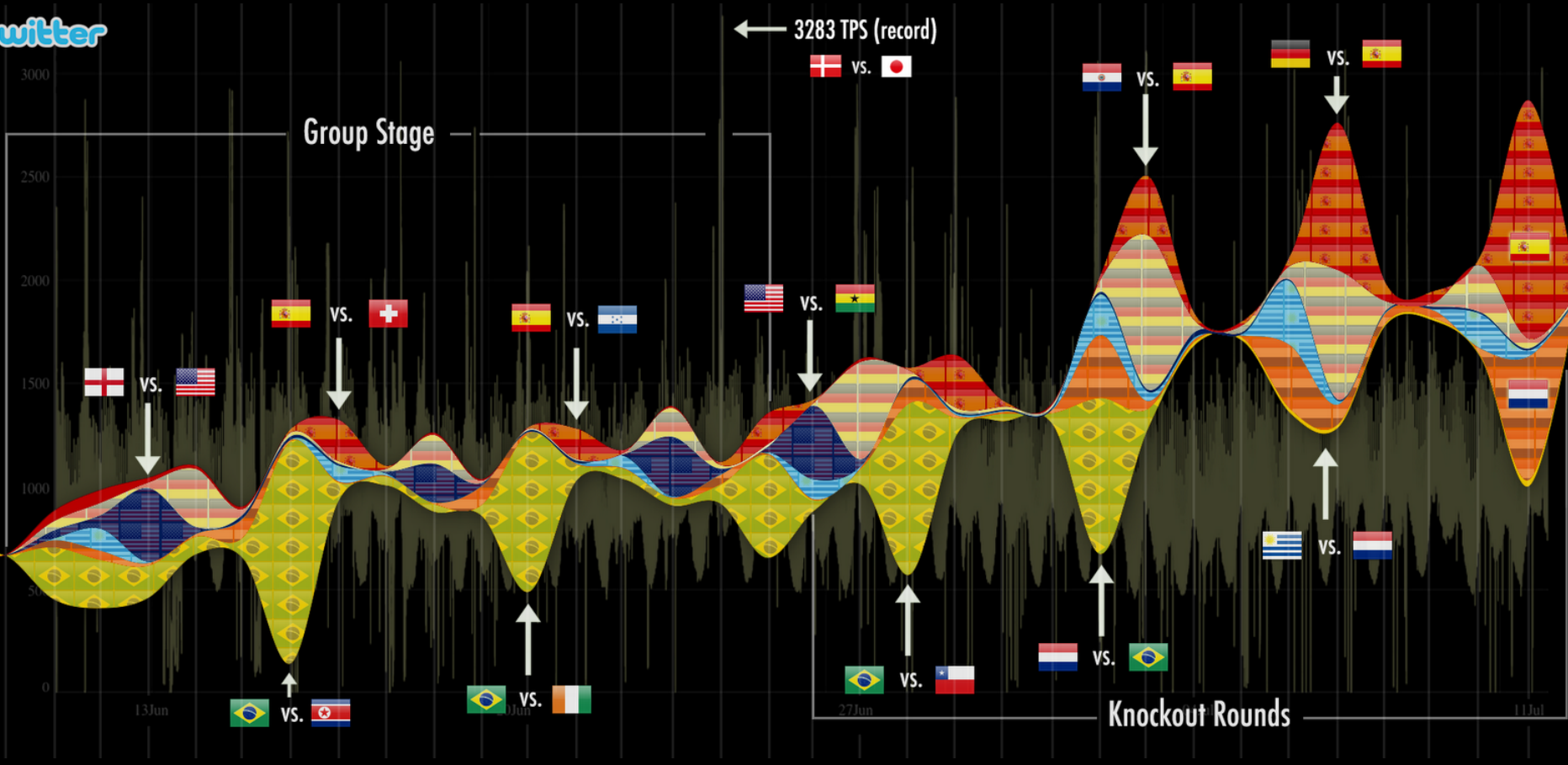
- Suitable for what types of data?
- What makes a good line graph?



The NCES Common Core of Data (CCD) 2004-2005

Stacked Graphs

- Multiple time-series data “stacked” on top of each other
 - Useful for showing aggregates
- Sometimes called “stream graphs”

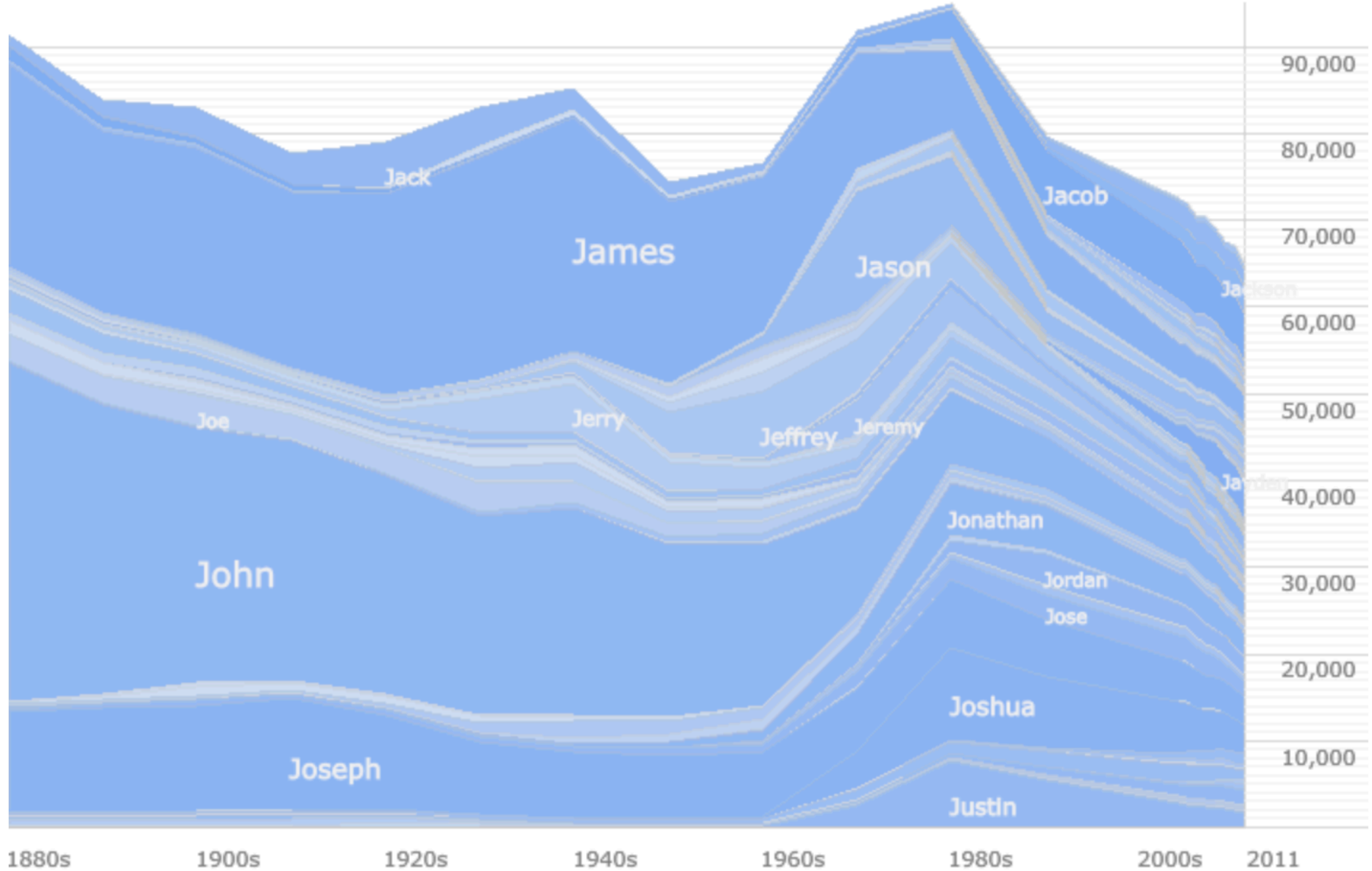


Baby Name >

Both Boys Girls

2010 rank: boys	1000	500	100	25	1
girls	1000	500	100	25	1

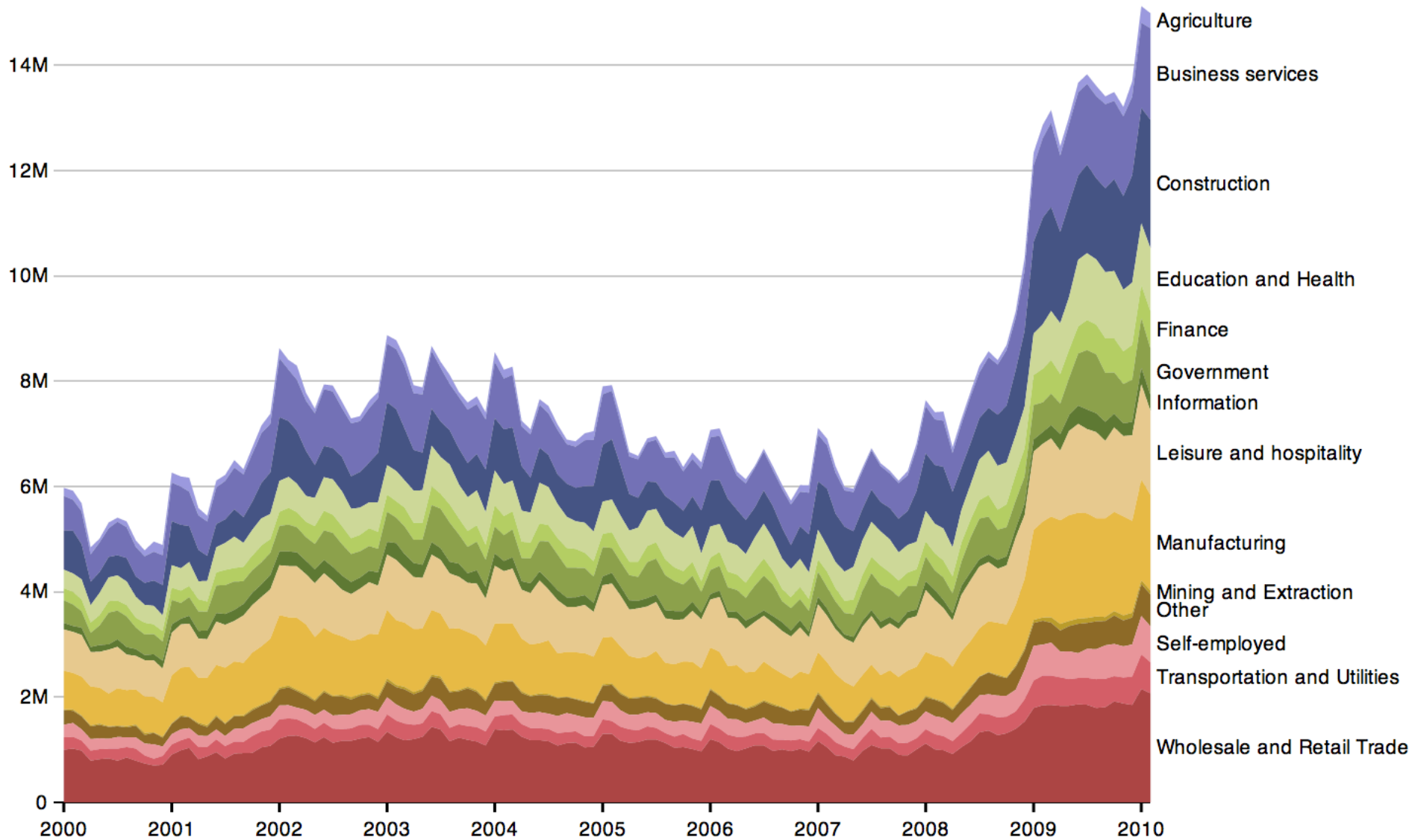
Names starting with 'J' per million babies



<http://www.babynamewizard.com/voyager#>

Stacked Graph of Unemployed U.S. Workers by Industry

View:

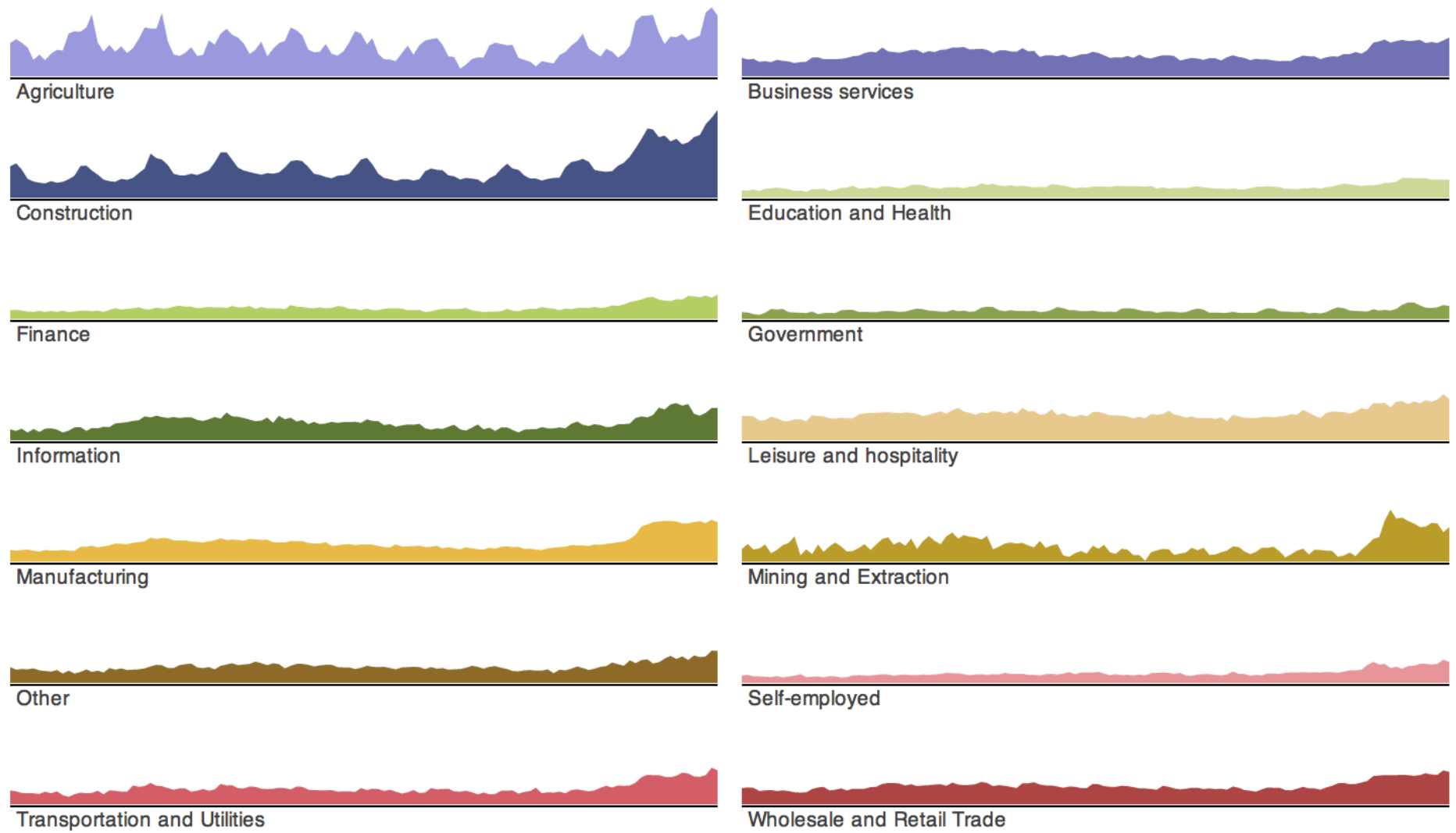


Total counts of unemployed persons per industry, 2000-2010.

Source: [U.S. Bureau of Labor Statistics](http://www.bls.gov)

<http://hci.stanford.edu/jheer/files/zoo/>

Unemployment Rate of U.S. Workers by Industry, 2000-2010



Unemployment rates of U.S. workers per industry.

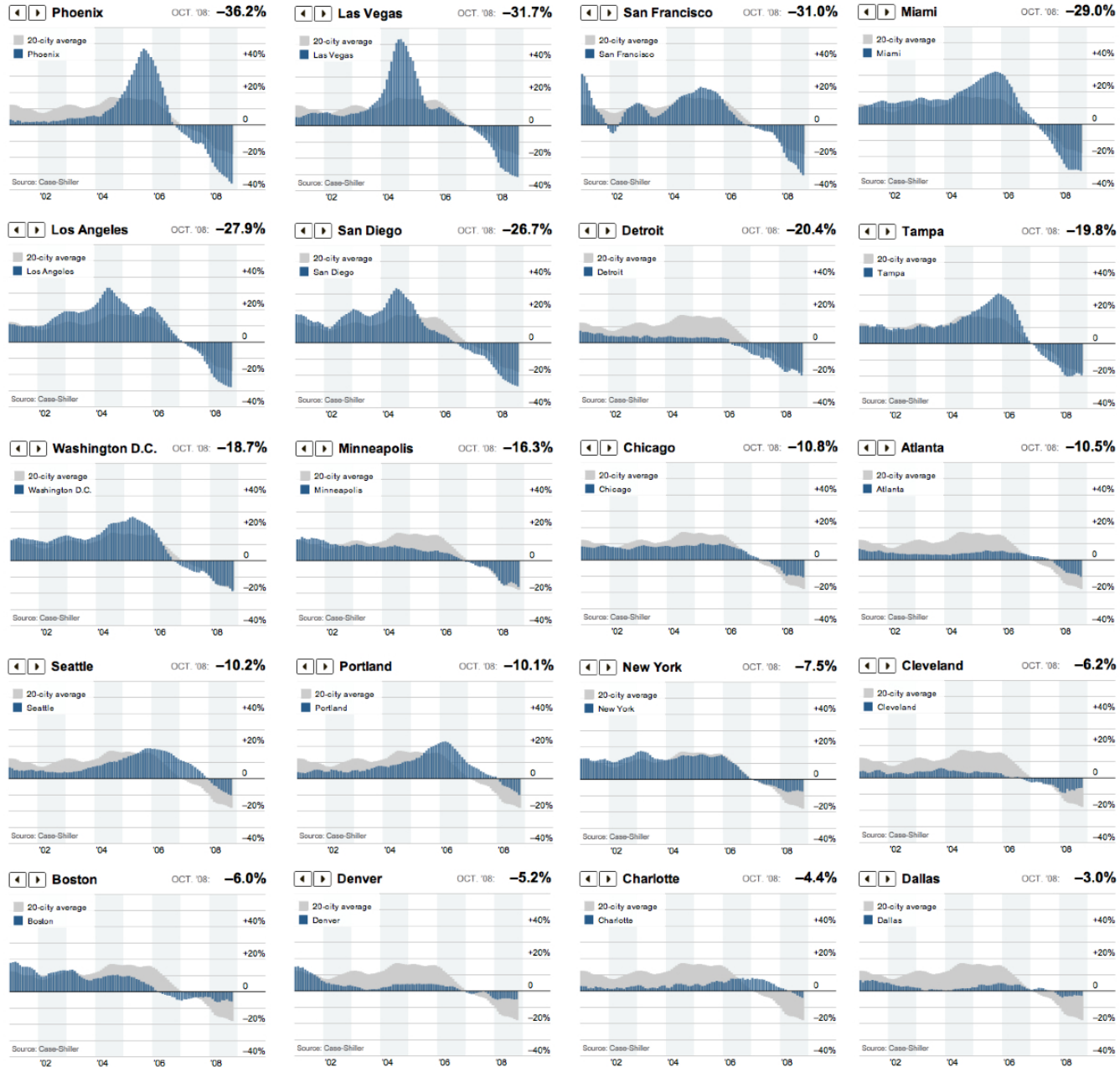
Source: [U.S. Bureau of Labor Statistics](http://www.bls.gov)

Small Multiples

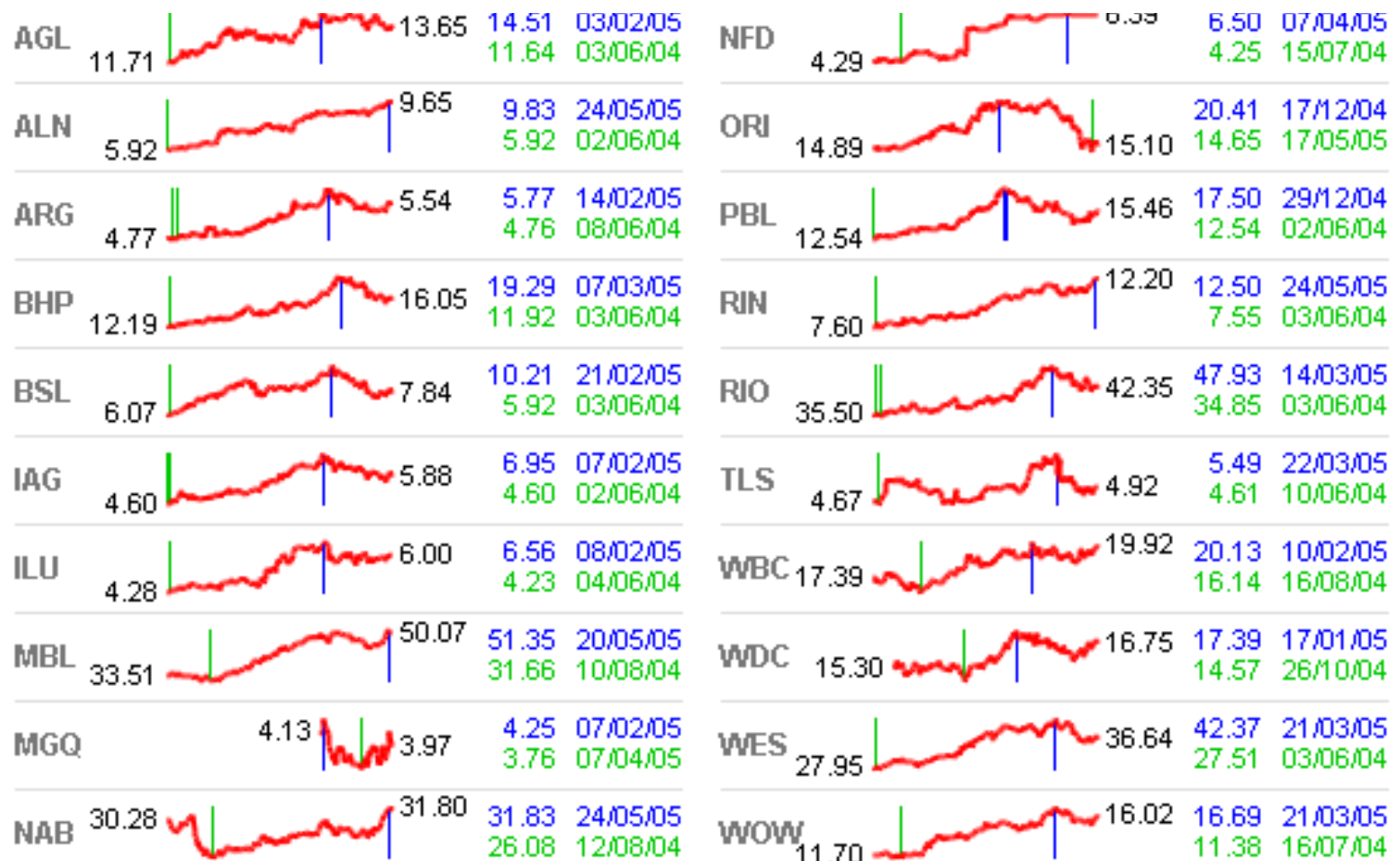
- Multiple small graphs arranged in a grid
- Advantages and disadvantages?

Change in Home Prices (year over year)

From New York Times Economix blog

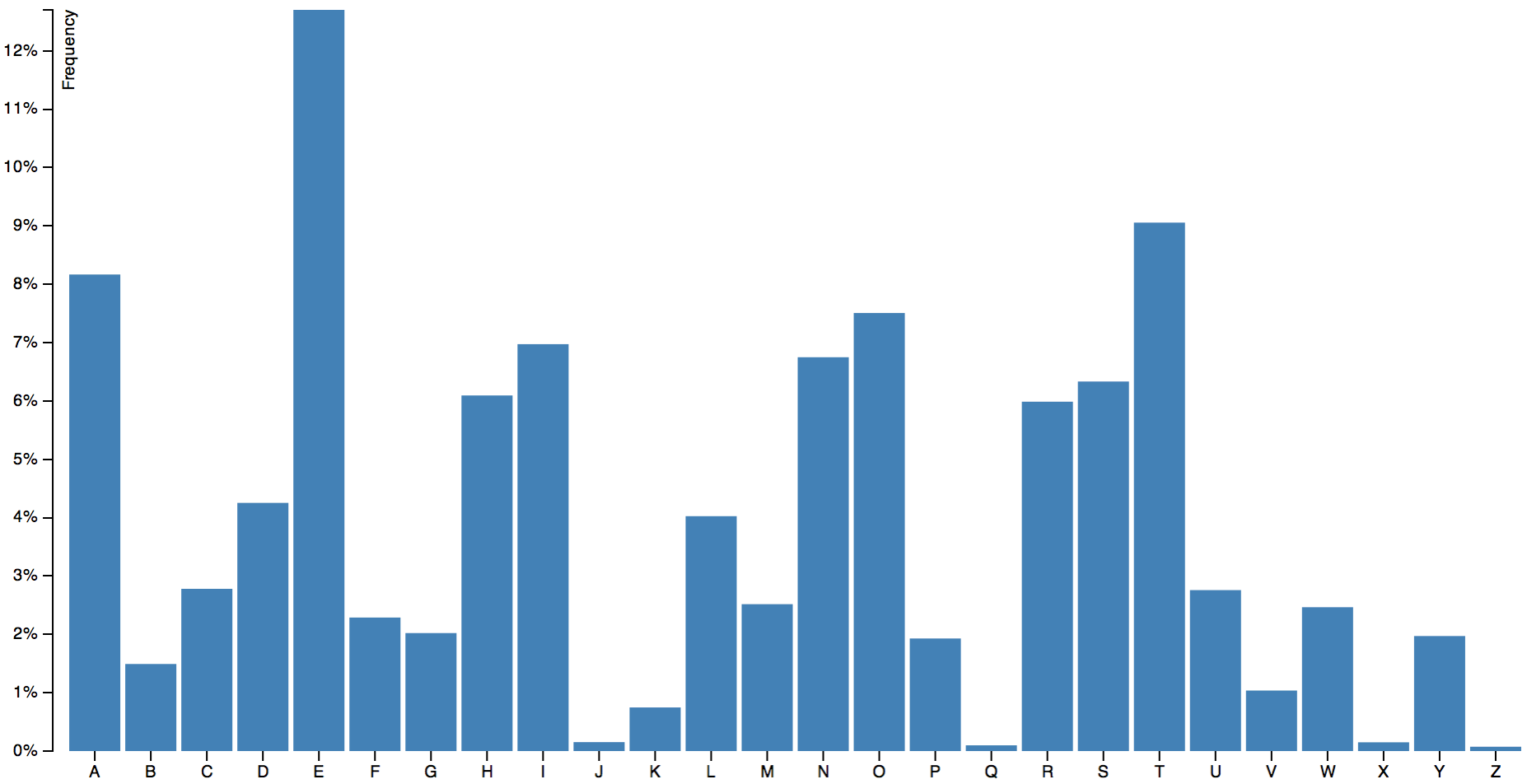


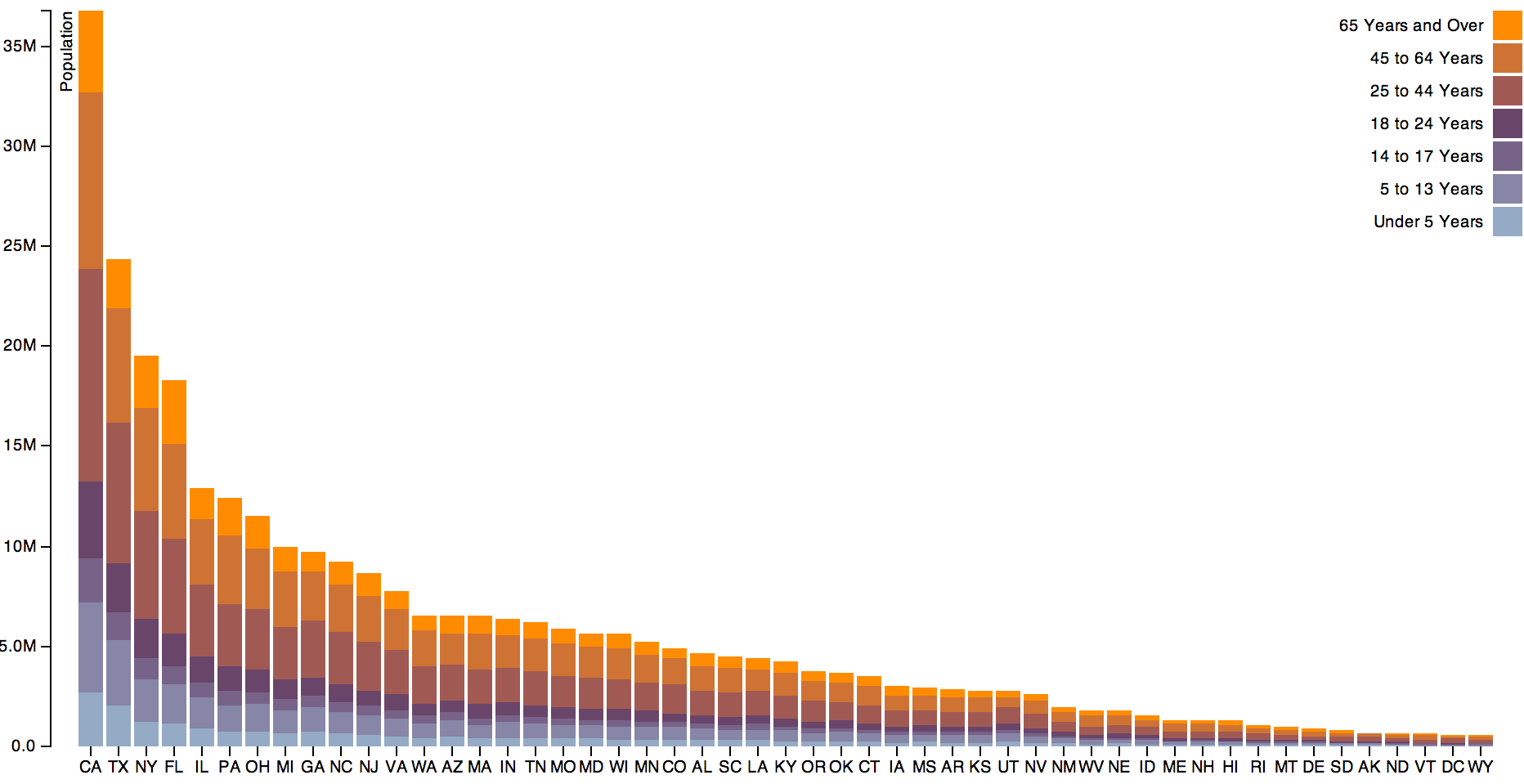
Spark Lines



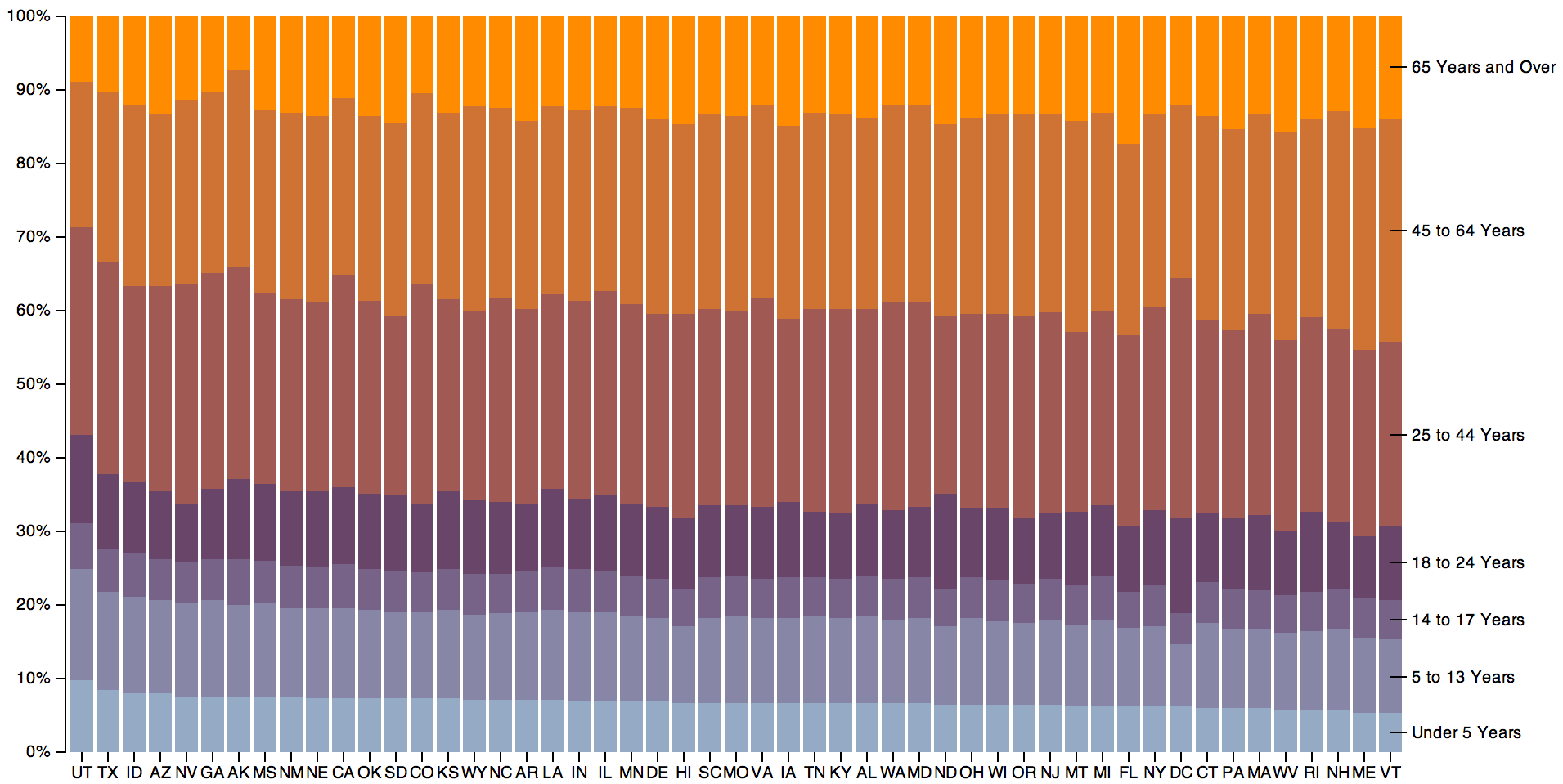
Bar Graphs (+ Variants)

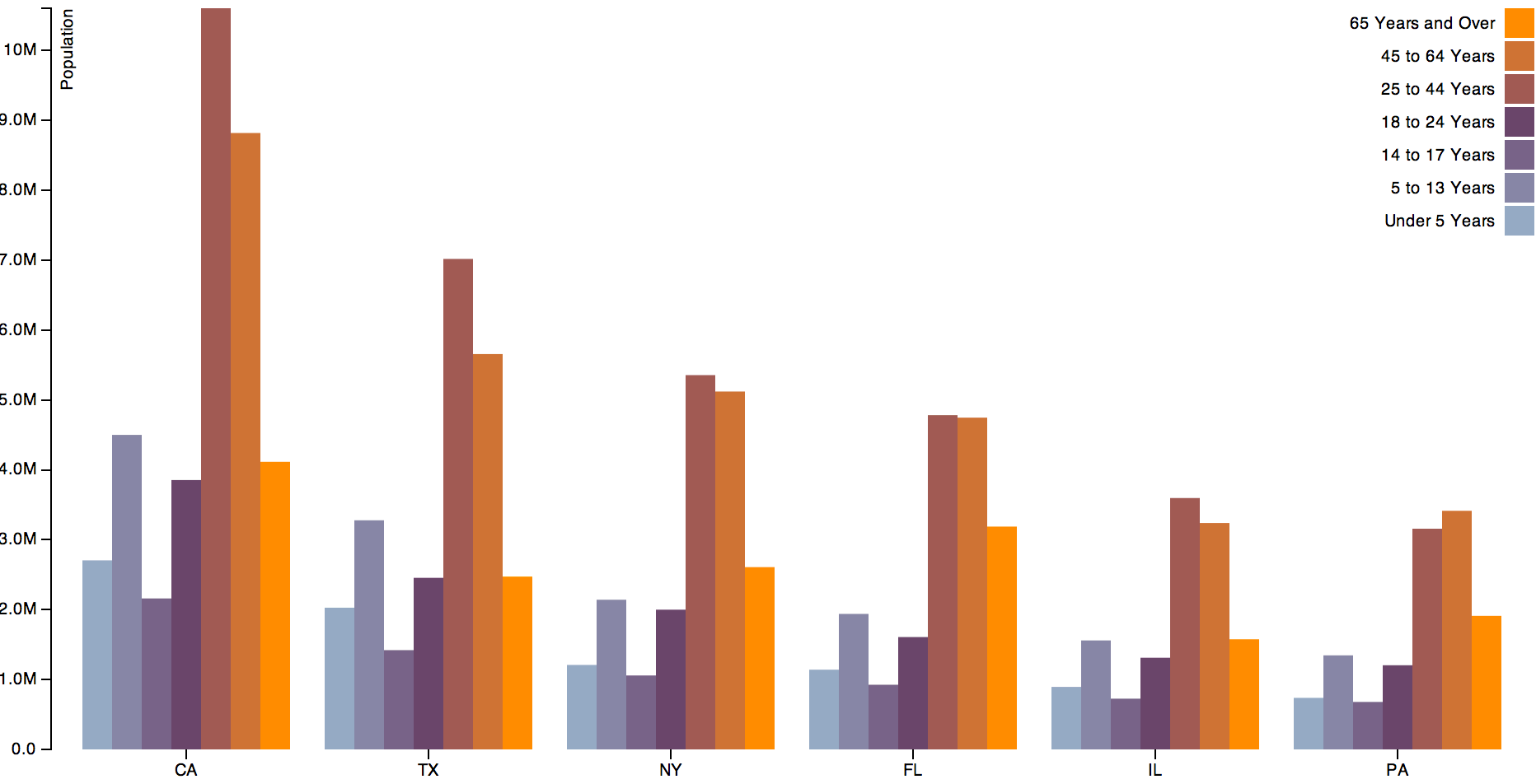
- Suitable for what types of data?
- Following examples from d3.js





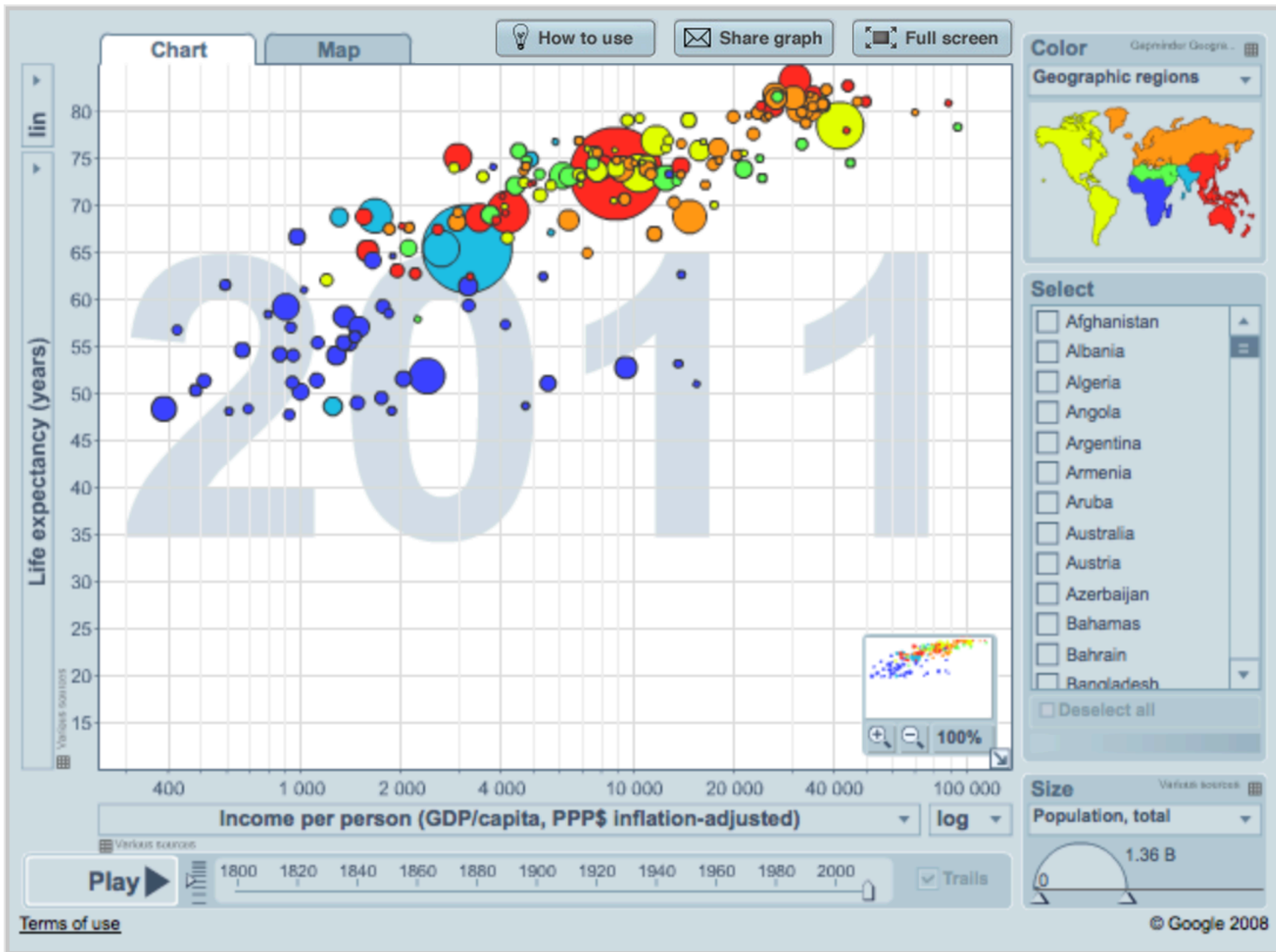
State	Under 5 Years	5 to 13 Years	14 to 17 Years	18 to 24 Years	25 to 44 Years	45 to 64 Years	65 Years and Over
CA	2.5	4.5	3.5	4.0	14.0	9.5	3.5
TX	1.5	4.0	3.5	3.5	11.0	7.5	2.5
NY	1.0	2.5	3.0	4.5	5.0	5.0	2.5
FL	1.0	3.0	1.5	6.0	4.5	4.5	3.0
IL	0.8	2.2	1.2	1.0	4.0	7.0	1.0
PA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
OH	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MI	0.8	1.8	1.0	1.0	3.0	6.5	1.5
GA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NC	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NJ	0.8	1.8	1.0	1.0	3.0	6.5	1.5
VA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
WA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
AZ	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
IN	0.8	1.8	1.0	1.0	3.0	6.5	1.5
TN	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MO	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MD	0.8	1.8	1.0	1.0	3.0	6.5	1.5
WI	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MN	0.8	1.8	1.0	1.0	3.0	6.5	1.5
CO	0.8	1.8	1.0	1.0	3.0	6.5	1.5
AL	0.8	1.8	1.0	1.0	3.0	6.5	1.5
SC	0.8	1.8	1.0	1.0	3.0	6.5	1.5
LA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
KY	0.8	1.8	1.0	1.0	3.0	6.5	1.5
OR	0.8	1.8	1.0	1.0	3.0	6.5	1.5
OK	0.8	1.8	1.0	1.0	3.0	6.5	1.5
CT	0.8	1.8	1.0	1.0	3.0	6.5	1.5
IA	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MS	0.8	1.8	1.0	1.0	3.0	6.5	1.5
AR	0.8	1.8	1.0	1.0	3.0	6.5	1.5
KS	0.8	1.8	1.0	1.0	3.0	6.5	1.5
UT	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NV	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NM	0.8	1.8	1.0	1.0	3.0	6.5	1.5
WV	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NE	0.8	1.8	1.0	1.0	3.0	6.5	1.5
ID	0.8	1.8	1.0	1.0	3.0	6.5	1.5
ME	0.8	1.8	1.0	1.0	3.0	6.5	1.5
NH	0.8	1.8	1.0	1.0	3.0	6.5	1.5
HI	0.8	1.8	1.0	1.0	3.0	6.5	1.5
RI	0.8	1.8	1.0	1.0	3.0	6.5	1.5
MT	0.8	1.8	1.0	1.0	3.0	6.5	1.5
DE	0.8	1.8	1.0	1.0	3.0	6.5	1.5
SD	0.8	1.8	1.0	1.0	3.0	6.5	1.5
AK	0.8	1.8	1.0	1.0	3.0	6.5	1.5
ND	0.8	1.8	1.0	1.0	3.0	6.5	1.5
VT	0.8	1.8	1.0	1.0	3.0	6.5	1.5
DC	0.8	1.8	1.0	1.0	3.0	6.5	1.5
WY	0.8	1.8	1.0	1.0	3.0	6.5	1.5





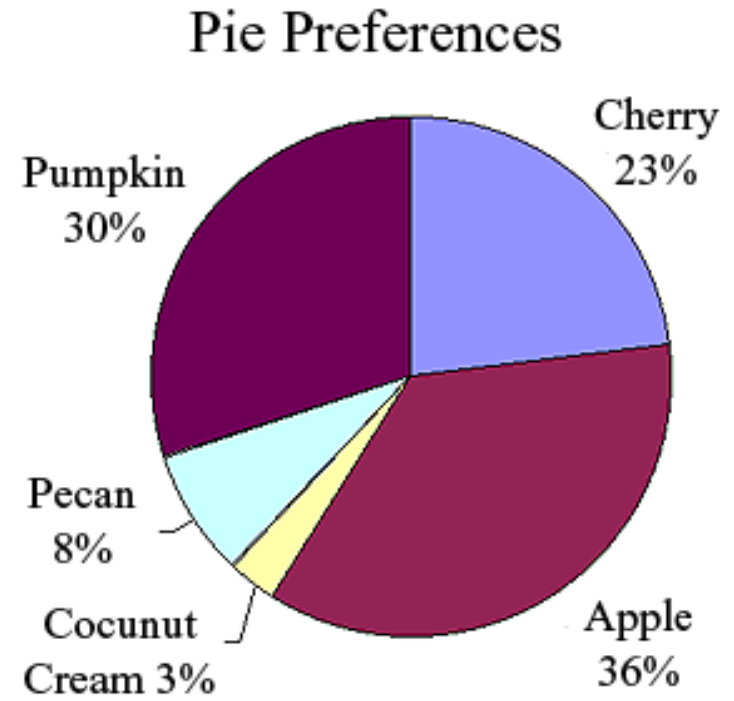
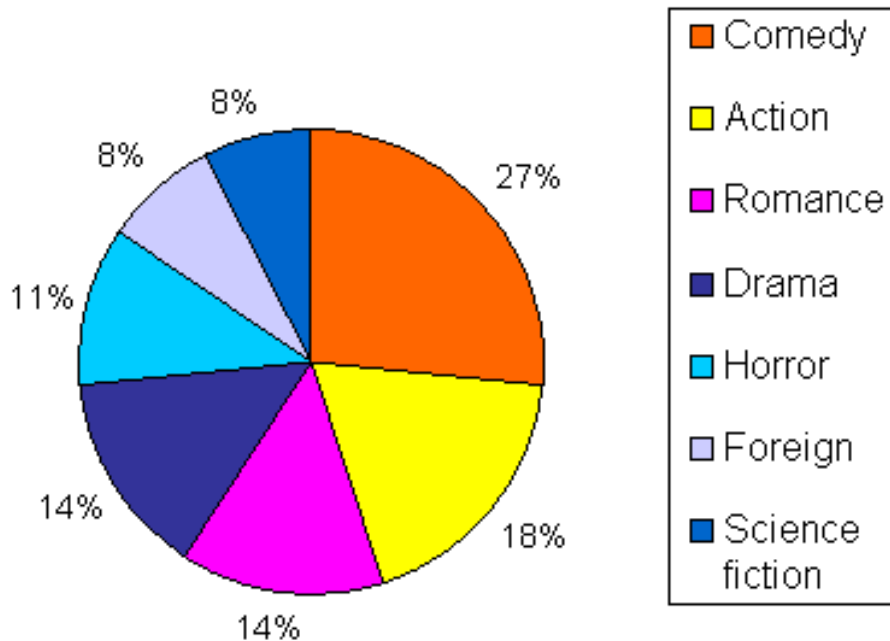
Scatterplots

- Suitable for what types of data?
- Note availability of other ways to encode data at points

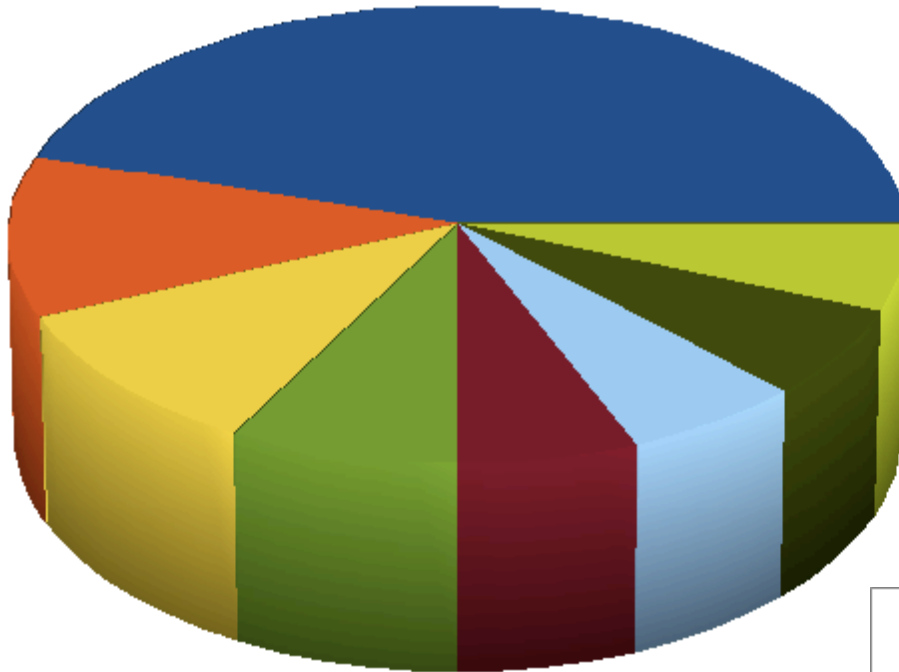


Pie Charts (+ Variants)

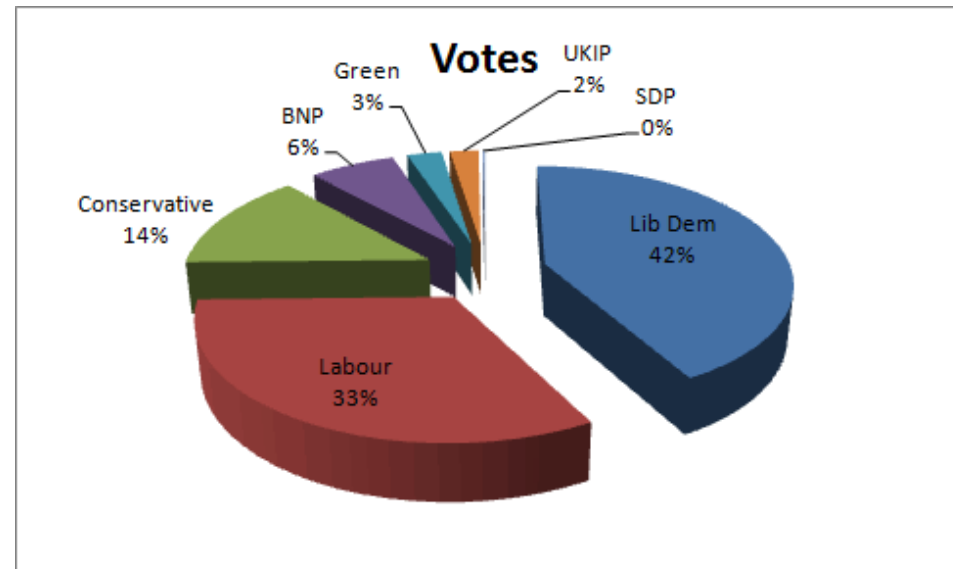
- Suitable for what types of data?
- Different ways for labeling



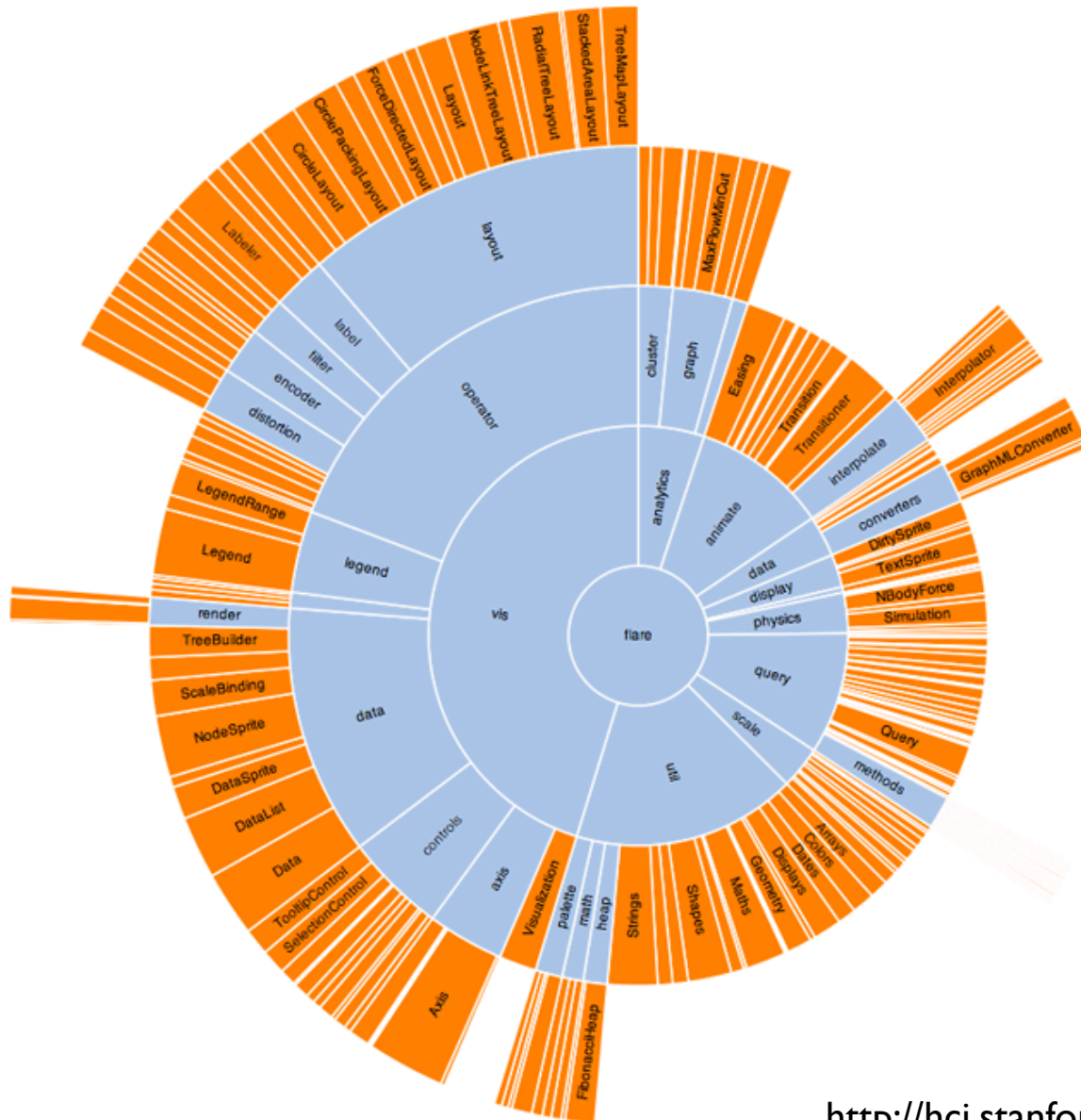
More Chart Junk



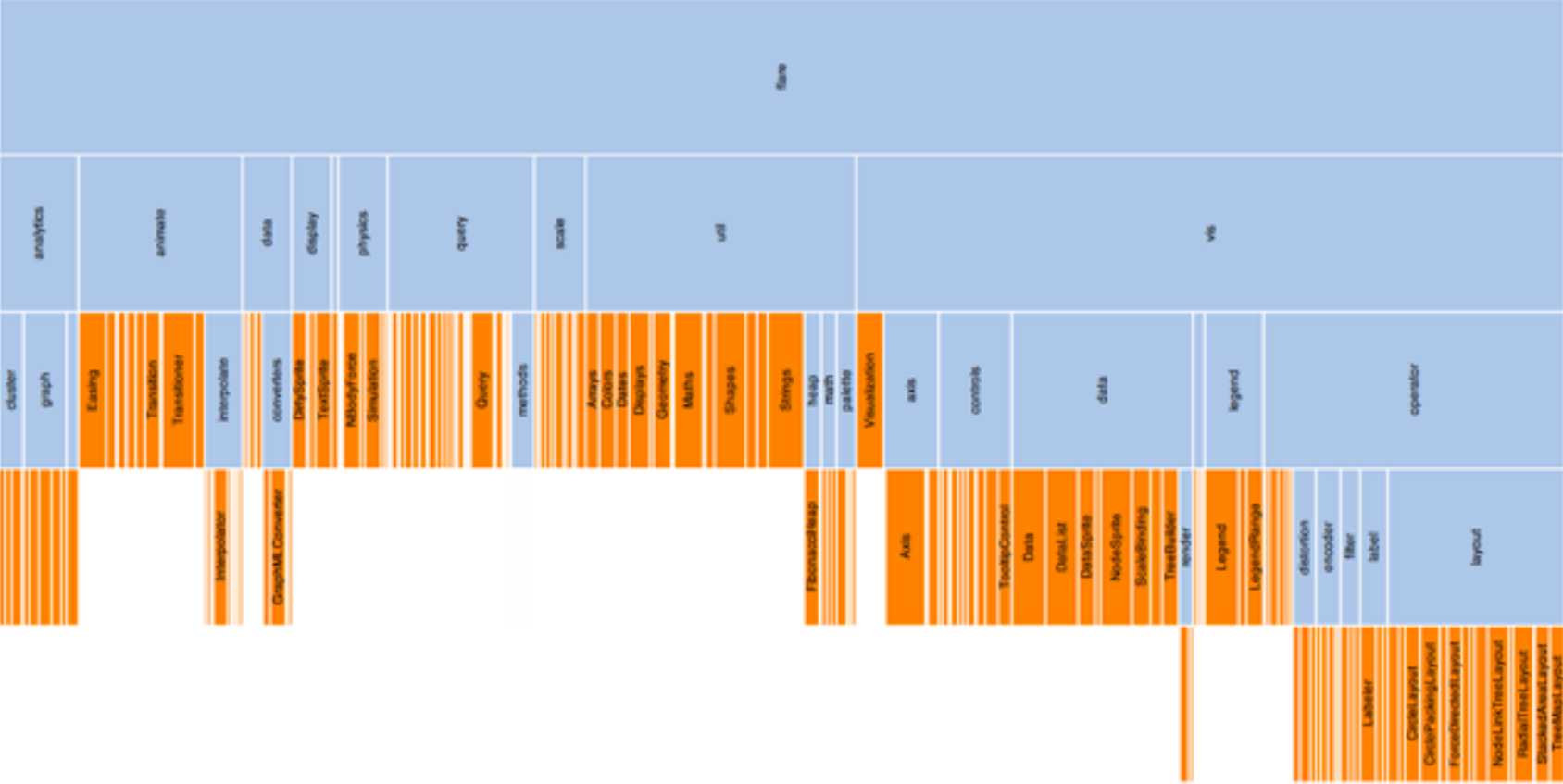
- MySpace
- Facebook
- Orkut
- hi5
- Xanga
- Live Spaces
- Classmates.com
- Bebo



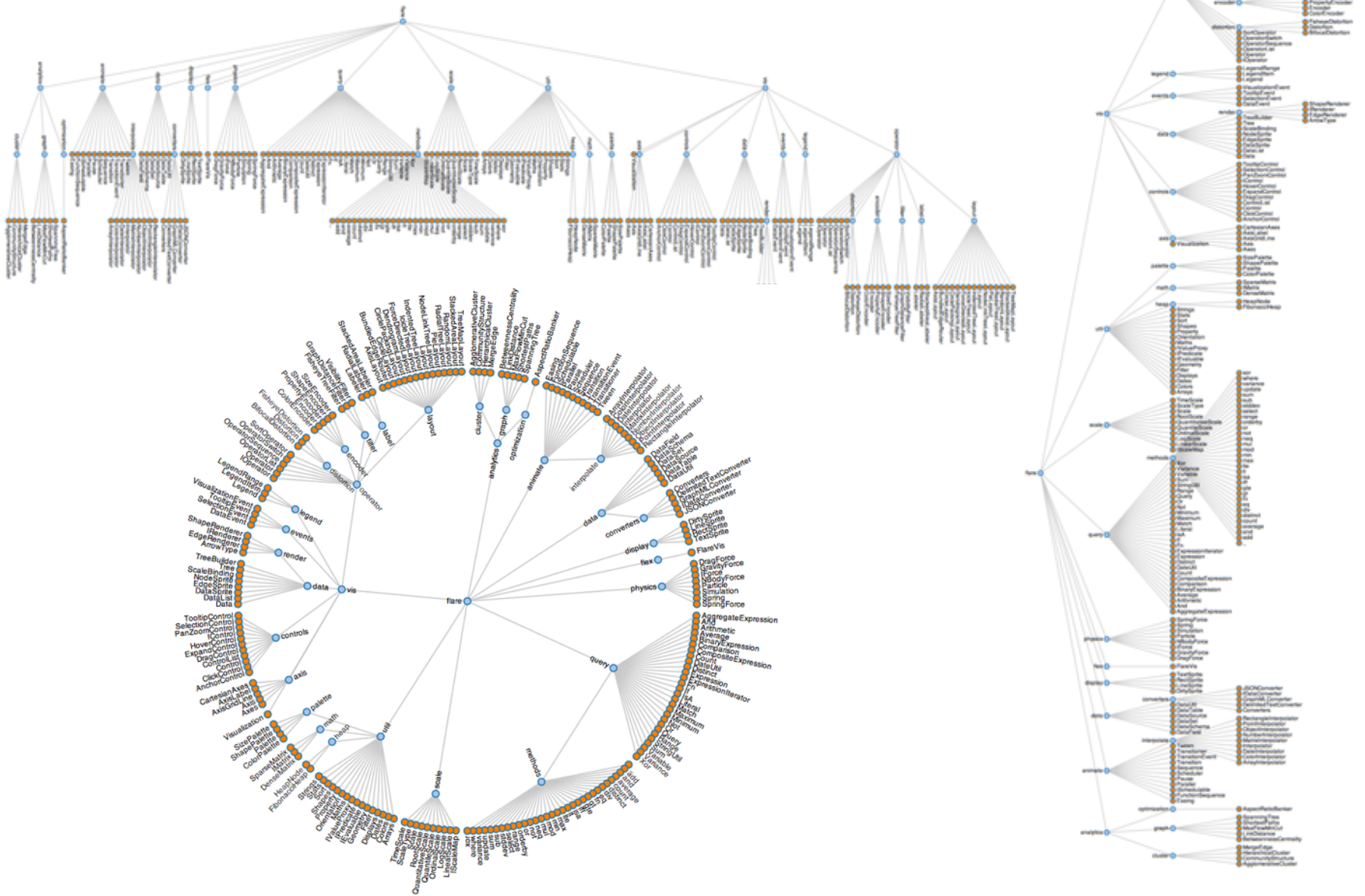
Sunburst Trees



Icicle Diagrams

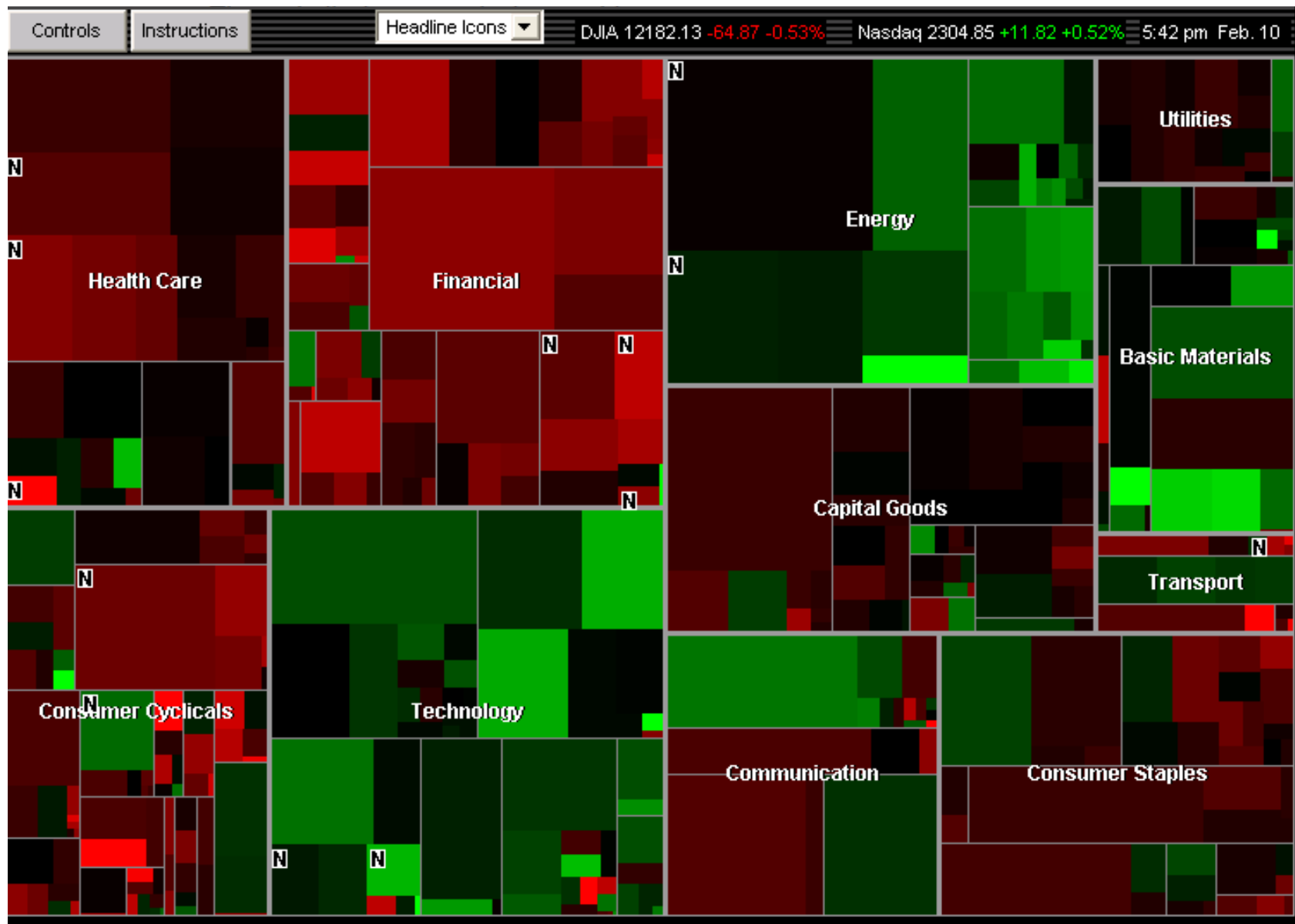


Visualizing Hierarchies

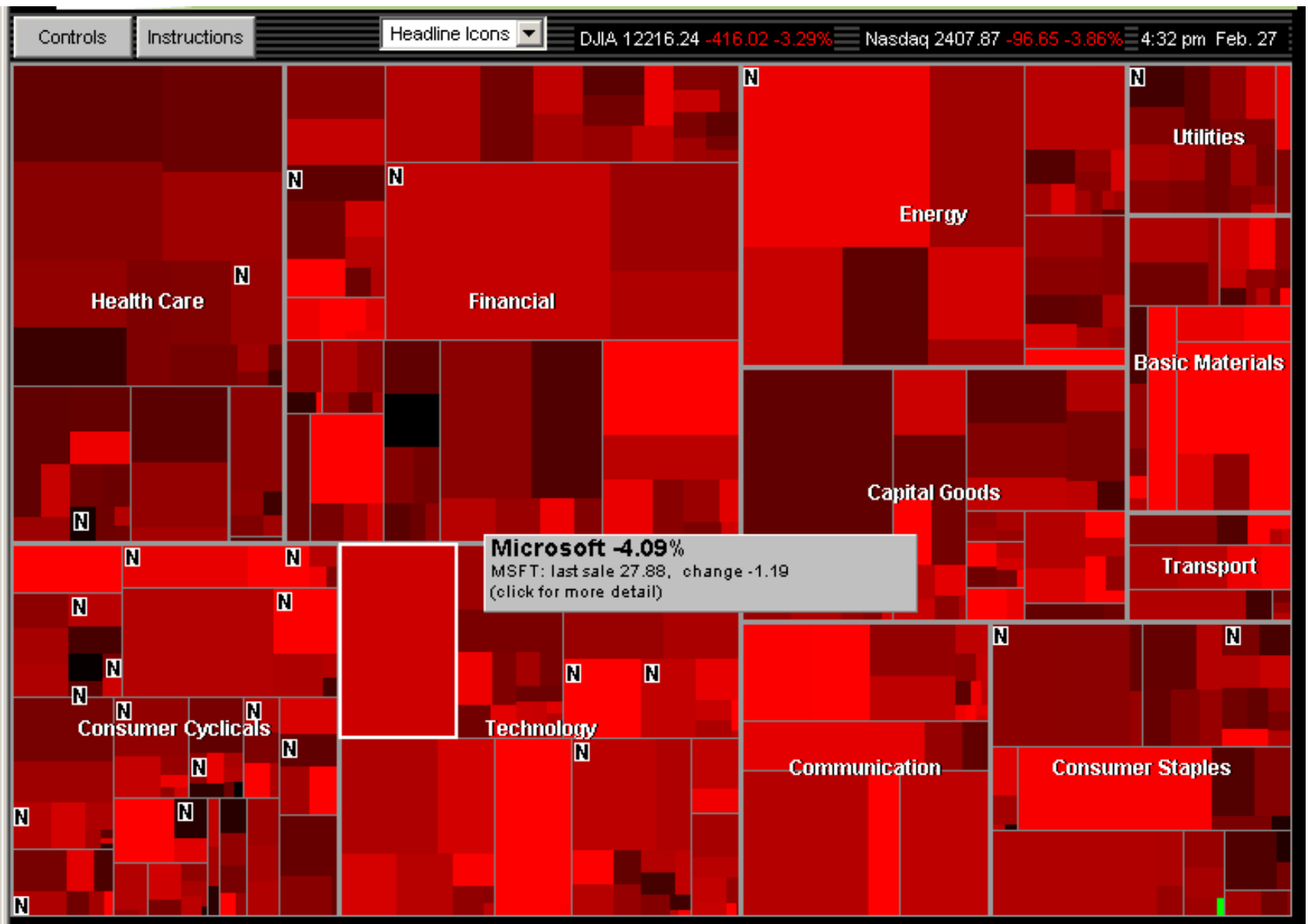


TreeMaps

- Useful for representing hierarchical relationships
- Two mechanisms for coding information:
 - Size and Color
 - Physical location of boxes not usually meaningful
- Requires learning to read

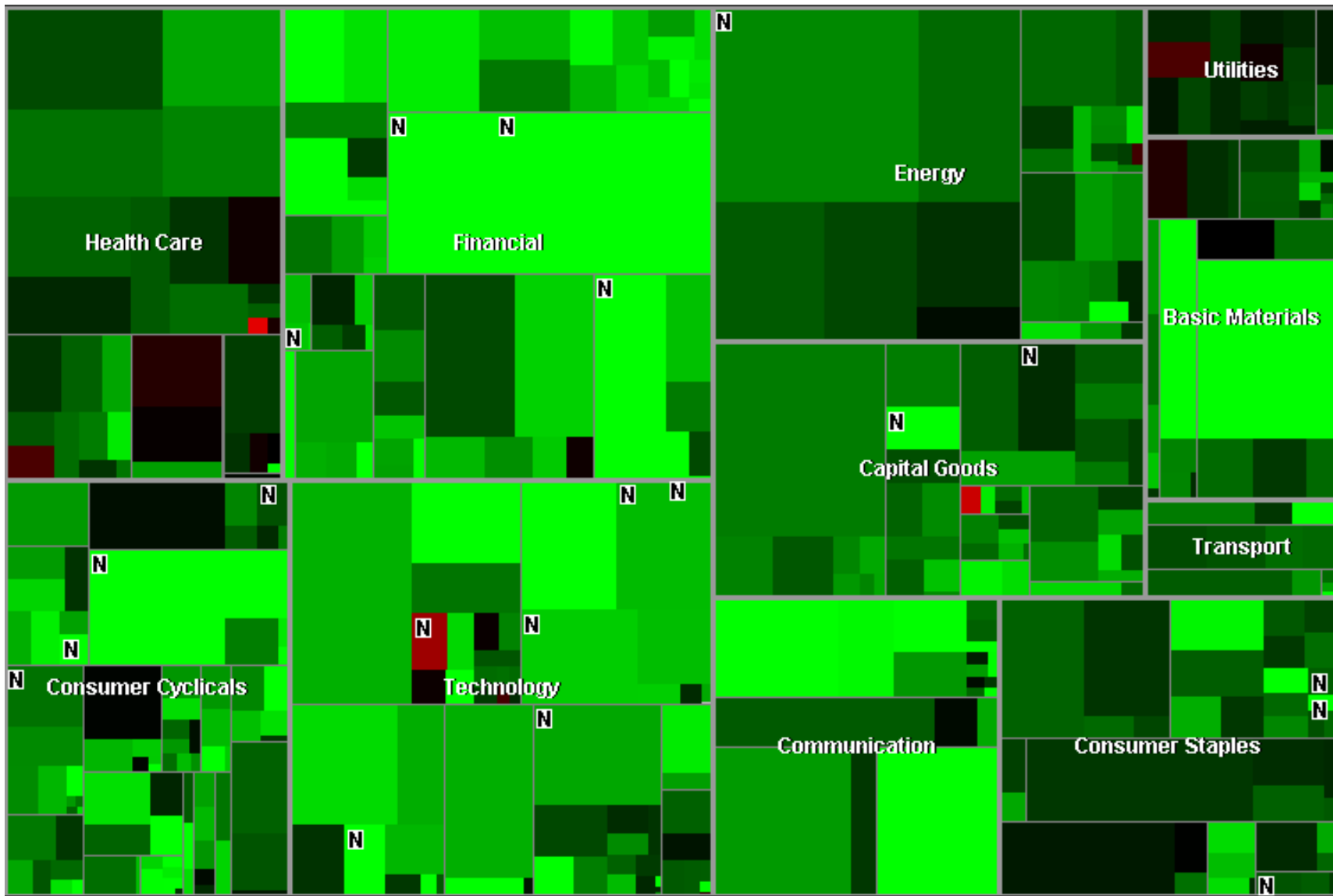


<http://www.smartmoney.com/map-of-the-market/>



Market mixed, February 8, 2008:

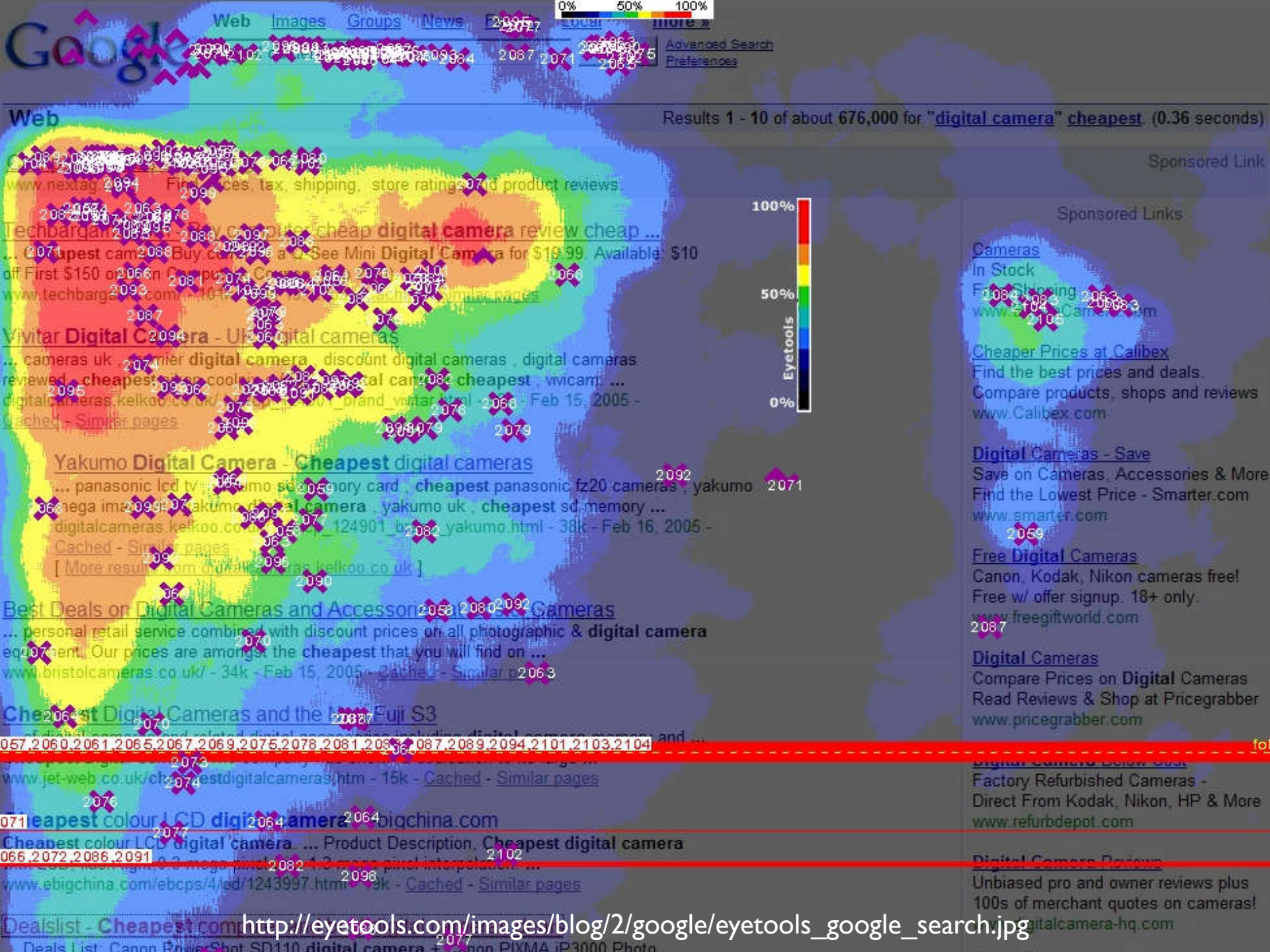
Energy & Technology up Financial & Health Care down



Market rises 319 points, November 13, 2007:
Five exceptions

Heatmaps

- Data represented in a matrix
- Matrix values are color coded



Web

Results 1 - 10 of about 676,000 for "digital camera" cheapest (0.36 seconds)

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... personal retail service combined with discount prices on all photographic & digital camera equipment. Our prices are among the cheapest that you will find on ...

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057 2060 2061 2065 2067 2069 2075 2078 2081 2083 2087 2089 2094 2101 2103 2104

www.jet-web.co.uk/cheapestdigitalcameras.htm - 15k - Cached - Similar pages

cheapest colour LCD digital camera bigchina.com

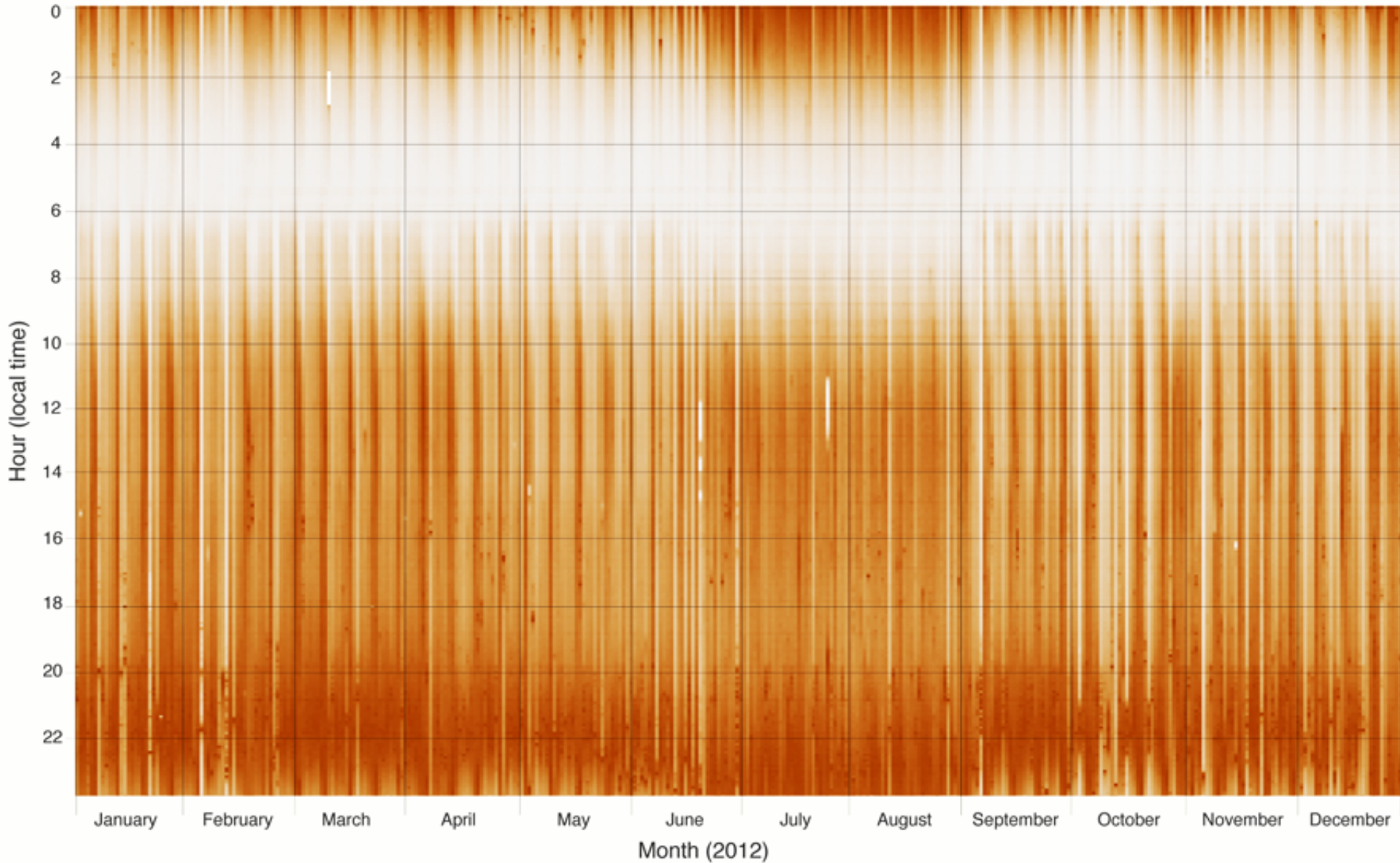
Cheapest colour LCD digital camera ... Product Description, Cheapest digital camera

www.ebigchina.com/ebcps/4/ed/1243997.html - 3k - Cached - Similar pages

Dealslist - Cheapest.com

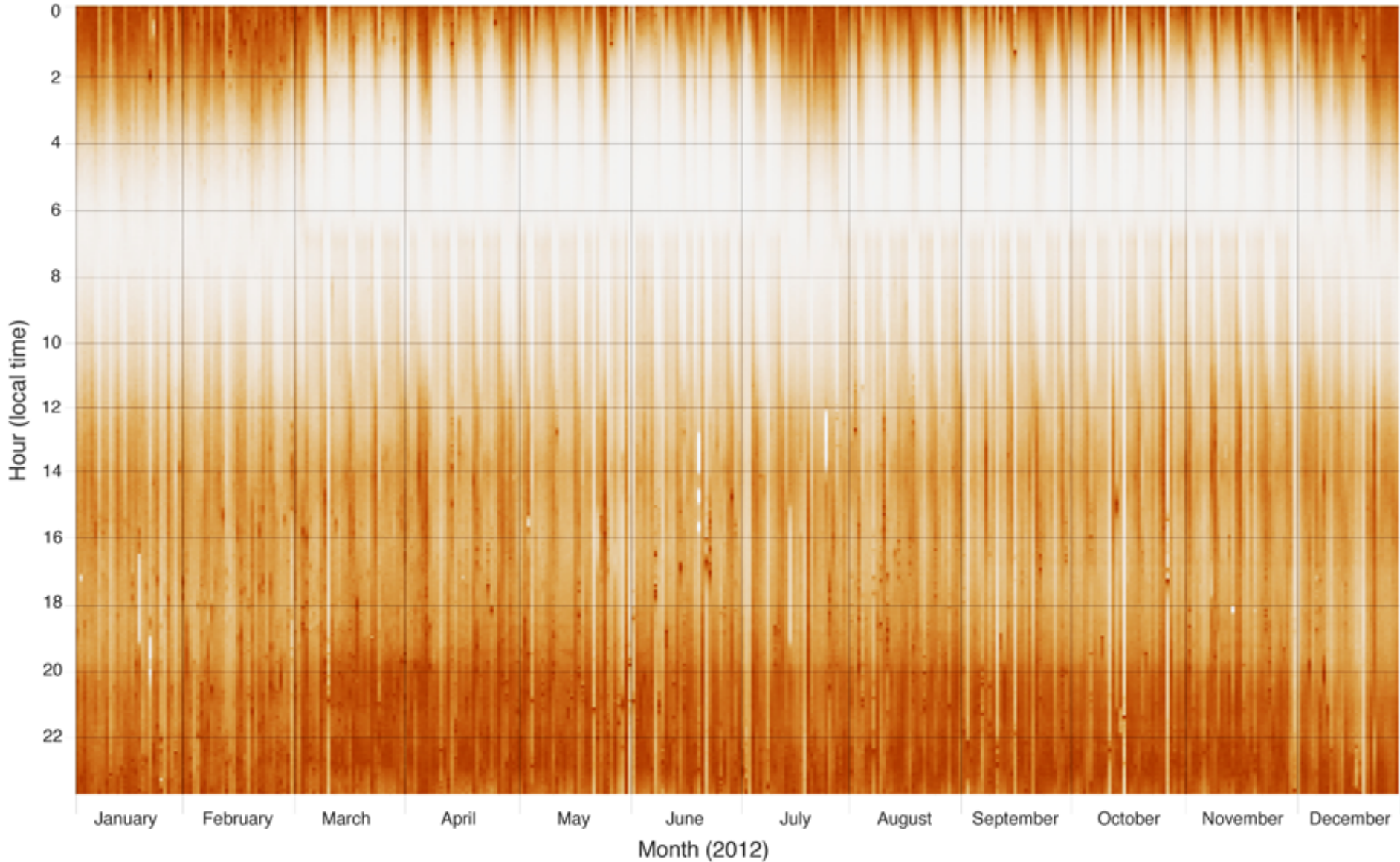
Deals List: Canon Power Shot SD110 digital camera + Canon PIXMA iP3000 Photo

Tweet Activity (New York City, New York, US)



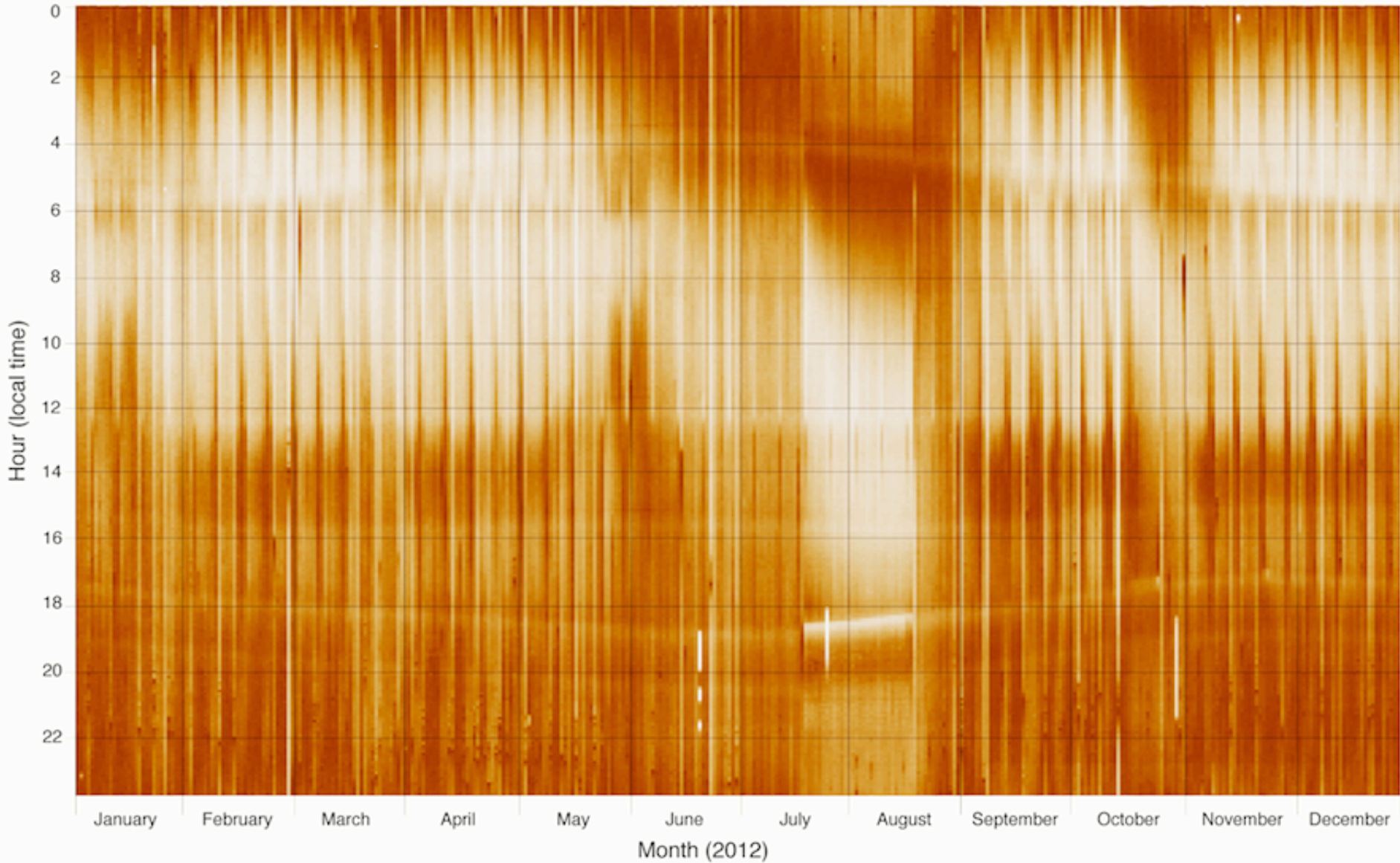
Miguel Rios and Jimmy Lin. Visualizing the “Pulse” of World Cities on Twitter. ICWSM 2013.

Tweet Activity (Buenos Aires, Argentina)



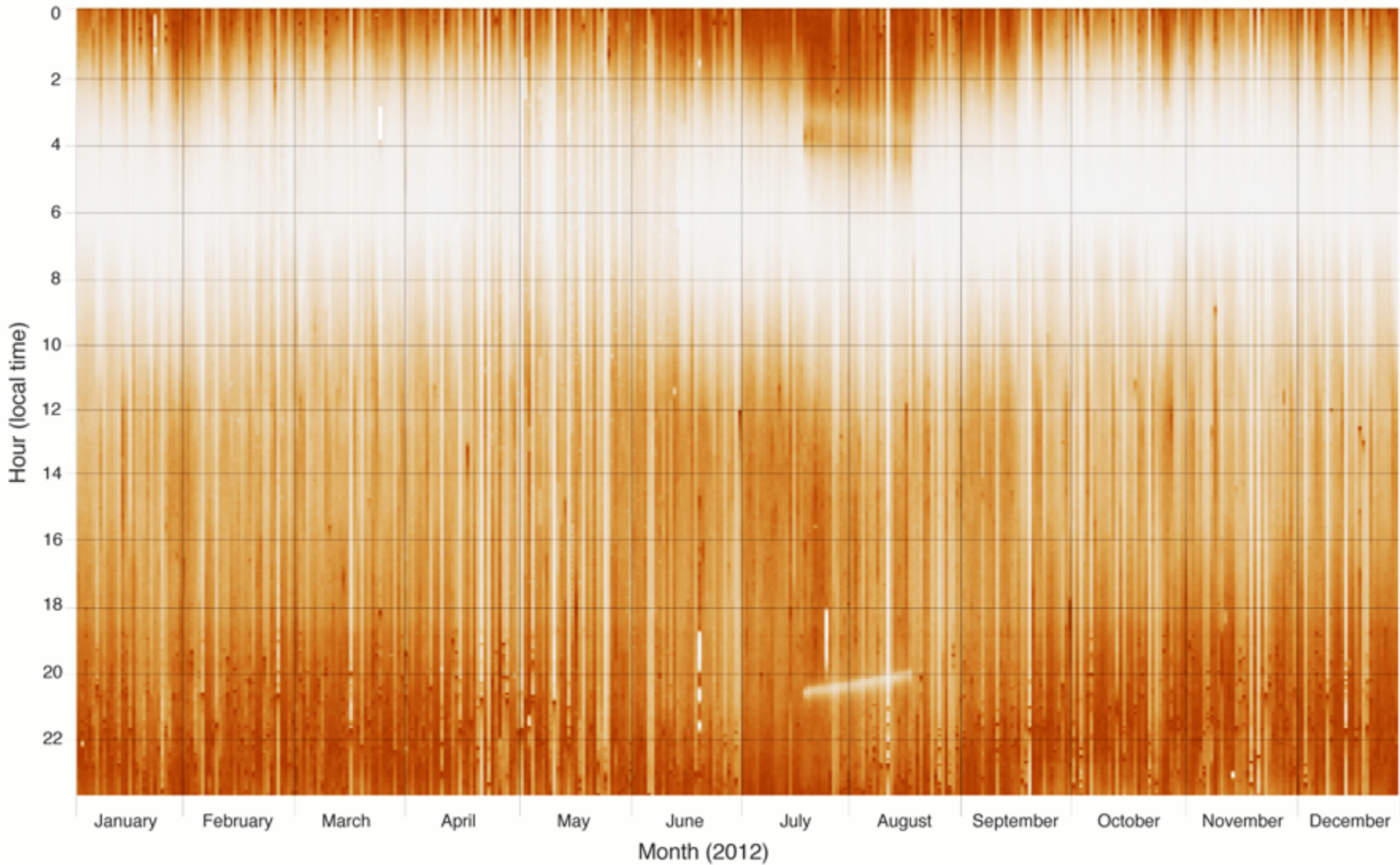
Miguel Rios and Jimmy Lin. Visualizing the “Pulse” of World Cities on Twitter. ICWSM 2013.

Tweet Activity (Riyadh, Saudi Arabia)



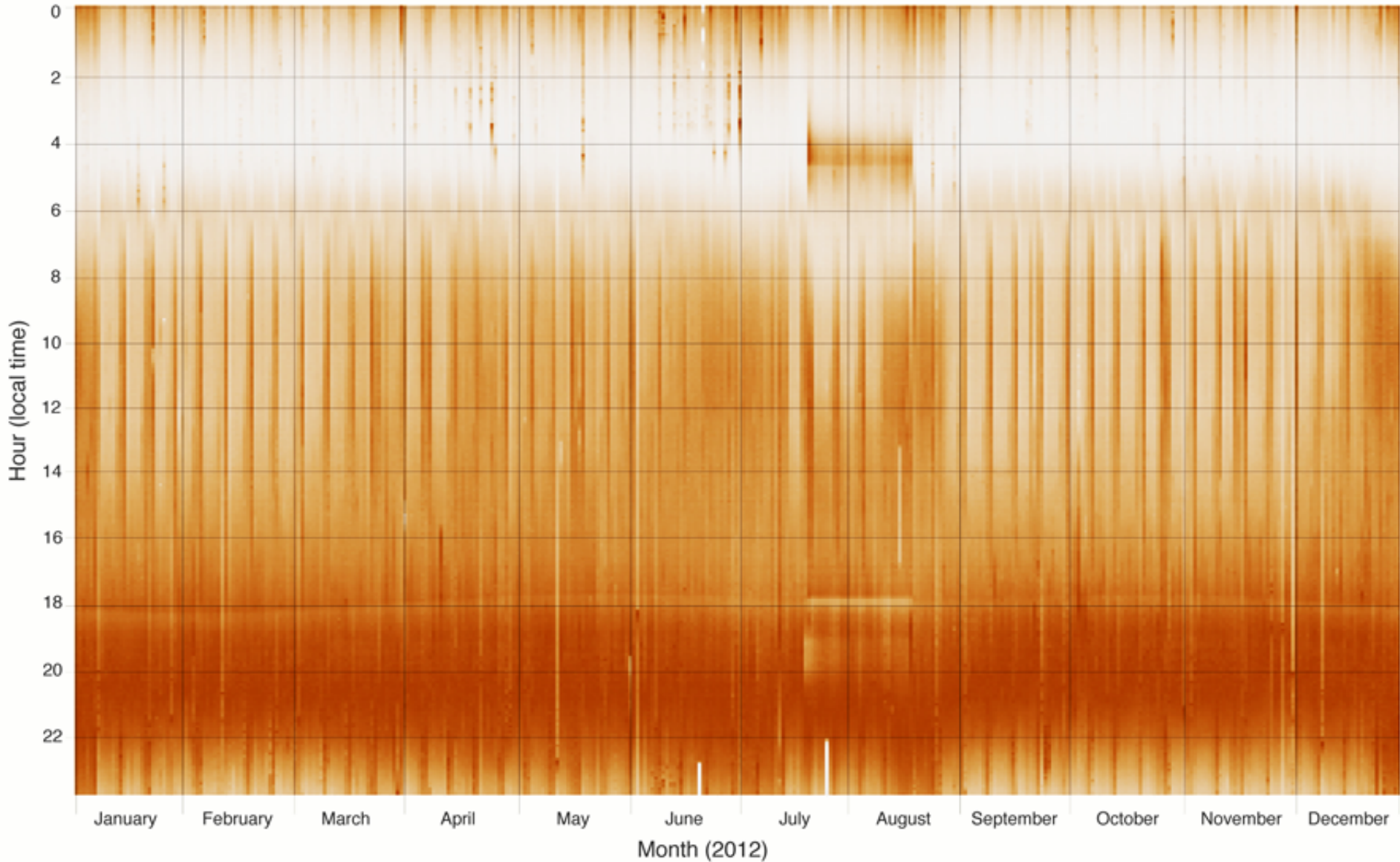
Miguel Rios and Jimmy Lin. Visualizing the “Pulse” of World Cities on Twitter. ICWSM 2013.

Tweet Activity (Istanbul, Turkey)



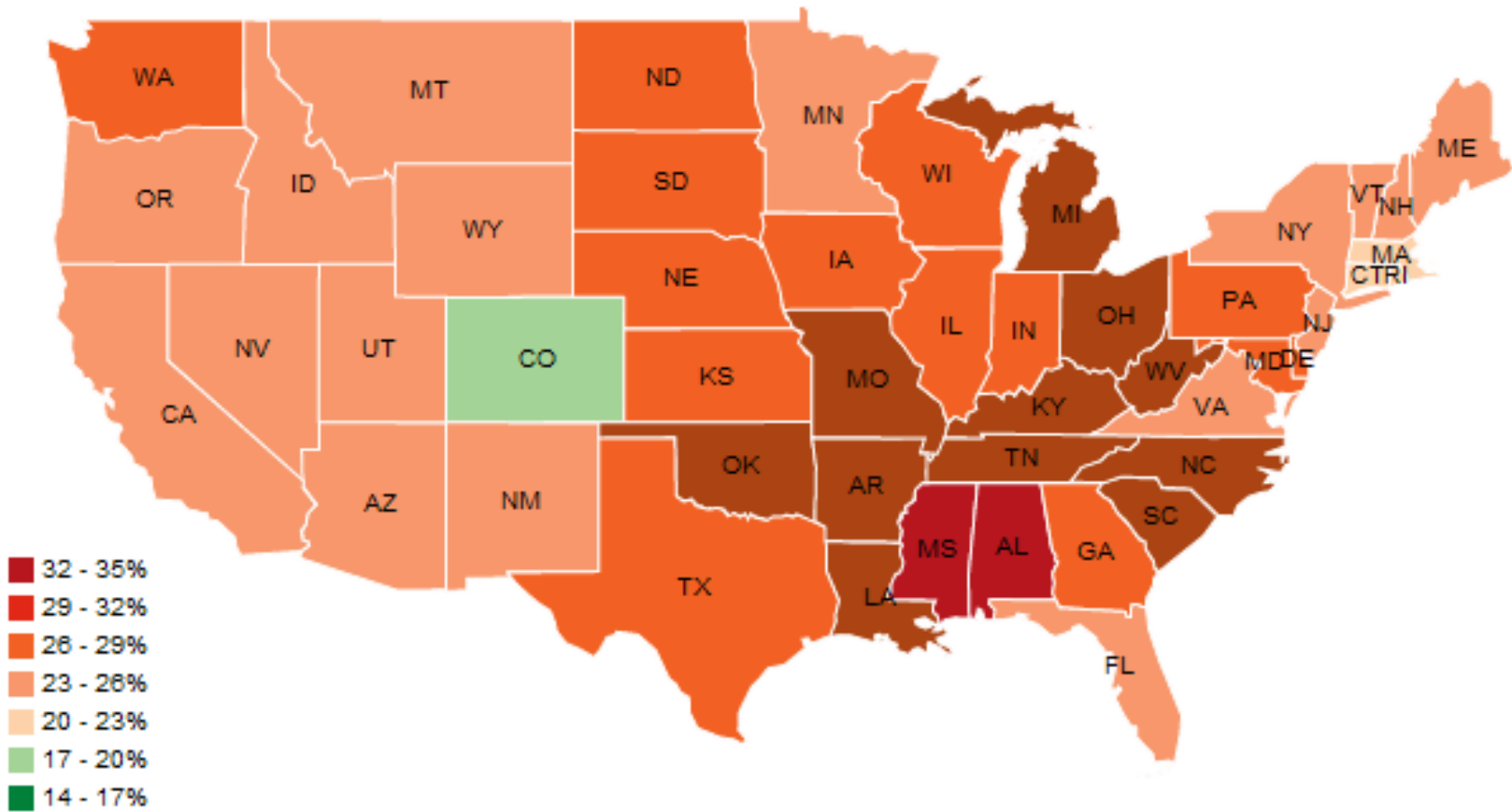
Miguel Rios and Jimmy Lin. Visualizing the “Pulse” of World Cities on Twitter. ICWSM 2013.

Tweet Activity (Jakarta, Indonesia)

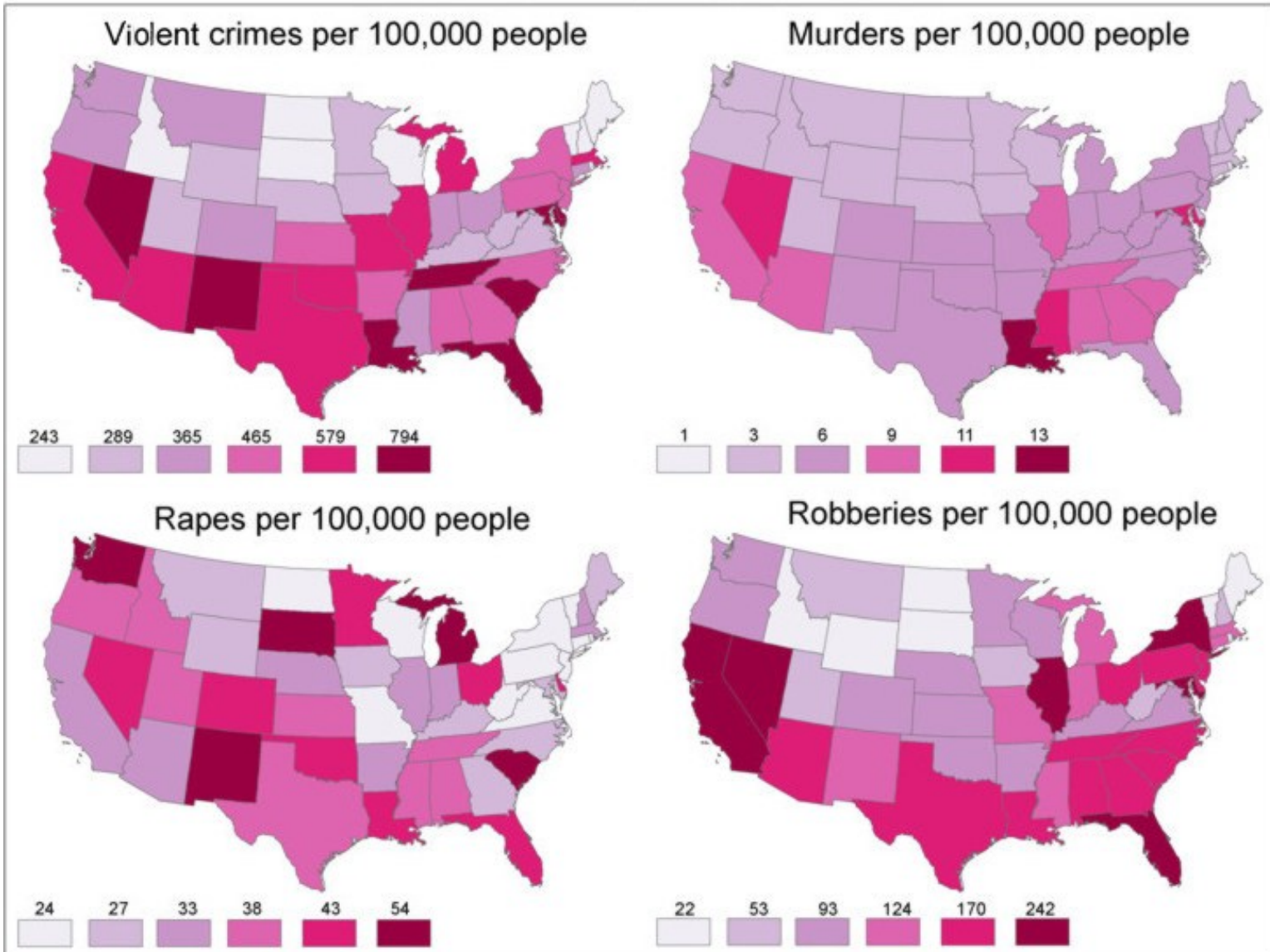


Miguel Rios and Jimmy Lin. Visualizing the “Pulse” of World Cities on Twitter. ICWSM 2013.

Choropleth Maps

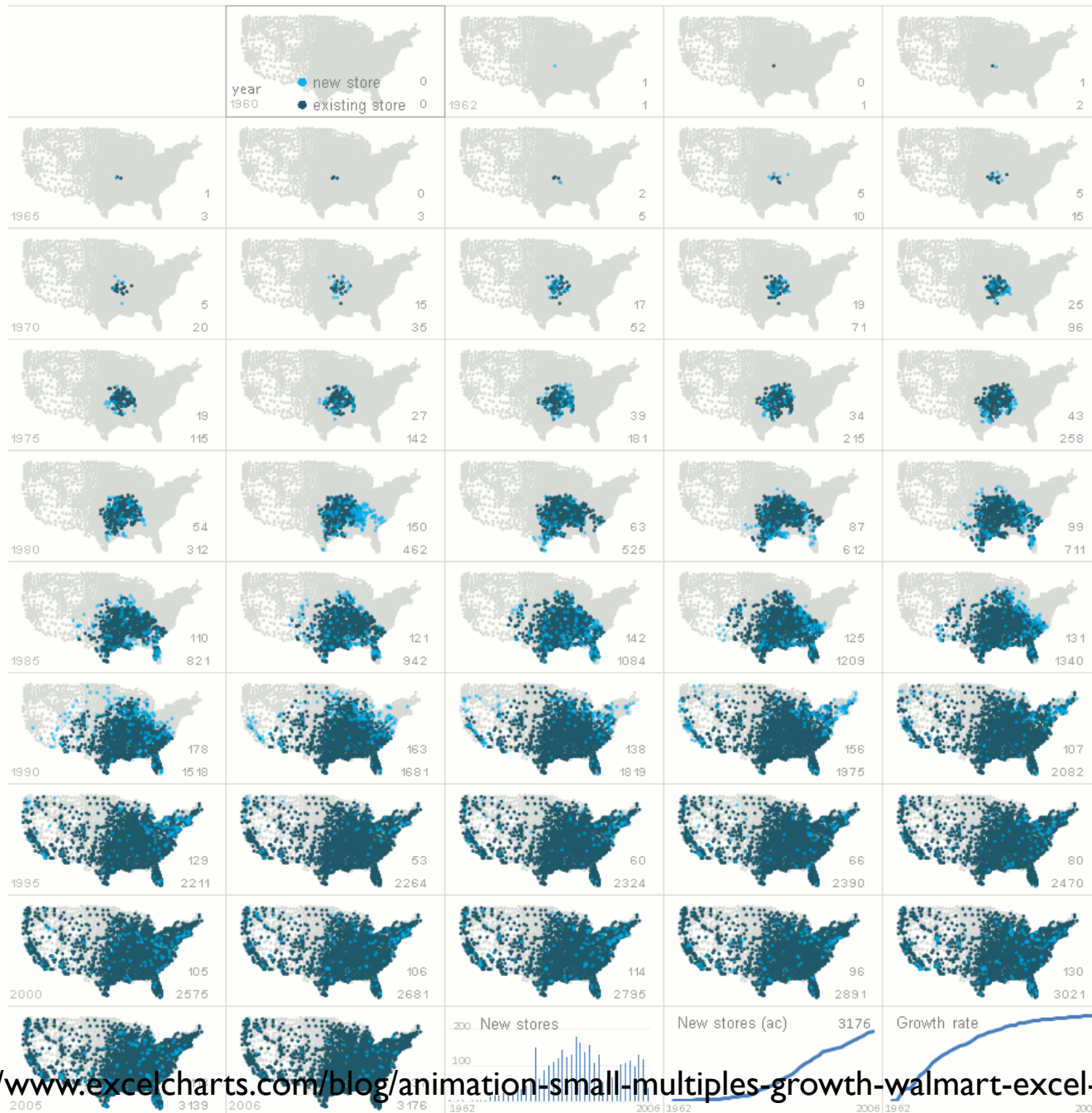


Crime Rates in the US - 2003



Source: *Crime in the United States, 2003*, FBI, *Uniform Crime Reports*

Growth of Walmart

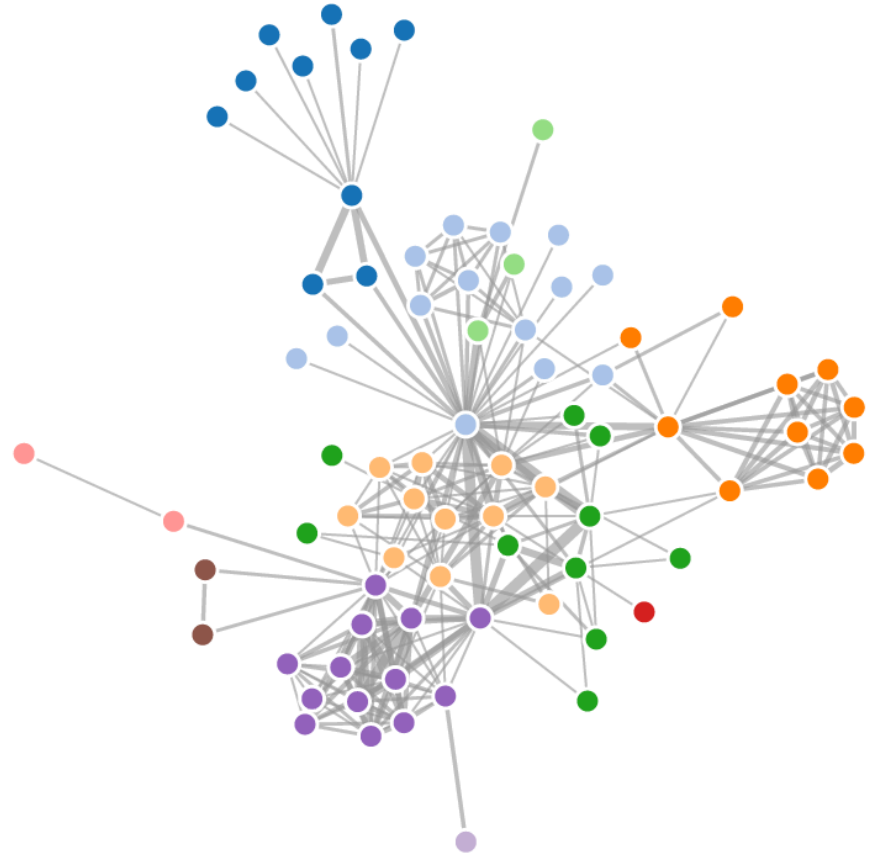


Small Multiples vs. Animations

- Advantages and disadvantages?

Visualizing Networks

- Types of networks: social networks, interaction networks, biological networks, computer networks, etc.
- Standard algorithm uses force-directed layout





Panda Viewing
Sun - 5:30pm

