

Data Visualization

Outline

- What?
- Why?
- How?

Outline

- What?
- Why?
- How?

Data Visualization

“...to convey information through visual representations.”

“...produces (interactive) visual representations of abstract data to reinforce human cognition; thus enabling the viewer to gain knowledge about the internal structure of the data and causal relationships in it.”

Outline

- What?
- **Why?**
- How?

VISUALIZATION GOALS

Visualization Goals

- Answer questions (or discover them)
- Make decisions
- See data in context
- Support graphical calculation
- Find patterns
- Present argument or tell a story
- Inspire

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Lignes et Chausées en retraite.

Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui ont été en Russie, le noir ceux qui en sont sortis. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Thiers, de Fégur, de Fozondac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout qui avaient été détachés sur Minsk et Mohilow et qui rejoignent vers Orscha et Witebsk, avaient toujours marché avec l'armée.

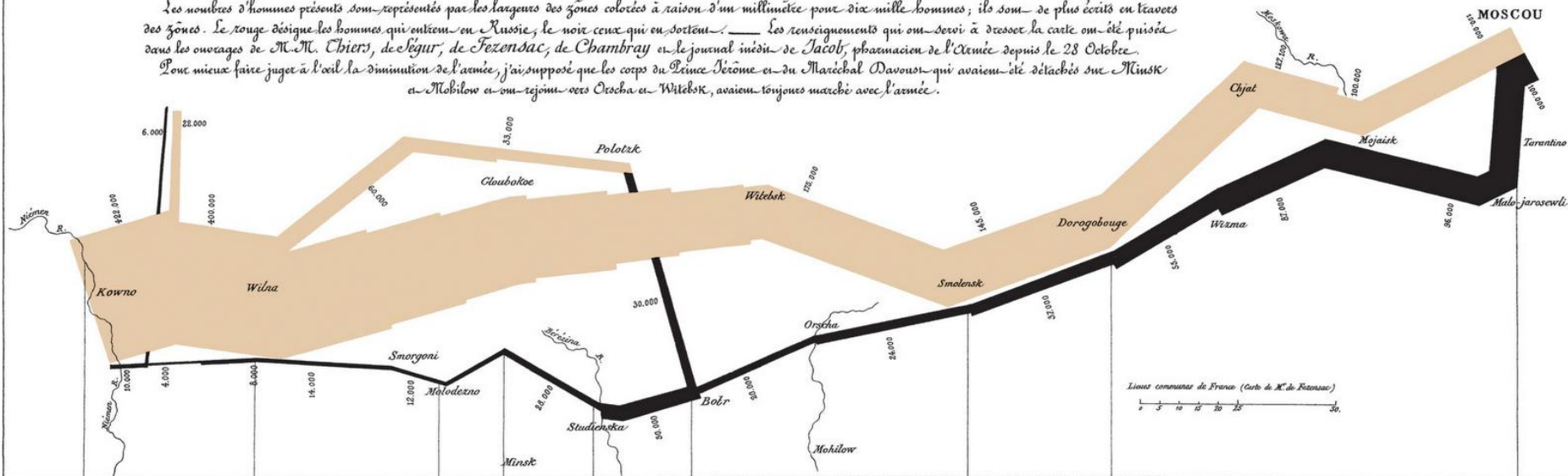
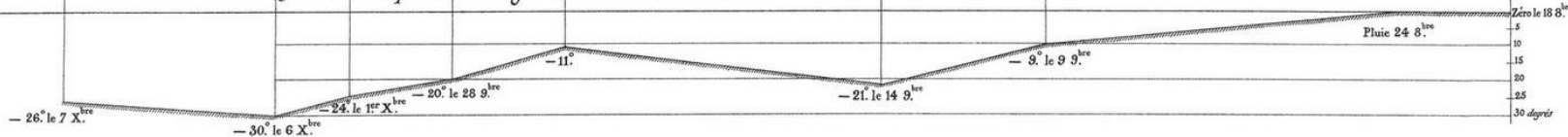


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



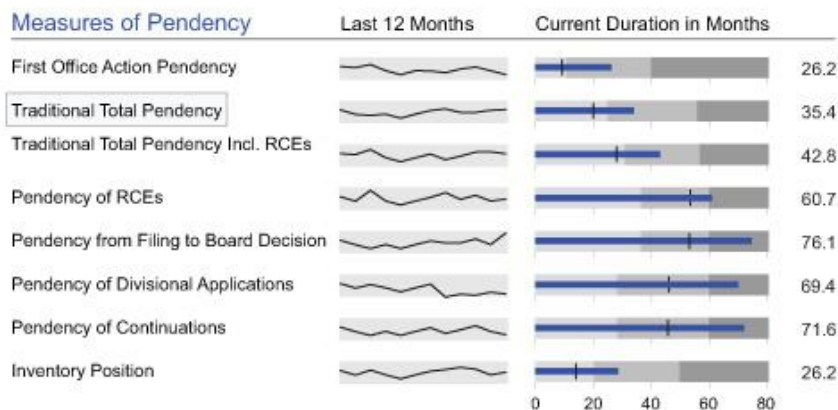
Les Cosaques passent au galop le Niemen gelé.

Data for August 2010 as of September 1, 2010

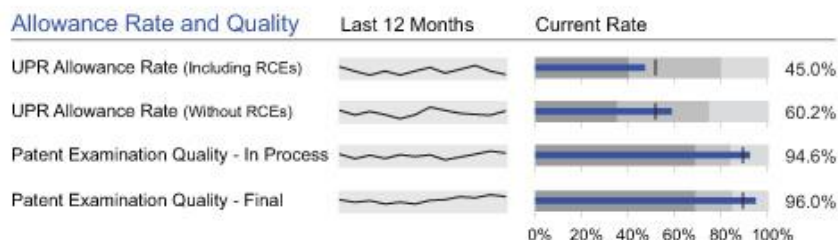
USPTO Patents Dashboard

August 2010 Value | Target | Good | OK | Poor

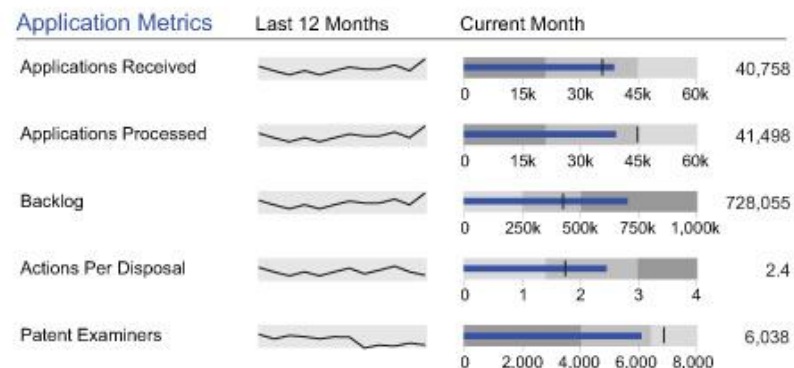
Measures of Pendency



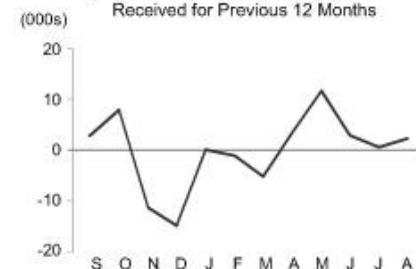
Allowance Rate and Quality



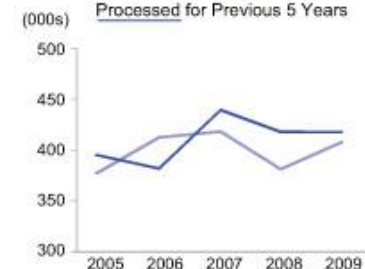
Application Metrics



Applications Processed minus Applications Received for Previous 12 Months



Applications Received and Processed for Previous 5 Years



Room to provide additional context or other information

Click on a variable for the definition:

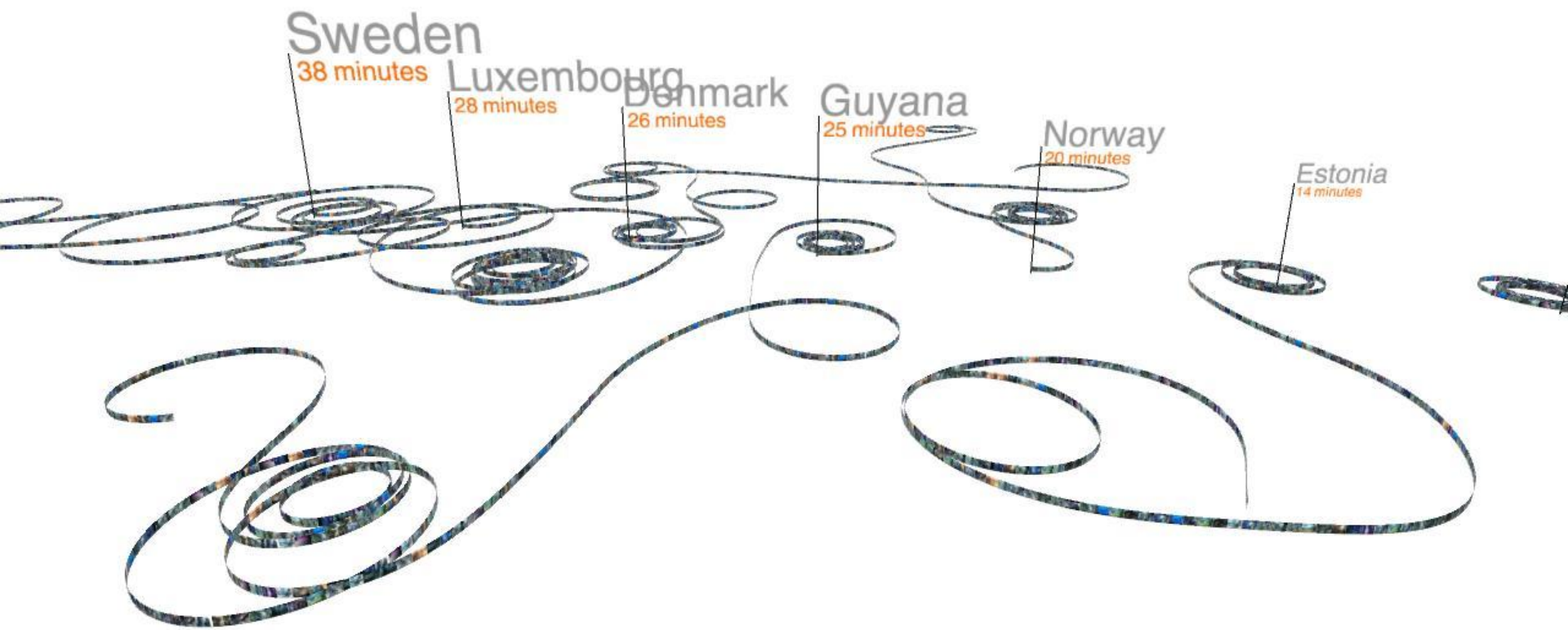
Traditional Total Pendency

This is the measure of total pendency, as traditionally measured. Historically, pendency has been measured as the average number of months from the patent application filing date to the date the application has reached final disposition (e.g., issued as a patent or abandoned) which is called a "disposal". Our goal is to reduce Traditional Total Pendency to an average of 20 months by 2015. This pendency includes the time periods awaiting action by the USPTO, as well as any time awaiting reply from an applicant. The traditional total pendency measure treats the abandonment for the filing of an RCE as a disposal, and stops the pendency clock at that point for that application.

The Traditional Total Pendency pendency number displayed, measured in months, is the average for all applicants which are "disposed" over a three-month period.

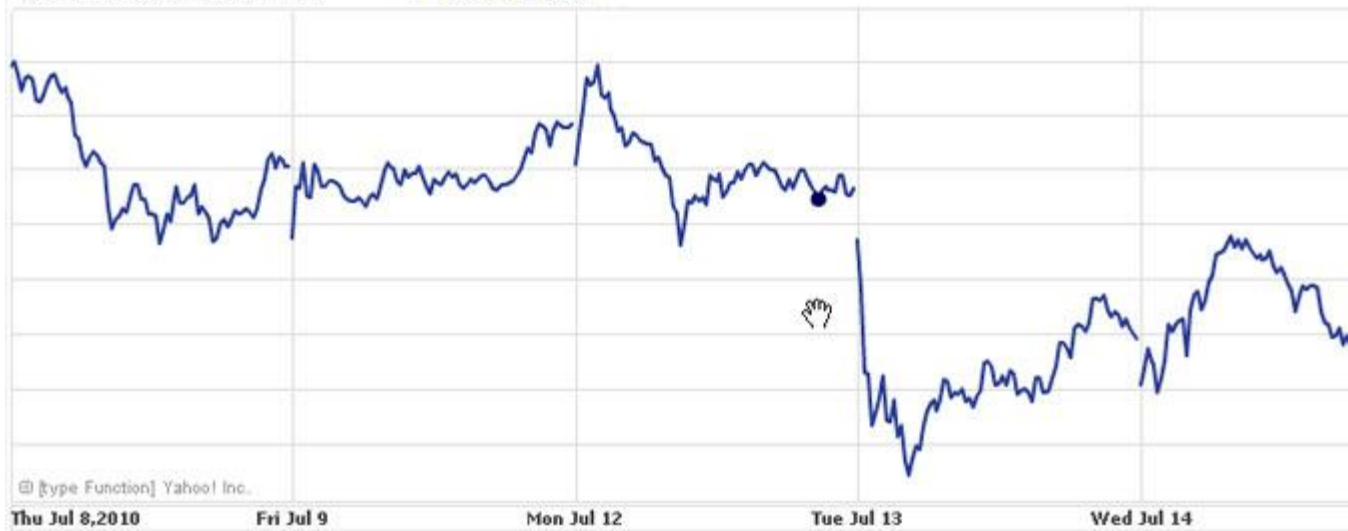
Space for logo





Jul 12, 2010 3:10 - 3:15 PM EDT :

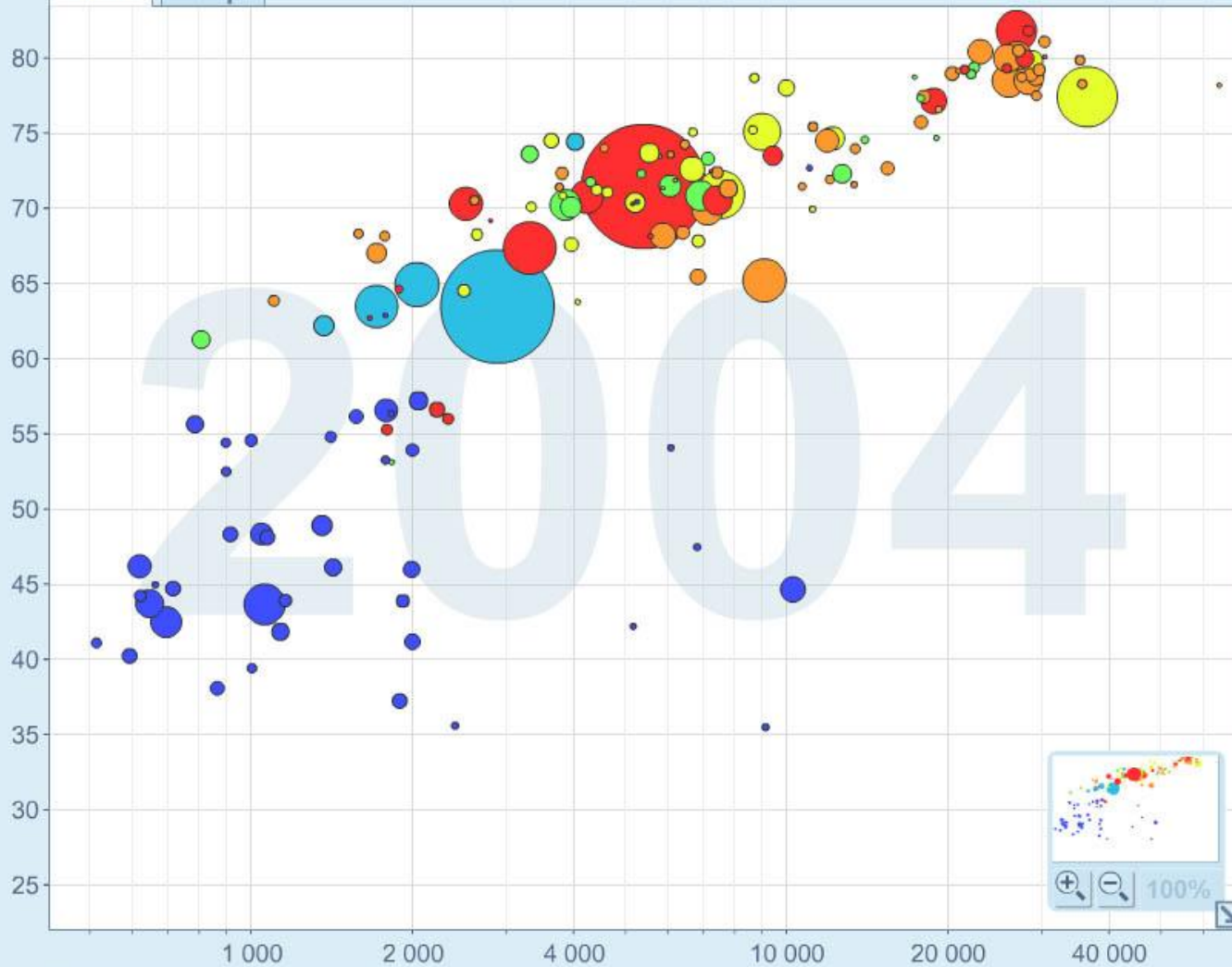
■ AAPL 257.2001



© [type Function] Yahoo! Inc.

Map

Life expectancy, years



Income per capita in international dollars (GNP or GNI)

log ▼

Play ▶

1980

1990

2000

Geographic regi... ▼



- ☐ Albania
- ☐ Algeria
- ☐ Angola
- ☐ Antigua and Barb...
- ☐ Argentina
- ☐ Armenia
- ☐ Australia
- ☐ Austria
- ☐ Azerbaijan
- ☐ Bahamas, The
- ☐ Bahrain
- ☐ Bangladesh
- ☐ Belarus

Population ▼

Three Functions of Visualization

- **Record:** store information
- **Analyze:** support reasoning about information
- **Communicate:** convey information to others

PERCEPTION & COGNITION

Anscombe Quartet

1		2		3		4	
x	y	x	y	x	y	x	y
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.80

For all four datasets:

N = 11

mean of x values = 9.0

variance of x values = 11.0

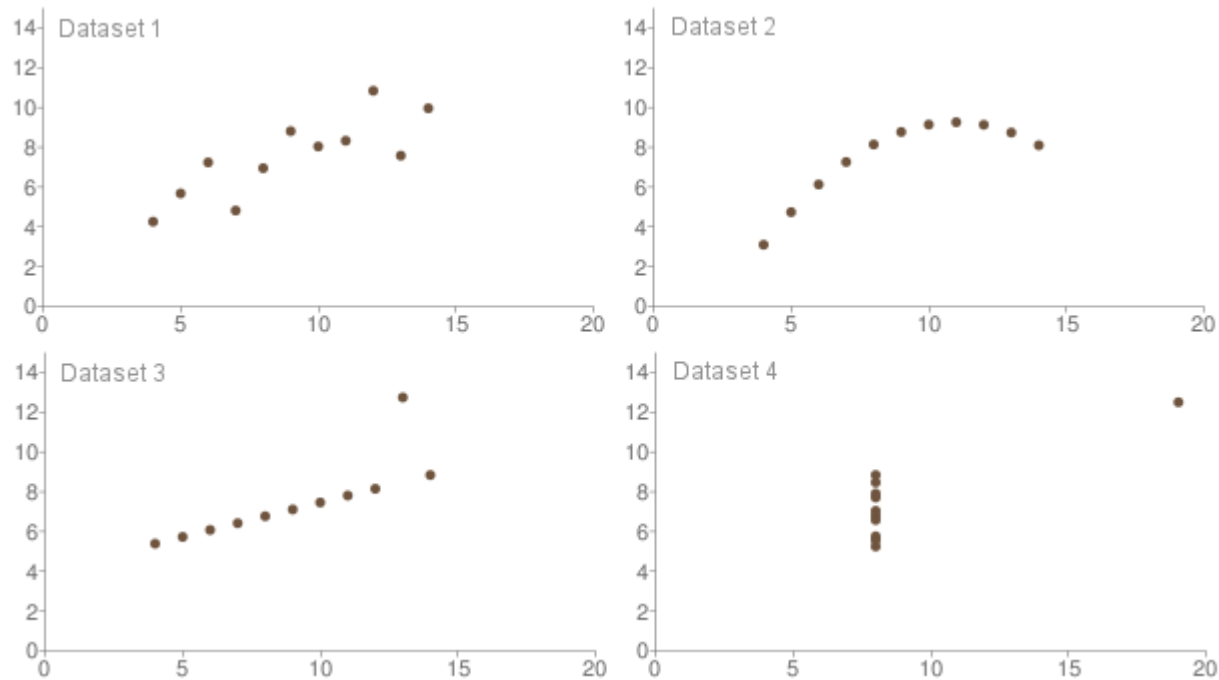
mean of y values = 7.5

variance of y values = 4.12

correlation between x & y = 0.816

regression line: $y = 3 + 0.5x$

Anscombe Quartet



How many 3's?

24872184012387409216590147609856093247209
12562906509852659048275829856809609863095
84390564095878950374509284750989475092984

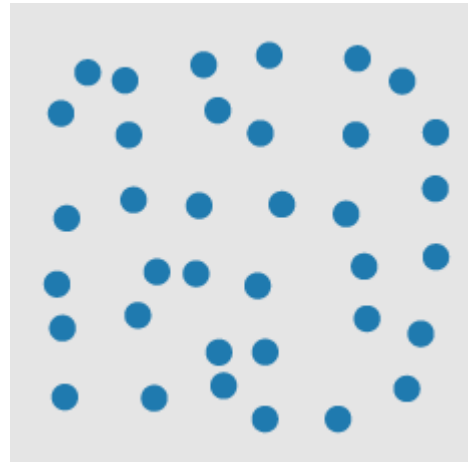
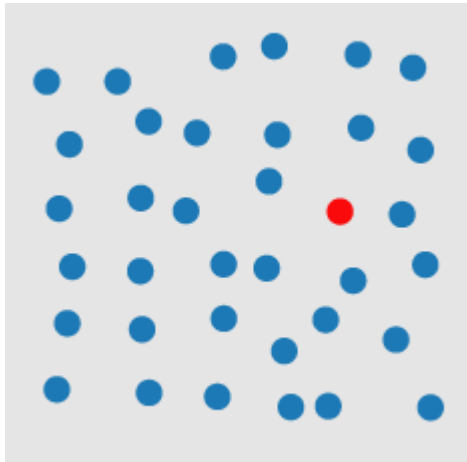
How many 3's?

24872184012**3**8740921659014760985609**3**247209
1256290650985265904827582985680960986**3**095
84**3**90564095878950**3**74509284750989475092984

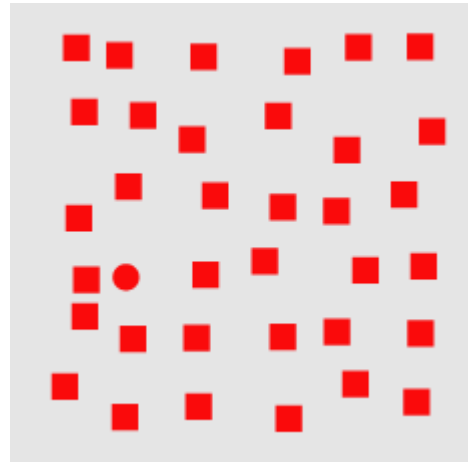
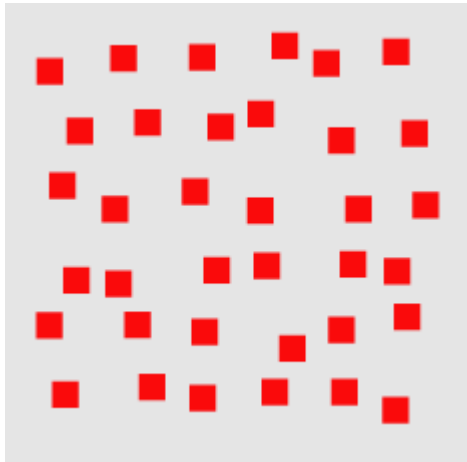
Preattentive Processing

- Requires attention despite the name
- Very fast: $< 200\text{-}250$ ms
- What matters most is the contrast between features

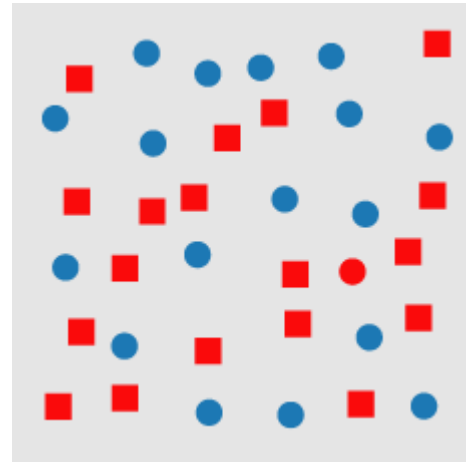
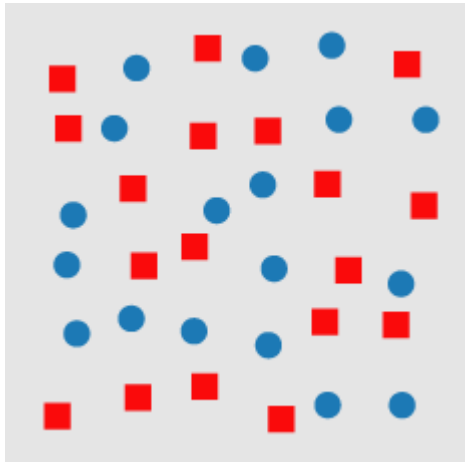
Color



Shape



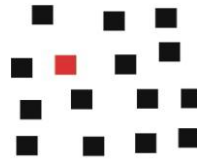
Conjunction



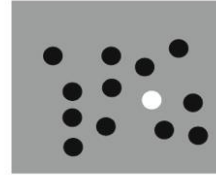
Basic Popout Channels

Color

hue



lightness

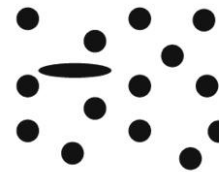


**Elementary
shape**

size



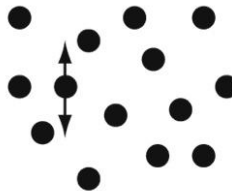
elongation



orientation



Motion



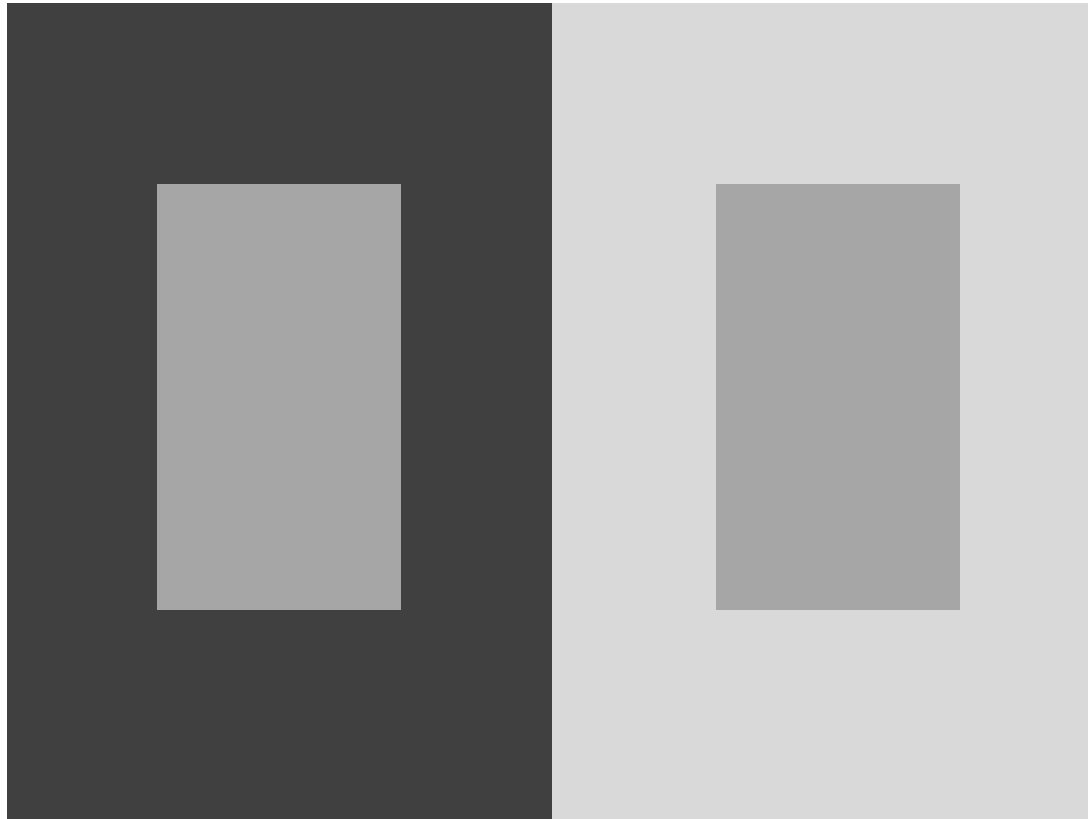
**Spatial
grouping**

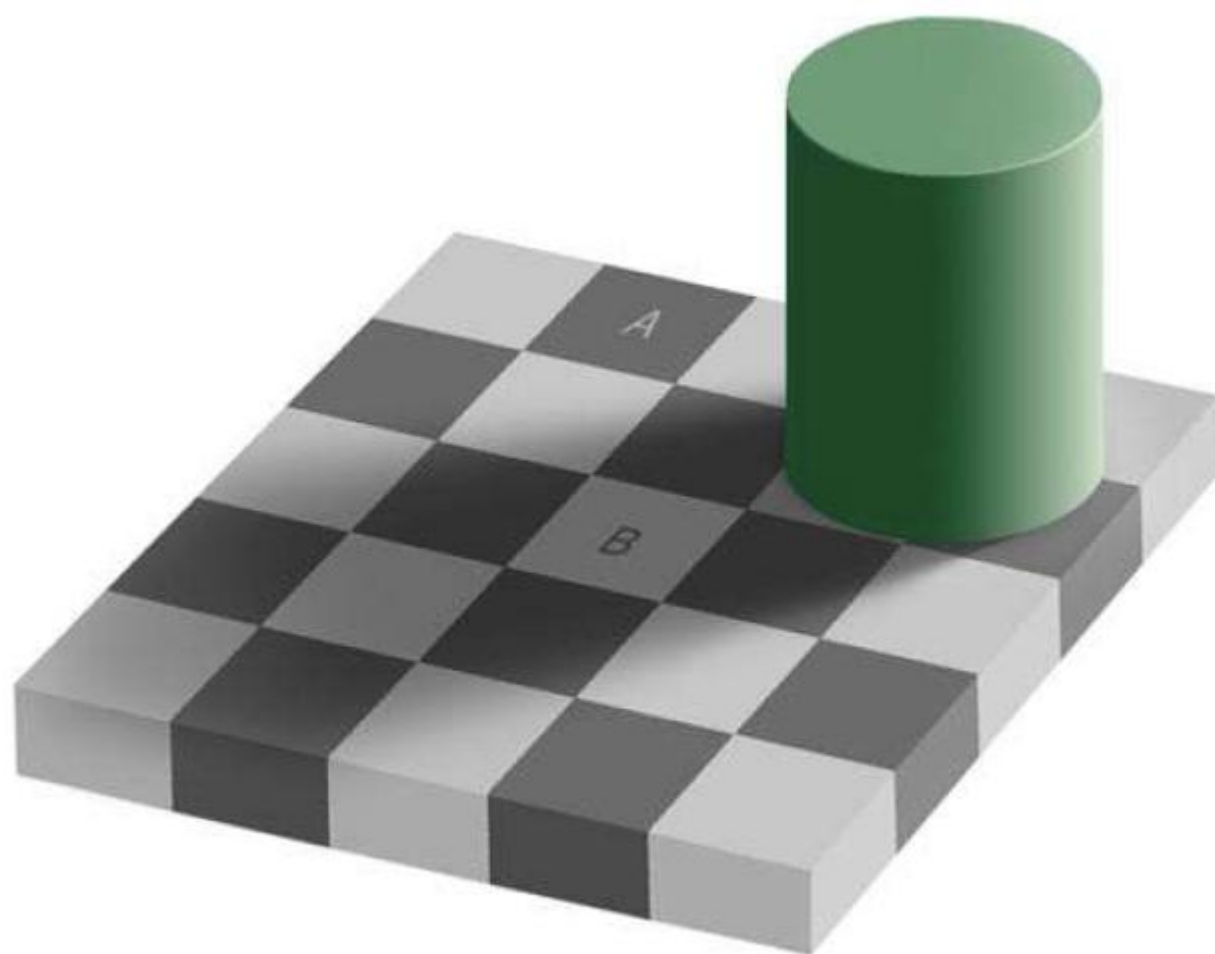


Change Blindness



Simultaneous Contrast



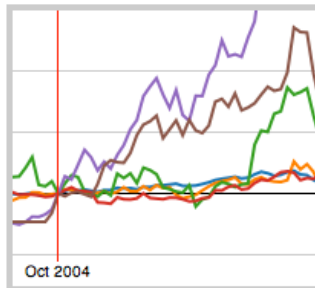


Outline

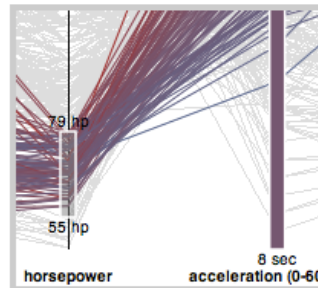
- What?
- Why?
- How?

FRAMEWORKS

ProtoVis



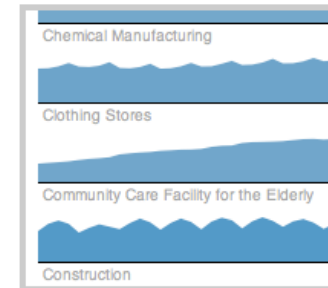
Index Charts



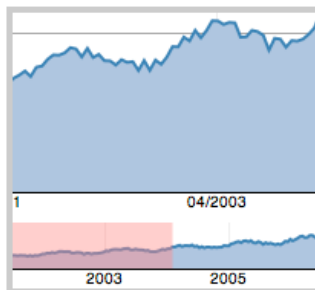
Parallel Coordinates



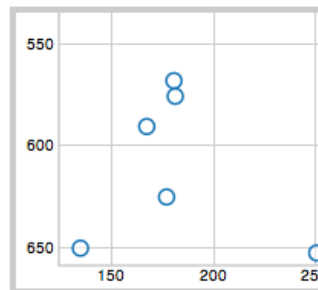
Job Voyager



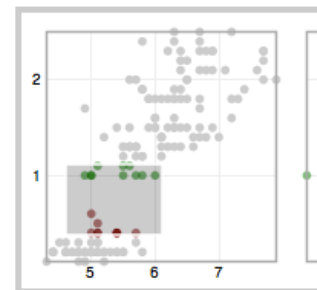
Minnesota Employment



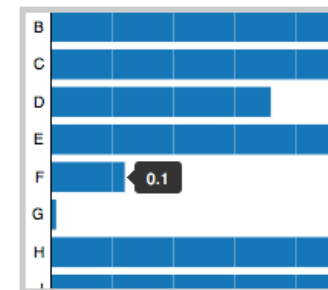
Focus + Context



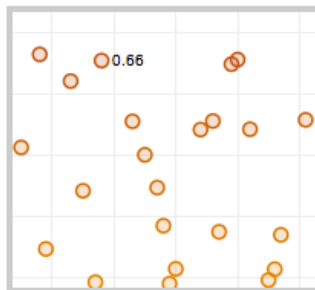
Pan + Zoom



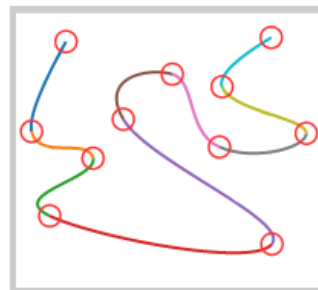
Brush + Link



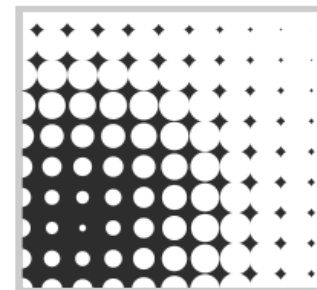
Tooltips



Pointing



Spline Editor



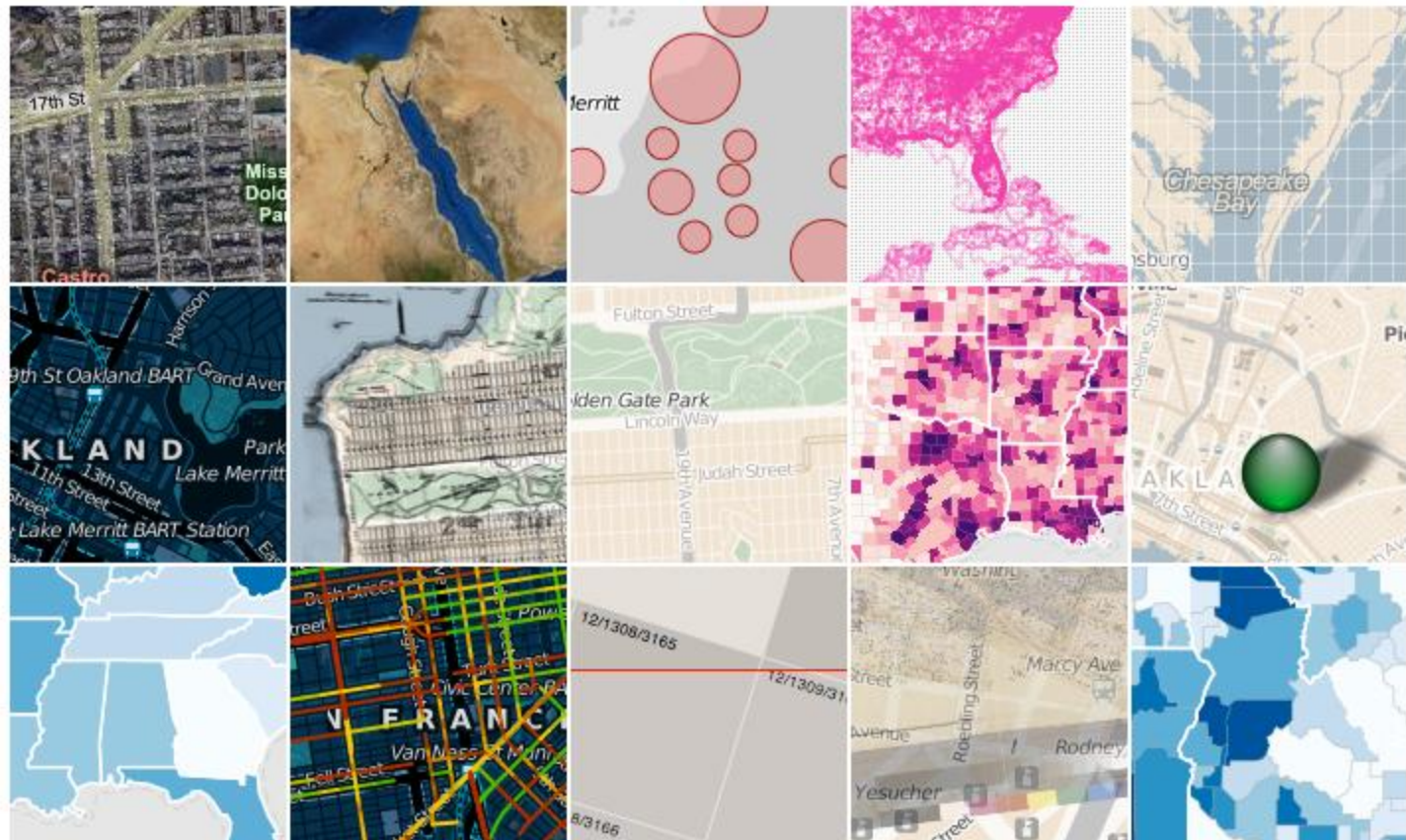
Bubbles



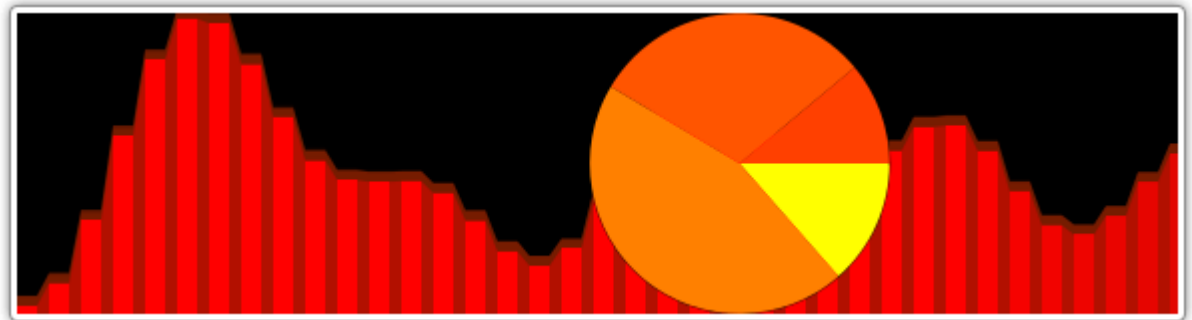
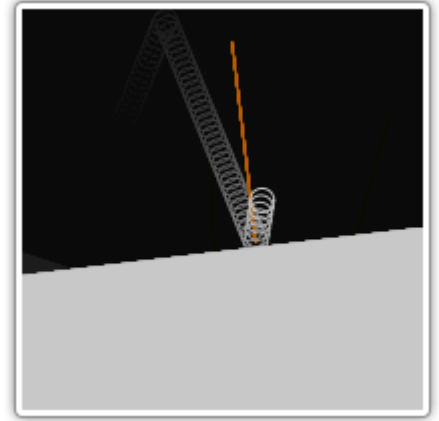
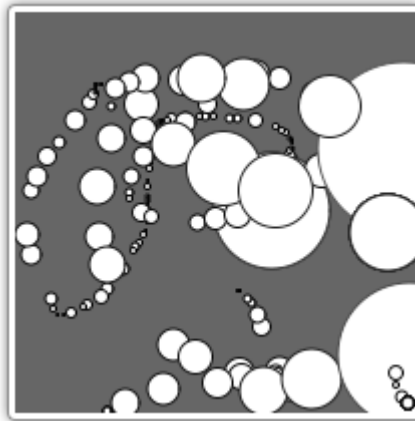
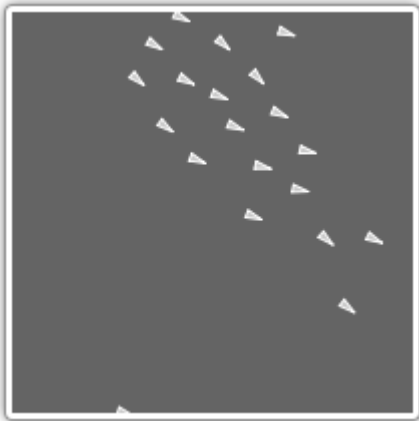
Eyes

Polymaps

Polymaps is a free JavaScript library for making dynamic, interactive maps in modern web browsers.



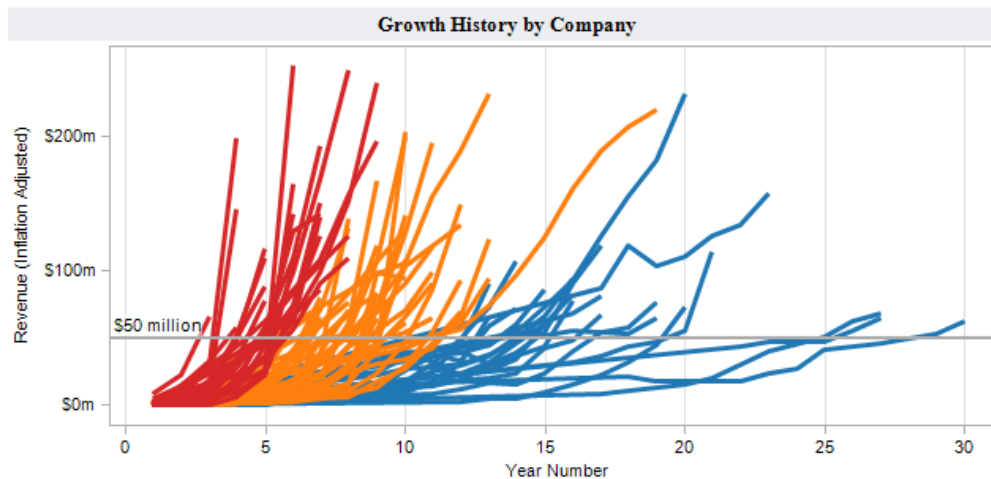
Processing



Tale of 100 Entrepreneurs

Click to interact

■ Rocket Ship
 ■ Hot Company
 ■ Slow Burner



Company Details				
Growth Group	Company Name	Avg. Year Founded	Years to \$50m	Revenue (2008)
Rocket Ship	Activision	1979	4	\$3,026m
	Adobe	1982	6	\$3,580m
	Autodesk	1982	5	\$2,172m
	Blackboard	1997	5	\$312m
	Cadence	1983	6	\$1,039m
	Checkpoint	1993	5	\$808m
	China Digital	2004	4	\$55m
	Cognizant	1994	5	\$2,816m
	Electronic Arts	1982	6	\$3,665m
	Interwoven	1995	6	\$260m
	McAfee	1989	6	\$1,600m
	MedAssets	1999	5	\$189m
	Mentor Graph..	1981	4	\$880m
	Novell	1983	3	\$957m
	OpenTV	1996	6	\$116m
	Rackspace	1998	6	\$532m

Select Segment:

- ☒ (All)
- ☒ Business Intelligence
- ☒ CAD / EDA
- ☒ Communications
- ☒ Content Management
- ☒ CRM
- ☒ Database
- ☒ Entertainment
- ☒ ERP
- ☒ Network / Infrastructure/ EAI
- ☒ Operating Systems
- ☒ Security
- ☒ Services
- ☒ Supply Chain
- ☒ Systems Management
- ☒ Vertical Application

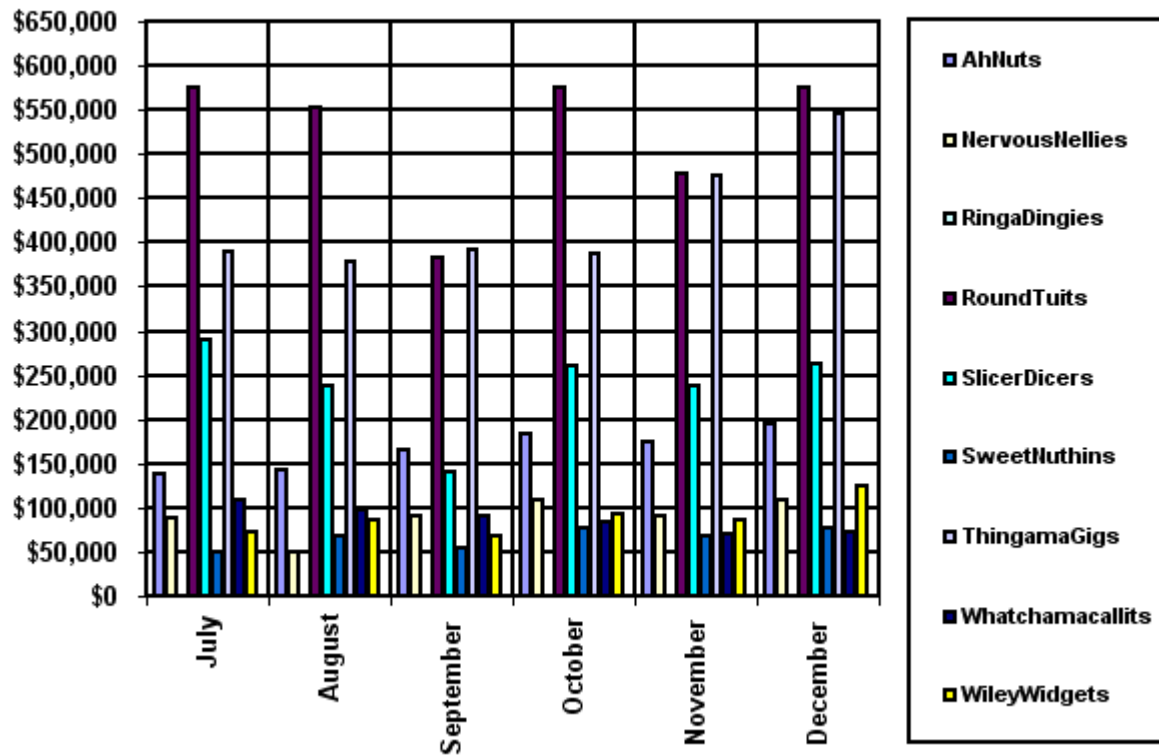
Share →



↓ Download

REDESIGN

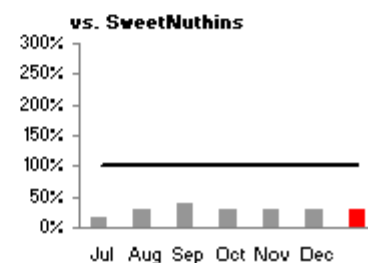
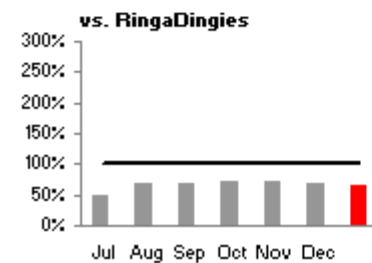
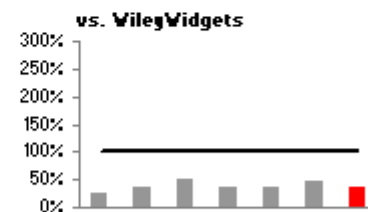
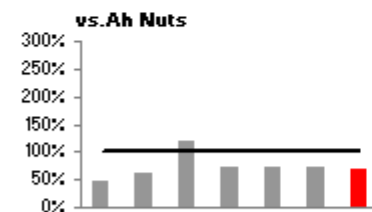
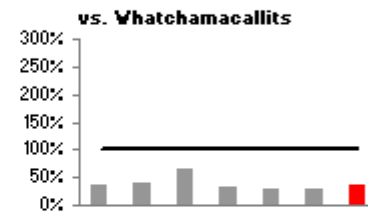
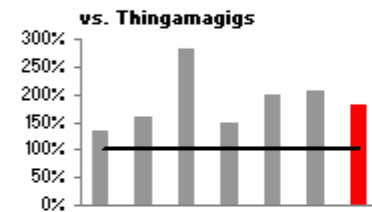
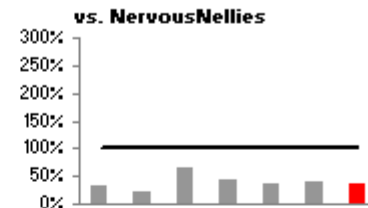
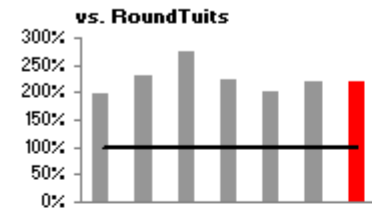
SlicerDicers' Sales Compared to Other Products



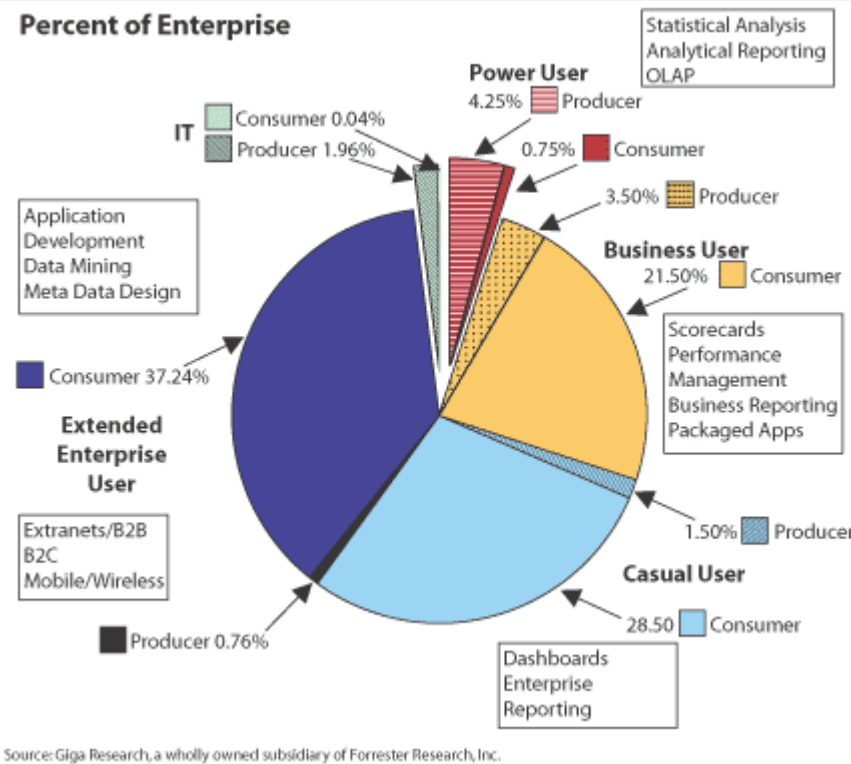
Sales of SlicersDicers Compared to Other Products

July - December, 2003

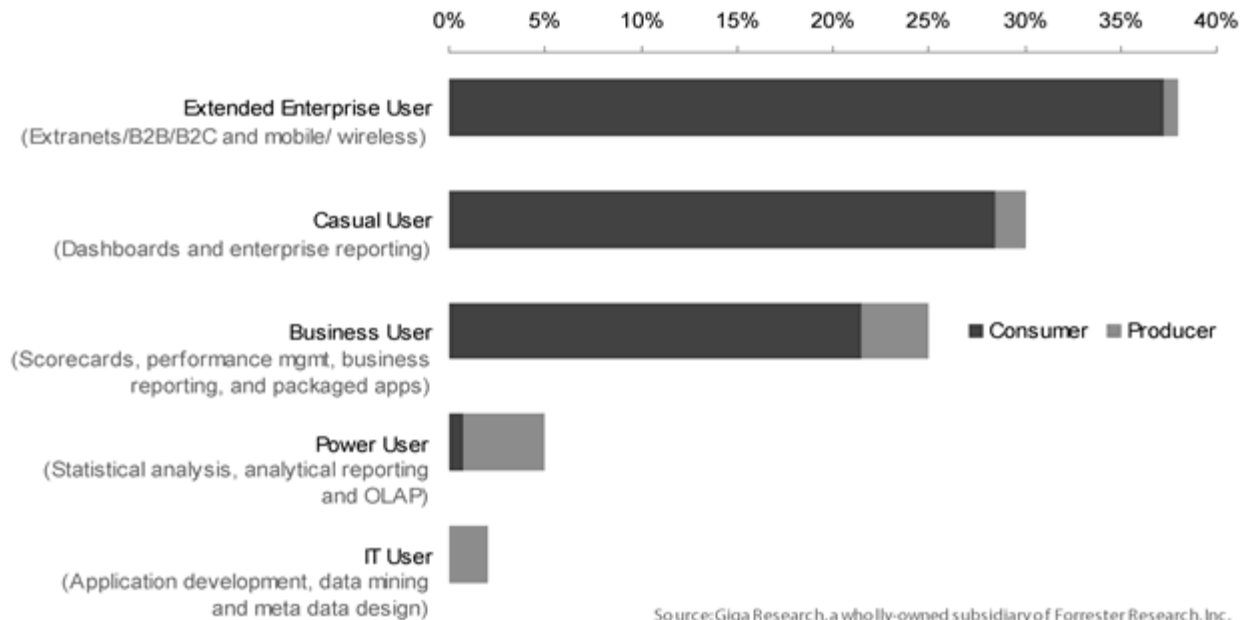
(SlicersDicers' sales are displayed as black reference lines of 100%; the red bars represent the average monthly sales percentage for July through December.)



Percent of Enterprise



Percentage of Analytic Computer Usage by Type

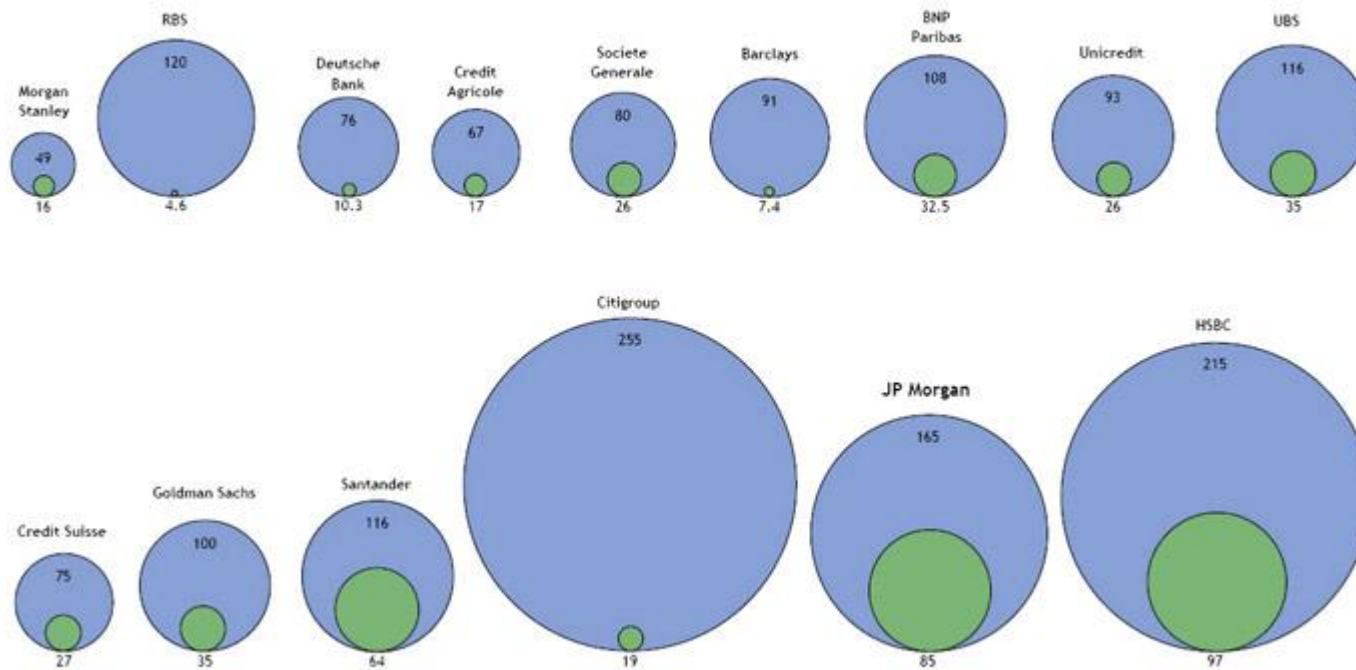


Source: Giga Research, a wholly-owned subsidiary of Forrester Research, Inc.

Banks: Market Cap

● Market Value as of January 20th 2009, \$Bn

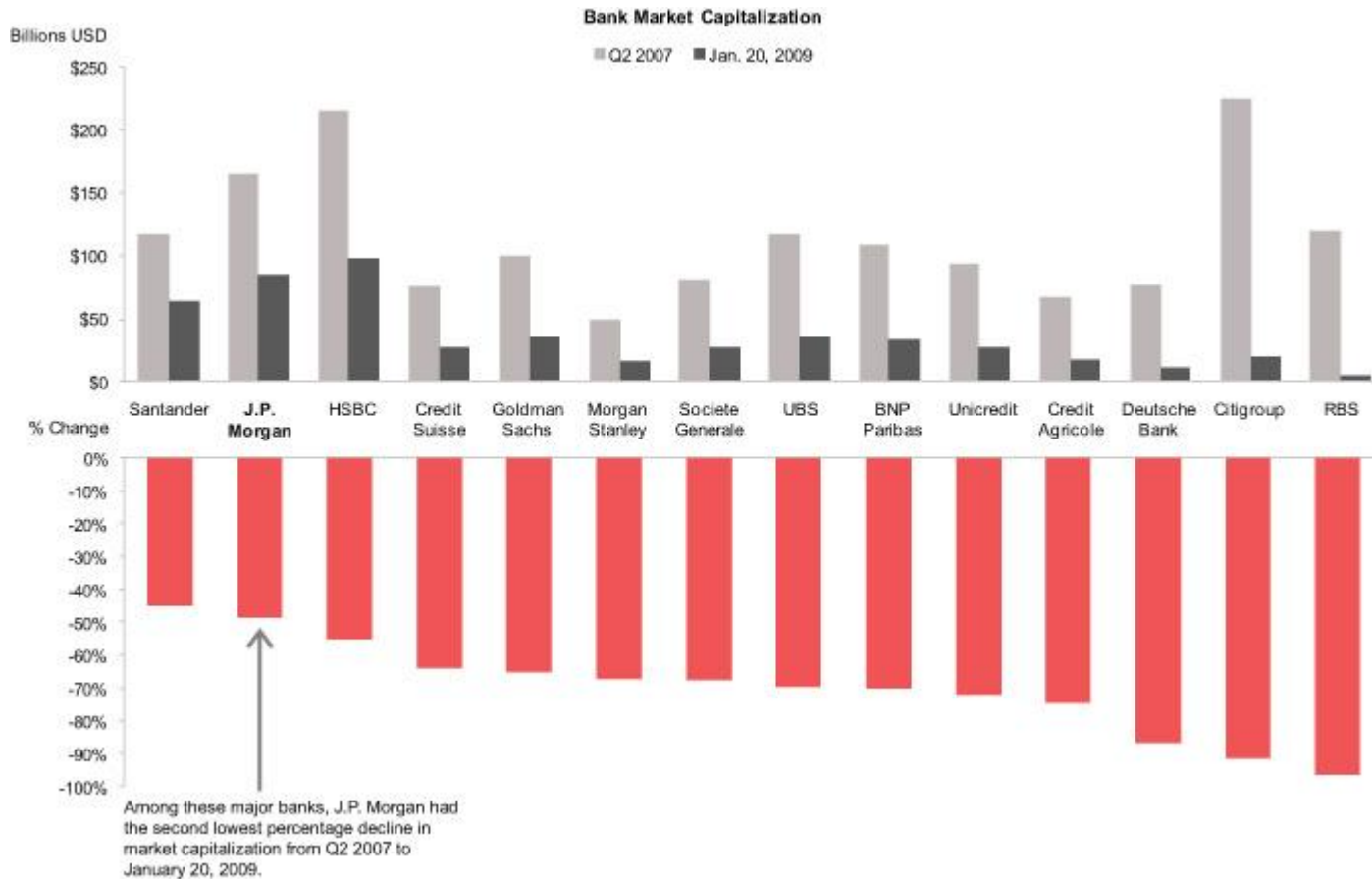
● Market Value as of Q2 2007, \$Bn



J.P.Morgan

While JPMorgan considers this information to be reliable, we cannot guarantee its accuracy or completeness

Source: Bloomberg, Jan 20th 2009



INSPIRATION





TIME OF DAY
 Show All | Hide All
 Light | Dark [nearest hour]
 Commute | Nightlife
 Day | Night | Swing Shift

NOON
12
3
6
9
12
MIDNIGHT

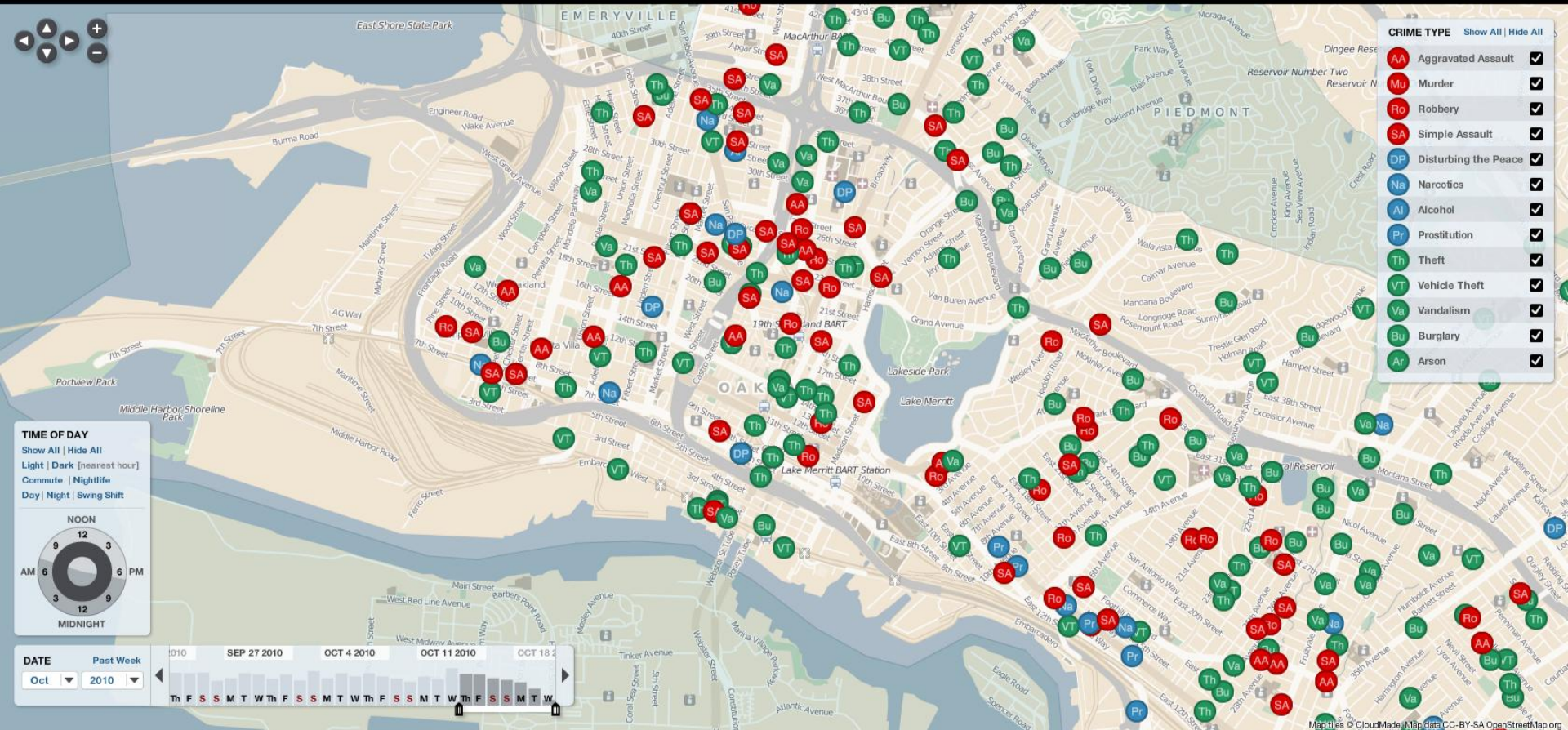
DATE Past Week

SEP 27 2010 OCT 4 2010 OCT 11 2010 OCT 18 2010

Oct 2010

Th F S S M T W Th F S S M T W Th F S S M T W

CRIME TYPE	Show All Hide All
AA Aggravated Assault	<input checked="" type="checkbox"/>
Mu Murder	<input checked="" type="checkbox"/>
Ro Robbery	<input checked="" type="checkbox"/>
SA Simple Assault	<input checked="" type="checkbox"/>
DP Disturbing the Peace	<input checked="" type="checkbox"/>
Na Narcotics	<input checked="" type="checkbox"/>
Al Alcohol	<input checked="" type="checkbox"/>
Pr Prostitution	<input checked="" type="checkbox"/>
Th Theft	<input checked="" type="checkbox"/>
VT Vehicle Theft	<input checked="" type="checkbox"/>
Va Vandalism	<input checked="" type="checkbox"/>
Bu Burglary	<input checked="" type="checkbox"/>
Ar Arson	<input checked="" type="checkbox"/>







"Abortion"
from Wikipedia

COLOR

group

individual

text changes

text age

SPACING

date

versions

authors

posts

198.37.26.168

Abortion

(Revision as of 22:56 4 Jun 2003)

"Abortion," in its most commonly used sense, refers to the deliberate early termination of **pregnancy, resulting in the death of the embryo or fetus.** [1] Medically, the term also refers to the early termination of a pregnancy by natural causes ("spontaneous abortion" or **miscarriage**, which ends 1 in 5 of all pregnancies, usually within the first 13 weeks) or to the cessation of normal growth of a body part or organ. What follows is a discussion of the issues related to deliberate or "induced" abortion.

Methods

Depending on the stage of pregnancy an abortion is performed by a number of different methods. For the earliest terminations (before nine weeks or so) a chemical abortion is the usual method, the drug **mifepristone** is usually the only legal method although research has uncovered similar effects from **methotrexate** and **misoprostol**. Concurrent with chemical abortion and extending up until around the fifteenth week **suction-aspiration** or vacuum abortion is the most common approach, replacing the more risky **dilation and curettage** (D & C). From the fifteenth week up until around the eighteenth week a surgical **dilation and evacuation** (D & E) is used.

As the fetus size increases other techniques must be used to secure abortion in the third trimester, premature expulsion of the fetus can be induced with **prostaglandin**, this can be coupled with injecting the amniotic fluid with saline or urea solution. Very late abortions can be brought about by the controversial **intact dilation and extraction** (D & X) or a **hysterotomy abortion**, similar to a **caesarian section**.

The controversy

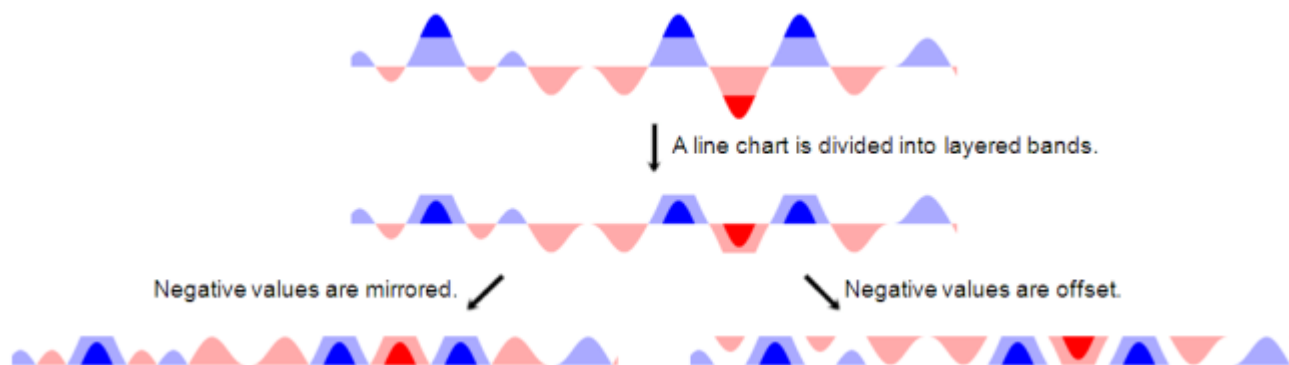
The morality and legality of abortion is a large and important topic in **applied ethics** and is also discussed by **legal scholars** and **religious people**. Important facts about abortion are also researched by **sociologists** and **historians**.

Abortion has been common in most societies, although it has often been opposed by some institutionalized religions and governments. In 20th century politics in the United States and Europe, abortion became commonly accepted by the end of the 20th century. Additionally, abortion is legal and accepted in China, India and other populous countries. The Catholic Church remains opposed to the procedure, however, and in other countries, notably the United States and the (predominantly Catholic) Republic of Ireland, the controversy is still extremely active, to the extent that even the names of the respective positions are subject to heated debate. While those on both sides of the argument are generally peaceful, if heated, in their advocacy of their positions, the debate is sometimes characterized by violence. Though true of both sides, this is more marked on the side of those opposed to abortion, because of what they see as the gravity and urgency of their views.

The central question

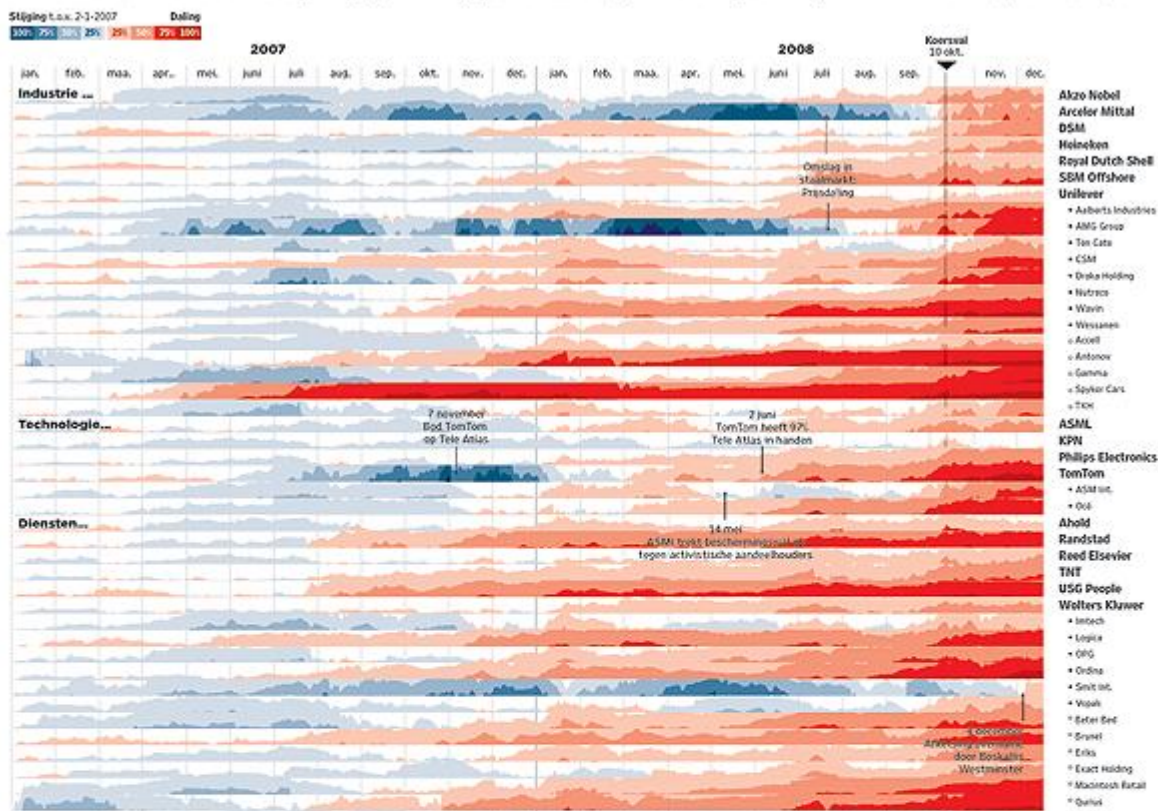
The central question in the abortion debate is a clash of presumed or perceived rights. On the one hand, is a fetus (sometimes called the "unborn" by pro-life/anti-abortion advocates) a human being with a right to life, and if so, at what point in the





Hoe de kredietcrisis de beurs besmette

De kredietcrisis heeft alle fondsen in de AEX, Midcap (*) en Smallcap (o) zonder uitzondering getroffen. Ten opzichte van 2 januari 2007 scoren vandaag alle fondsen lager



Stelling:

Oneens

Neutraal

Eens

SLEEP
STELLINGEN
HIERHEEN

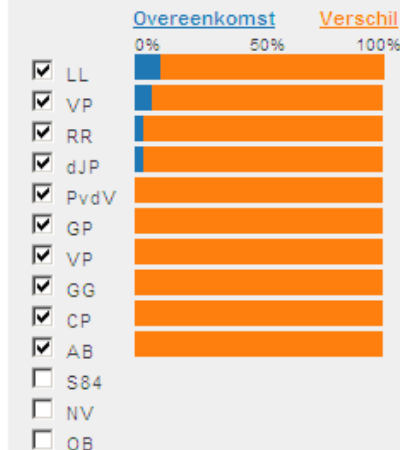
SLEEP
STELLINGEN
HIERHEEN


Unieke overeenkomst

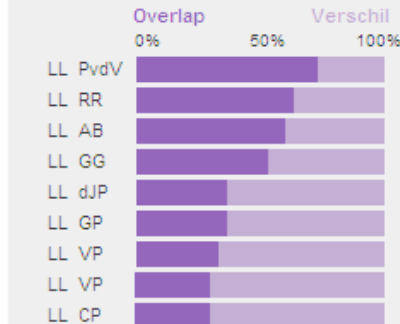
Kan nog niet worden bepaald

[Hoe wordt dit bepaald?](#)

Overeenkomst met jouw keuze



Onderlinge partijoverlap



Logisch Links

Credits & Resources

- HansPeter Phister for slides inspiration: <http://www.cs171.org/>
- Stephen Few for Dashboard & redesigns: <http://www.perceptualedge.com>
- Christopher G. Healy for Change Blindness & Preattentive Variables: <http://www.csc.ncsu.edu/faculty/healey/PP/>
- Hans Rosling from Gapminder: http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html
<http://www.gapminder.org/>
- Protovis: <http://vis.stanford.edu/protovis/>
- Polymaps: <http://www.polymaps.org/>
- Processing: <http://processing.org/>
- Processing.js: <http://processingjs.org/>
- Spde: <http://technically.us/spde/About>
- Tableau Public: <http://www.tableausoftware.com/public/>
- Oakland Crime Spotting & Cab Spotting by Stamen Design: <http://www.stamen.com/>
- “Good Morning” & Haiti Earthquake Aid in Avatar Minutes by Jer Thorp: <http://blog.blprnt.com/>
- House of Cards video clip for Radiohead by Aaron Koblin: <http://www.aaronkoblin.com/>
- Wikipedia history flow by Martin Wattenberg & Fernanda Viegaz: <http://www.bewitched.com/> <http://fernandaviegas.com/>
- Map of USA by Ben Fry: <http://benfry.com/>
- “Hoe de kredietcrisis de beurs besmette by Frédérik Ruys: <http://www.vizualism.com/>
- StemBesef by Jan Willem Tulp: <http://www.janwillemtulp.com/stembesef>