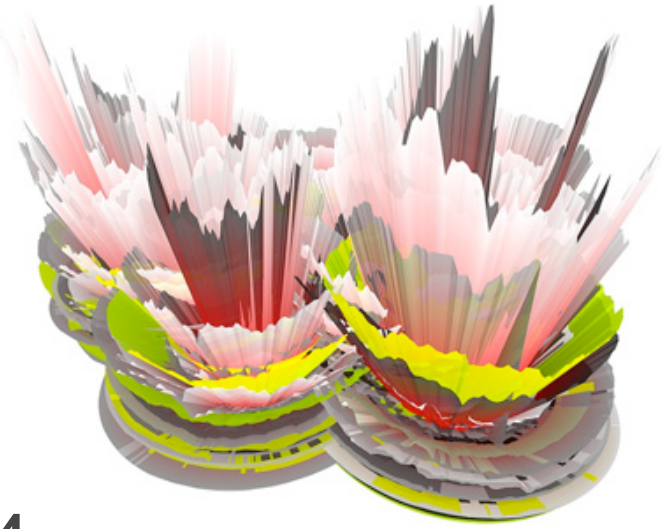
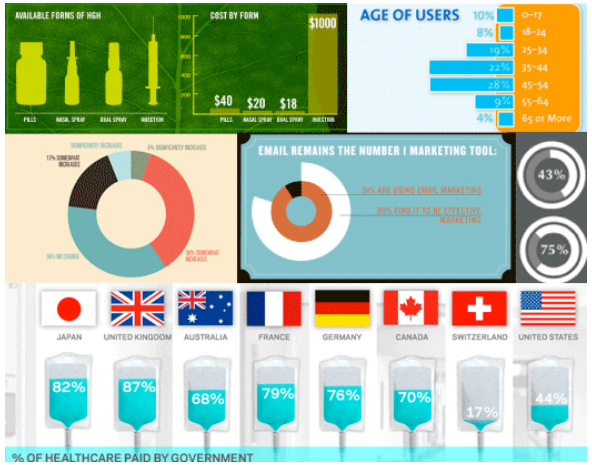




IAT 814
VIsualization

Getting to Design

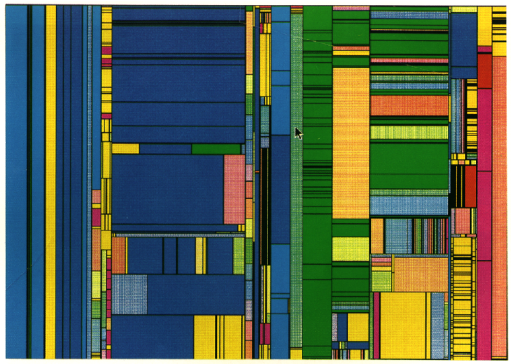


Fig. 4. 850 files at four levels with color coding by tile type. File name pops up when cursor rests on a file.

Lyn Bartram

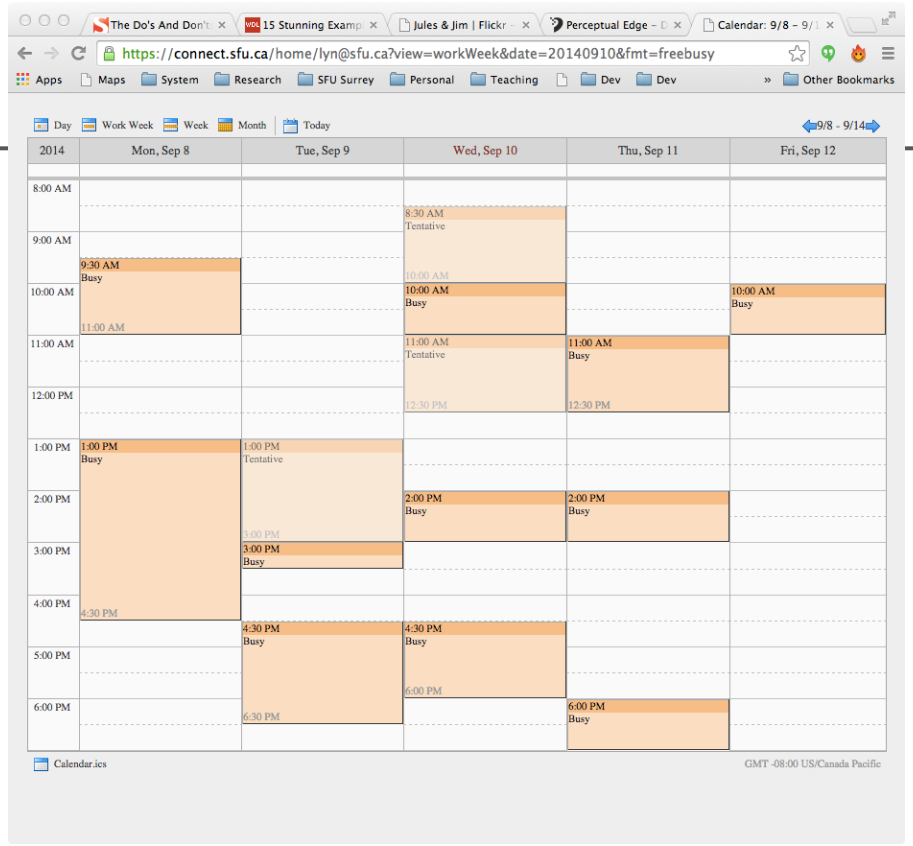
SFU

Administrivia: Assignment 1

- Visualization in practice
- Find one good and one bad example
- Put on Canvas discussion
- Present BRIEFLY in class
- We'll need to run over
- We will revisit these choices later!

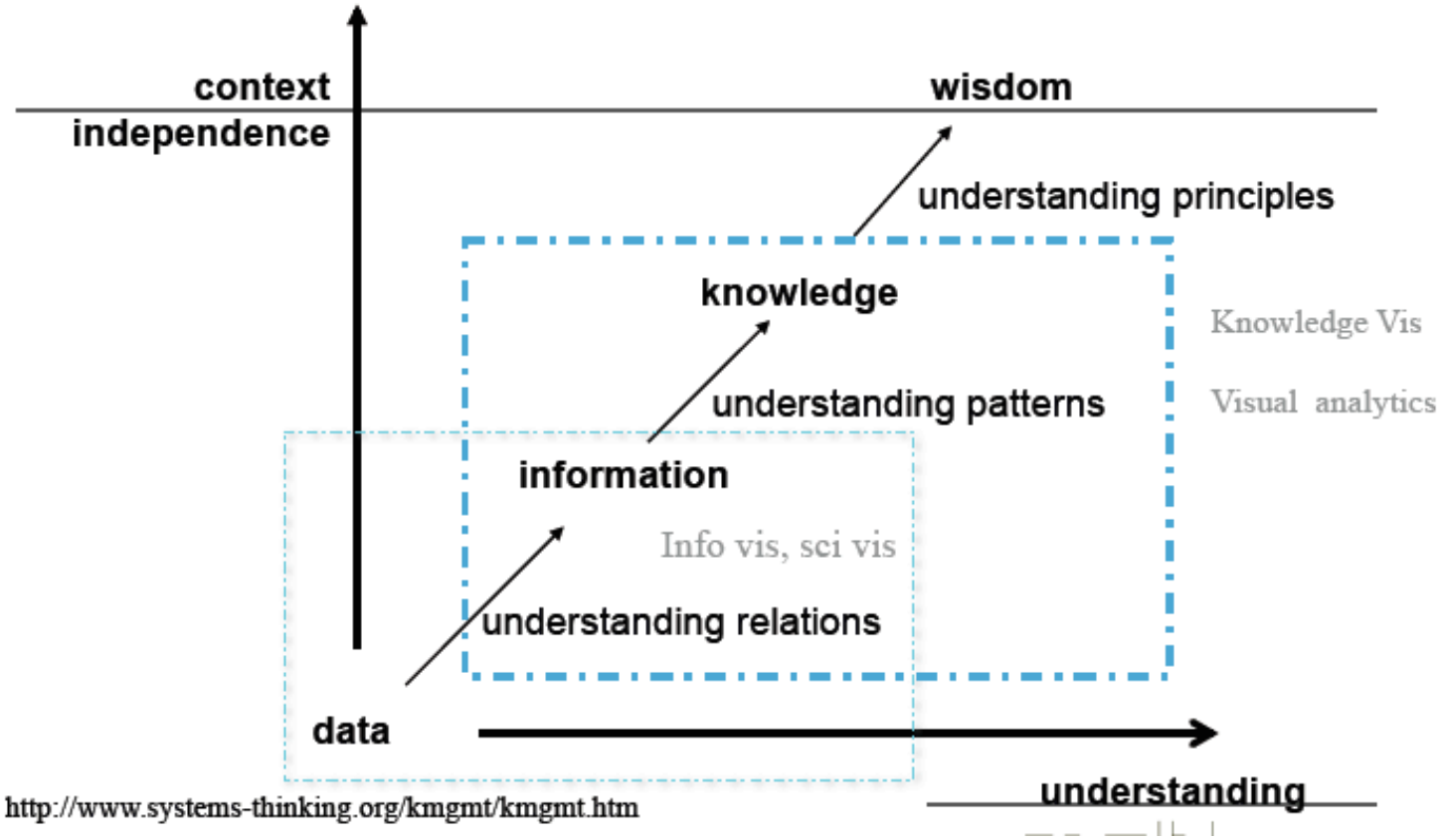
Administrivia 2

WHEN YOU WANT
TO MEET WITH ME



https://connect.sfu.ca/home/lyn@sfu.ca?fmt=freebusy

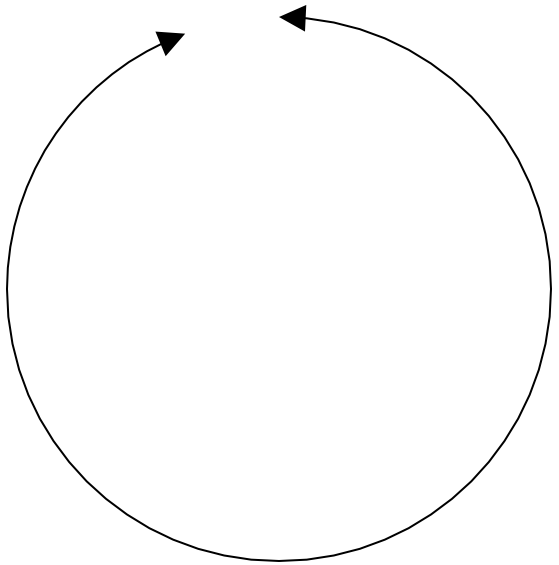
The desired progression



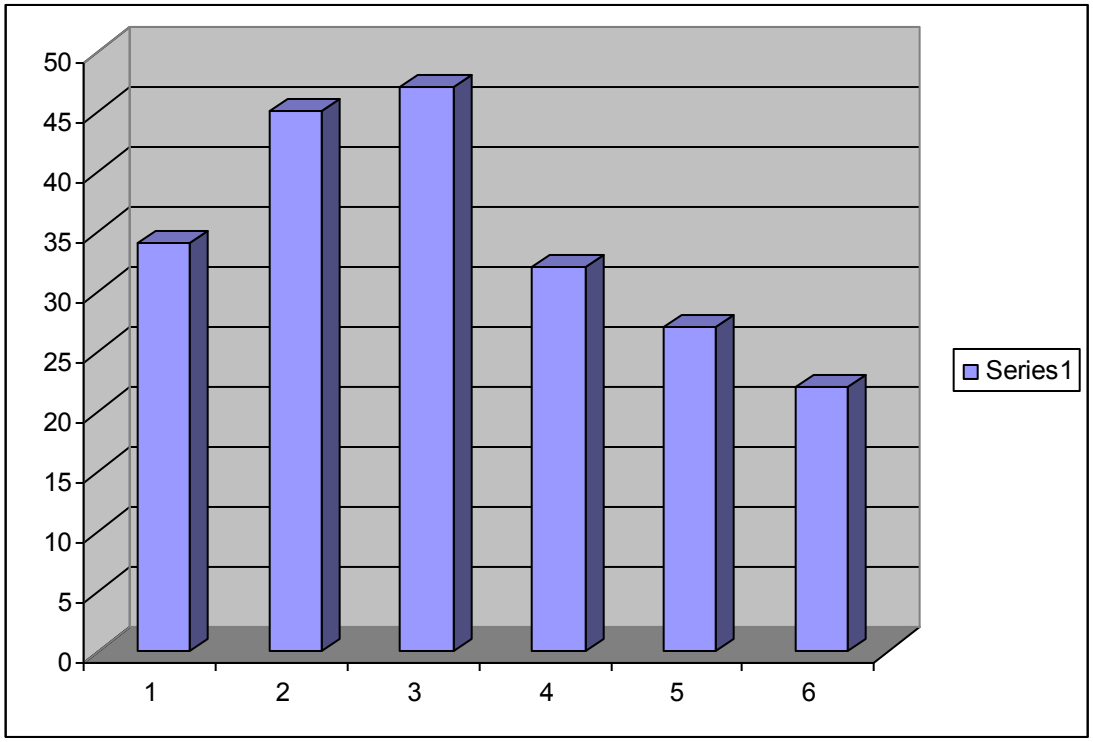
Another way of looking at it ….

The value of visualization

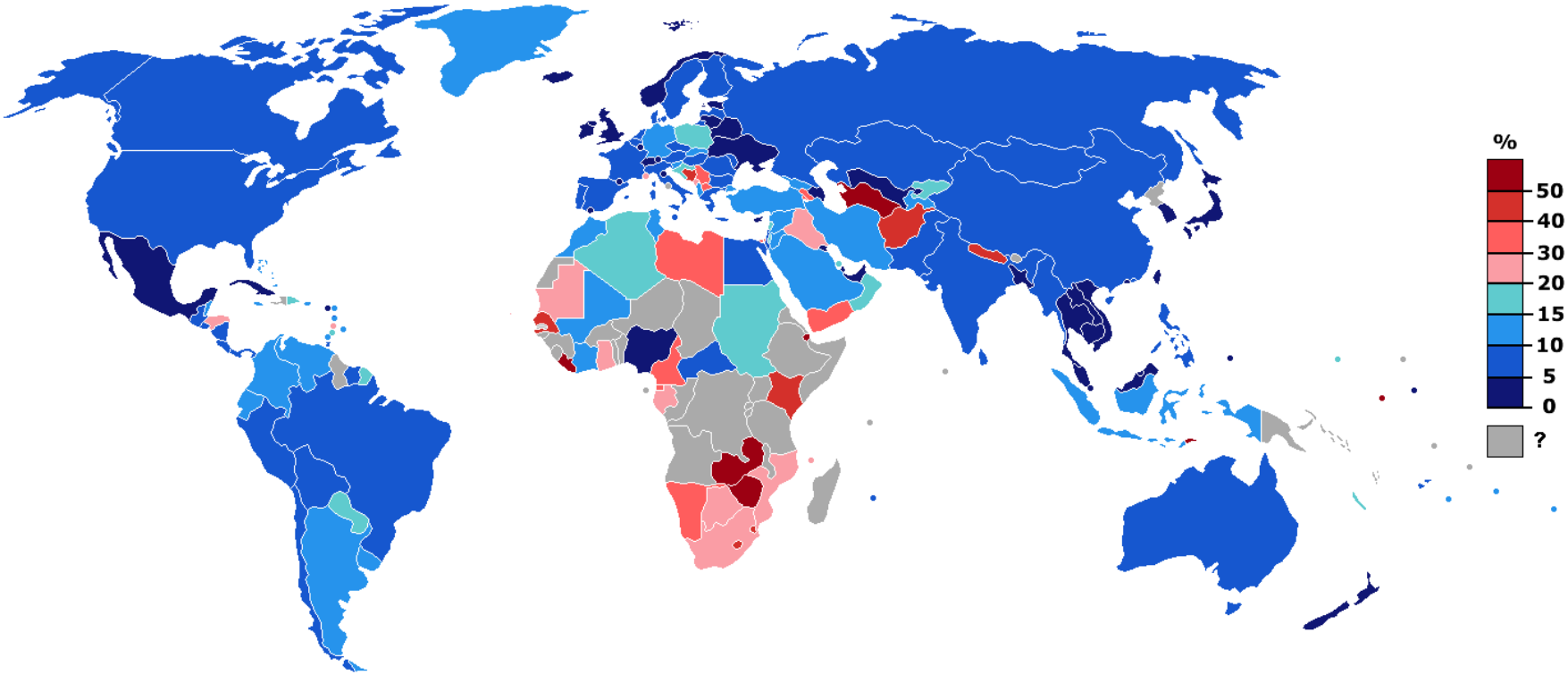
- Capture information
  - Blueprints, photographs, sensors, seismographs, maps… metadata!
- Analyse data to support reasoning
  - Develop and test hypotheses
  - Discover errors
  - Find patterns
  - Expand memory
- Communicate
  - Share, persuade, educate

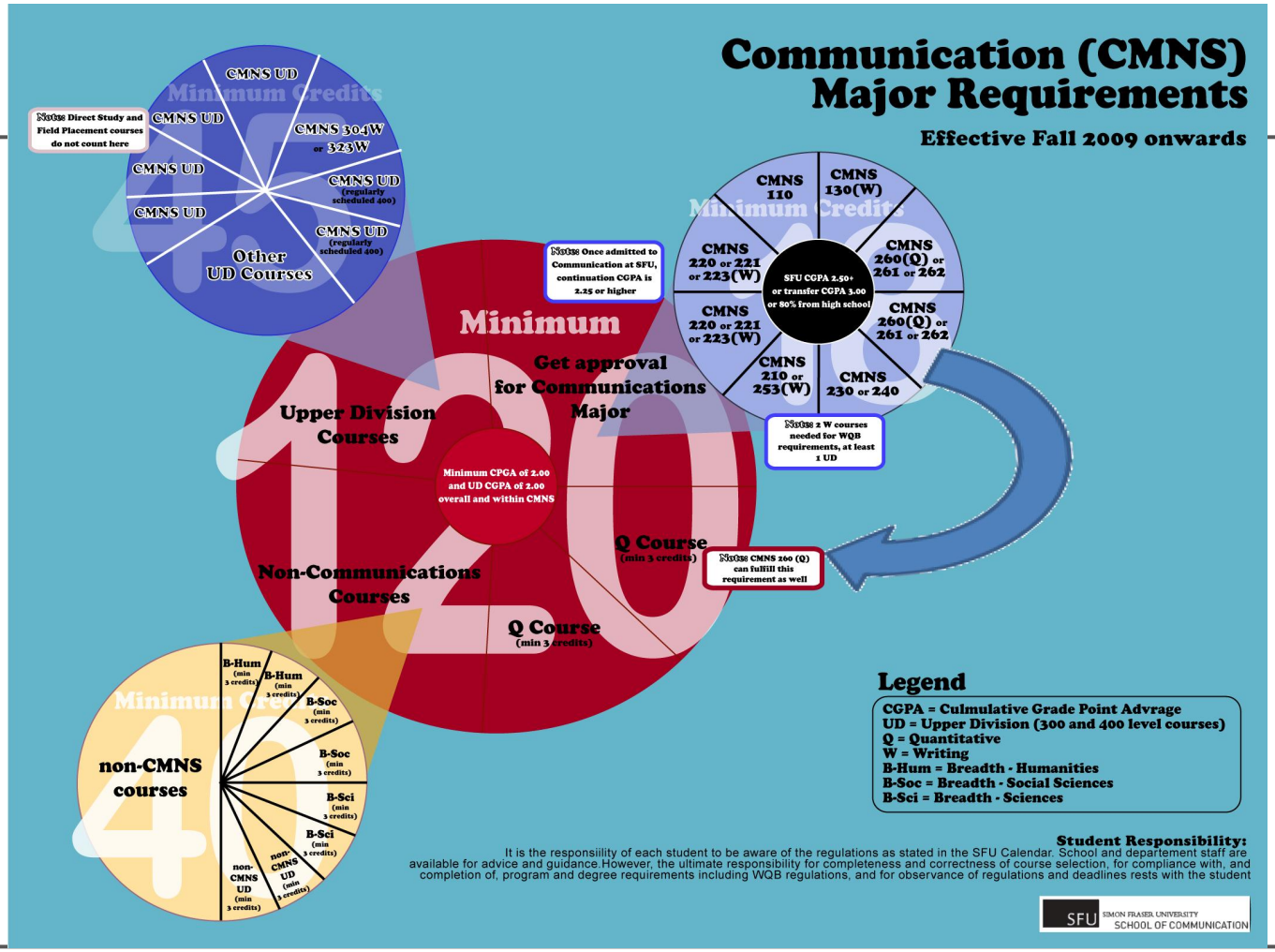


Excel

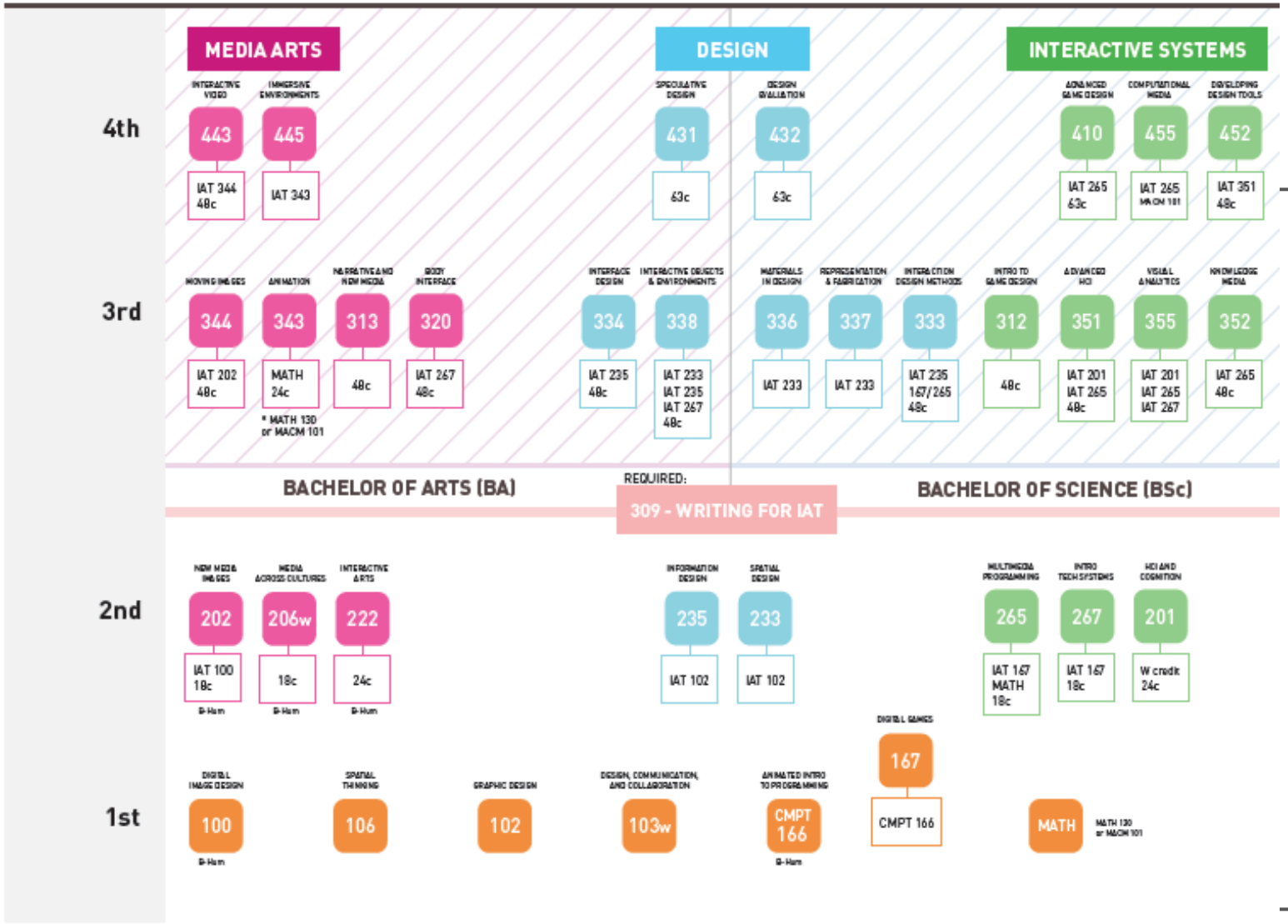


Unemployment rates




Communication (CMNS) Major Requirements
Effective Fall 2009 onwards
Minimum Credits
120
Minimum
Upper Division Courses
Non-Communications Courses
Get approval for Communications Major
Minimum CPGA of 2.00 and UD CGPA of 2.00 overall and within CMNS
Note: Once admitted to Communication at SFU, continuation CGPA is 2.25 or higher
Note: Direct Study and Field Placement courses do not count here
CMNS UD
CMNS UD
CMNS 304W or 323W
CMNS UD (regularly scheduled 400)
CMNS UD (regularly scheduled 400)
CMNS UD
CMNS UD
Other UD Courses
CMNS 110
CMNS 130(W)
CMNS 260(Q) or 261 or 262
CMNS 260(Q) or 261 or 262
CMNS 230 or 240
CMNS 210 or 253(W)
CMNS 220 or 221 or 223(W)
CMNS 220 or 221 or 223(W)
SFU CGPA 2.50+ or transfer CGPA 3.00 or 80% from high school
Note: 2 W courses needed for WQB requirements, at least 1 UD
Q Course (min 3 credits)
Note: CMNS 260 (Q) can fulfill this requirement as well
Q Course (min 3 credits)
non-CMNS courses
B-Hum (min 3 credits)
B-Hum (min 3 credits)
B-Soc (min 3 credits)
B-Soc (min 3 credits)
B-Sci (min 3 credits)
B-Sci (min 3 credits)
non-CMNS UD (min 3 credits)
non-CMNS UD (min 3 credits)
Legend
CGPA = Culmulative Grade Point Advrage
UD = Upper Division (300 and 400 level courses)
Q = Quantitative
W = Writing
B-Hum = Breadth - Humanities
B-Soc = Breadth - Social Sciences
B-Sci = Breadth - Sciences
Student Responsibility:
It is the responsiility of each student to be aware of the regulations as stated in the SFU Calendar. School and departement staff are available for advice and guidance.However, the ultimate responsibility for completeness and correctness of course selection, for compliance with, and completion of, program and degree requirements including WQB regulations, and for observance of regulations and deadlines rests with the student
SFU SIMON FRASER UNIVERSITY SCHOOL OF COMMUNICATION

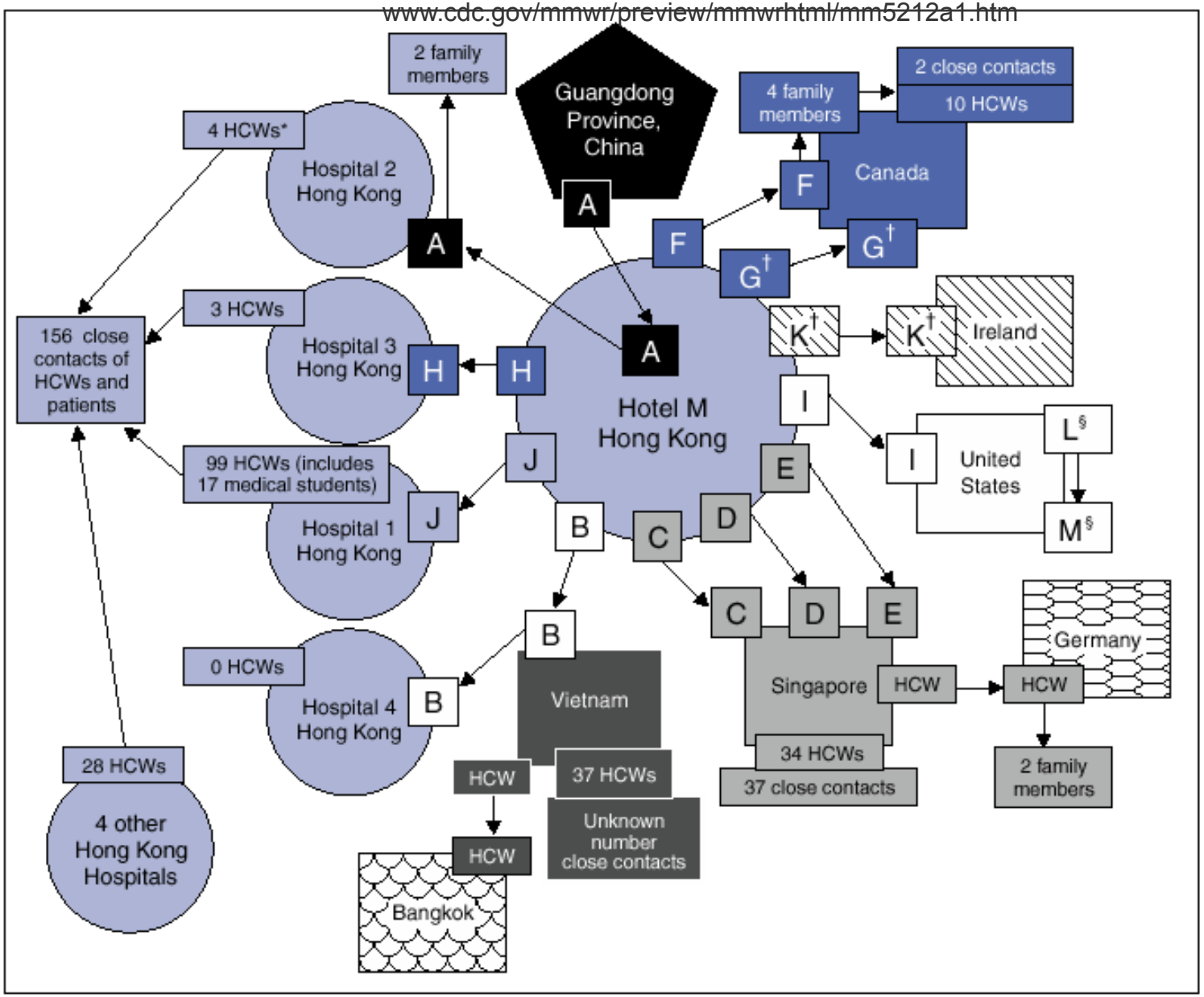
SCHOOL OF INTERACTIVE ARTS & TECHNOLOGY PRE-REQUISITE MAP



SARS

FIGURE 1. Chain of transmission among guests at Hotel M — Hong Kong, 2003

www.cdc.gov/mmwr/preview/mmwrhtml/mm5212a1.htm



† All guests except G and K stayed on the 9th floor of the hotel. Guest G stayed on the 14th floor, and Guest K stayed on the 11th floor.
§ Guests L and M (spouses) were not at Hotel M during the same time as index Guest A but were at the hotel during the same times as Guests G, H, and I, who were ill during this period.

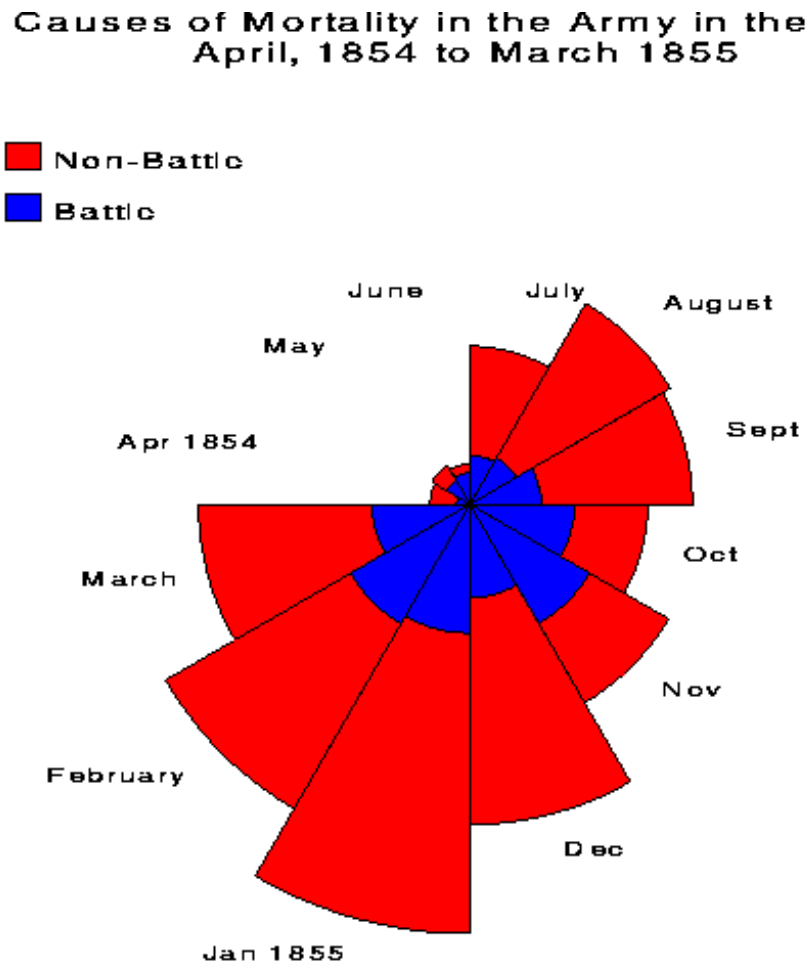
Train Schedule

Pied-mont	Palmetto	Caro-linian	Silver Star	Silver Meteor	Crescent	◄ Train Name ►			Silver Meteor	Crescent	Silver Star	Caro-linian	Palmetto	Pied-mont
73	89	79	91	97	19	◄ Train Number ►			98	20	92	80	90	74
Daily	Daily	Daily	Daily	Daily	Daily	◄ Days of Operation ►			Daily	Daily	Daily	Daily	Daily	Daily
						◄ On Board Service ►								
Read Down						Mile			Read Up					
	R 67	R 67	R95/R195	R93/83/161	R93/83/161			Connecting Train Number	R172/R164	R88/R176	R194/R94	R66	R66	
	9 45P	9 45P	6 05A	9 35A	9 35A	0	Dp	Boston, MA–South Sta. (ET)	Ar	3 15P	7 05P	9 05P	7 52A	7 52A
	R 9 50P	R 9 50P	R 6 10A	R 9 40A	R 9 40A	1		Boston, MA–Back Bay Sta.		D 3 10P	7 00P	D 9 00P	D 7 47A	D 7 47A
	R10 00P	R10 00P	R 6 20A	R 9 51A	R 9 51A	11		Route 128, MA		D 3 00P	6 49P	D 8 49P	D 7 30A	D 7 30A
	10 25P	10 25P	6 55A	10 16A	10 16A	43		Providence, RI		2 27P	6 18P	8 19P	7 04A	7 04A
	12 26A	12 26A	8 45A	12 11P	12 11P	156		New Haven, CT		12 36P	4 36P	6 33P	4 55A	4 55A
	1 12A	1 12A	9 28A	12 56P	12 56P	195		Stamford, CT	Ar	11 48A	3 48P	5 48P	4 04A	4 04A
	2 01A	2 01A	10 20A	1 50P	1 50P	231	Ar	New York, NY–Penn Sta.	Dp	11 00A		5 00P	3 15A	3 15A
	7 00A	7 00A	2 00P	5 20P	5 20P	456	Ar	Washington, DC	Dp	7 25A	11 25A	1 25P	10 00P	10 00P
	6 15A	7 15A	11 08A	3 15P	2 15P	0	Dp	New York, NY–Penn Sta.	Ar	10 30A	2 02P	3 43P	8 58P	10 56P
	R 6 31A	R 7 36A	R11 30A	R 3 38P	R 2 37P	10		Newark, NJ–Penn Sta.		D10 10A	D 1 43P	D 3 20P	D 8 37P	D10 35P
	R 7 05A	8 13A	R12 10P	R 4 18P	R 3 15P	58		Trenton, NJ		D 9 30A	D 1 03P	D 2 42P	D 7 55P	D 9 58P
	R 7 36A	8 48A	R12 45P	R 4 55P	R 3 55P	91		Philadelphia, PA–30th St. Sta.		D 8 55A	D12 25P	D 2 07P	D 7 22P	D 9 23P
	R 8 01A	9 11A	R 1 10P	R 5 20P	R 4 19P	116		Wilmington, DE		D 8 30A	D12 01P	D 1 42P	D 6 57P	D 8 57P
	R 8 51A	9 58A	R 2 00P	R 6 15P	R 5 17P	185		Baltimore, MD–Penn Sta.	Ar	D 7 40A	D11 12A	D12 51P	D 6 05P	D 8 06P
	R 9 54A	10 55A	R 3 05P	R 7 30P	R 6 30P	225	Ar Dp	Washington, DC Charlottesville—see right	Dp Ar	D 6 32A	D10 10A	D11 53A	D 5 08P	D 7 05P
	10 11A	11 12A	3 25P	R 7 50P	6 49P	234		Alexandria, VA		D 5 41A	D 9 43A	D11 09A	4 32P	6 20P
					7 22P	258		Manassas, VA			8 46A			
					7 55P	293		Culpeper, VA			8 12A			
					8 52P	338		Charlottesville, VA			7 20A			
					10 06P	398		Lynchburg, VA			6 07A			
					11 14P	461		Danville, VA			4 57A			
		11 39A				260		Quantico, VA				4 01P		
		11 57A				280		Fredericksburg, VA				3 41P		
	11 49A 11 59A	1 02P 1 10P	5 09P 5 19P	9 40P 9 50P		334	Ar Dp	Richmond, VA–Staples Mill Rd.	Dp Ar	4 00A 3 50A		D 9 18A	2 46P 2 39P	4 40P 4 30P
	12 29P	1 43P	5 57P	10 24P		362		Petersburg, VA	Dp	3 07A		8 29A	1 54P	3 51P
	1 56P	3 13P	7 29P	11 56P		460		Rocky Mount, NC		1 43A		7 01A	12 30P	2 29P
	2 14P	3 32P				476		Wilson, NC					12 10P	2 11P
	2 41P	4 03P				502		Selma-Smithfield, NC					11 41A	1 39P
7 05A		4 42P 4 50P	9 13P			531	Dp	Raleigh, NC	Dp			5 40A	11 06A 10 58A	8 40P
7 16A		5 03P	9 27P			540		Cary, NC				5 11A	10 43A	8 21P
7 35A		5 24P				557		Durham, NC					10 23A	8 02P
8 11A		6 01P				591		Burlington, NC					9 43A	7 26P
8 35A		6 32P			12 15A 12 22A	615	Ar Dp	Greensboro, NC Winston-Salem—see right	Dp Ar		3 58A 3 51A		9 21A	7 05P
8 52A		6 49P			12 39A	628		High Point, NC			3 30A		8 58A	6 45P
9 26A		7 25P			1 17A	662		Salisbury, NC			2 49A		8 25A	6 13P
9 42A		7 42P				677		Kannapolis, NC					8 07A	5 57P
10 14A		8 14P			2 20A	704	Ar	Charlotte, NC	Dp		2 03A		7 40A	5 30P
	3 27P			1 29A		550	Dp	Fayetteville, NC	Ar	11 59P				12 54P
	4 14P					603	Dp	Dillon, SC	Ar					12 05P
	5 06P 5 11P			3 20A 3 28A		633	Ar Dp	Florence, SC (Myrtle Beach)	Dp Ar	10 41P 10 31P				11 31A 11 26A
	5 47P			4 05A		672		Kingstree, SC		9 38P				10 40A
	6 46P			5 06A		728		Charleston, SC		8 44P				9 44A
	7 35P			5 56A		782		Yemassee, SC		7 48P				8 48A
			10 39P			599		Southern Pines, NC (Pinehurst)				4 02A		
			11 21P			628		Hamlet, NC				3 25A		
			12 50A			701		Camden, SC				1 53A		
			1 44A			734		Columbia, SC				1 12A		
			2 41A			784		Denmark, SC				11 57P		
	8 34P		4 29A 4 34A	6 44A 6 50A		829 *871	Ar Dp	Savannah, GA (*mileage via Columbia)	Dp Ar	6 59P 6 53P		10 34P 10 28P		8 00A
				7 44A		881	Dp	Jesup, GA (Brunswick)	Ar	5 59P				

Continuation of service to/from Florida continues at right

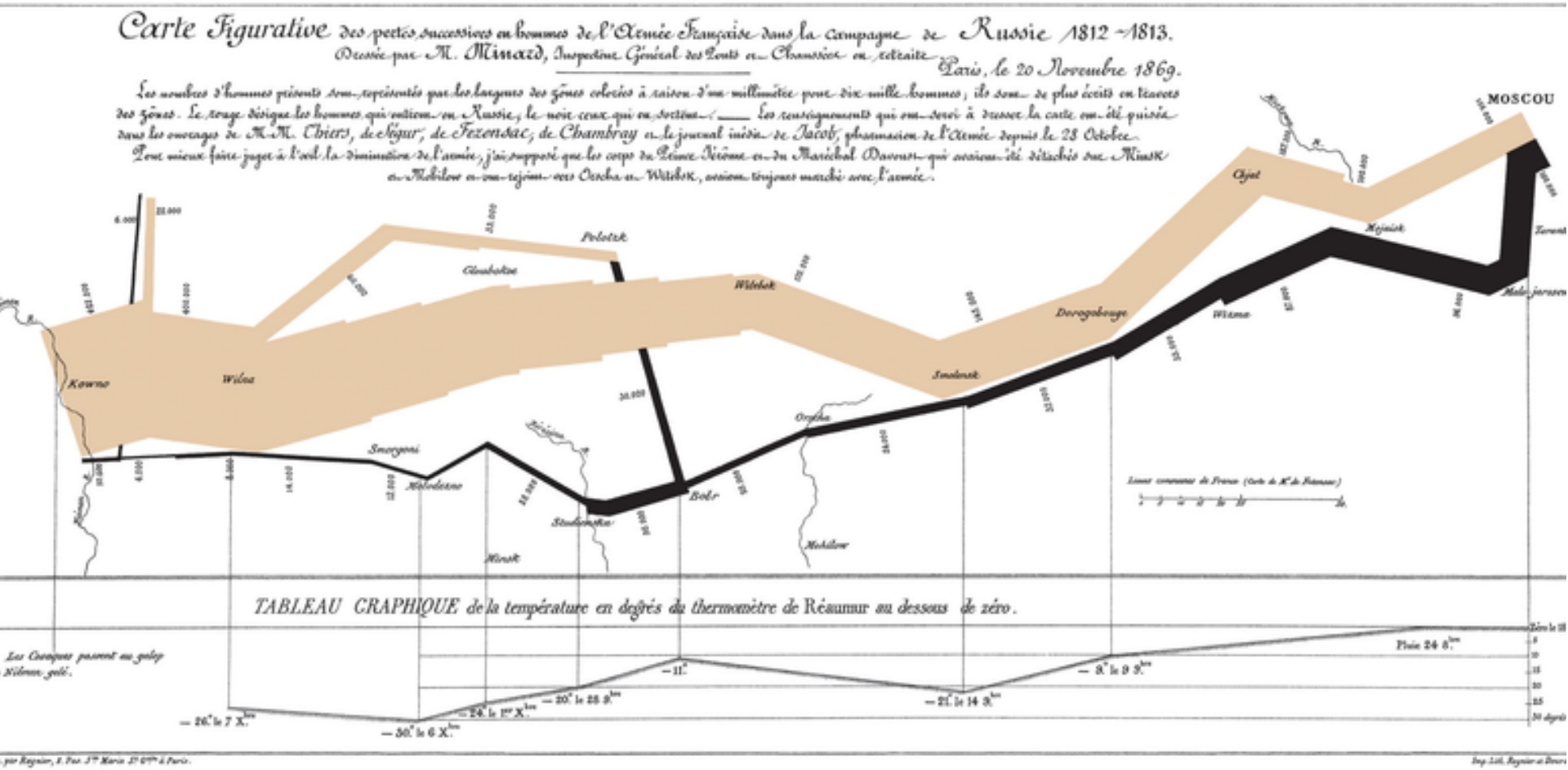
SFU

Nightingale's Coxcomb



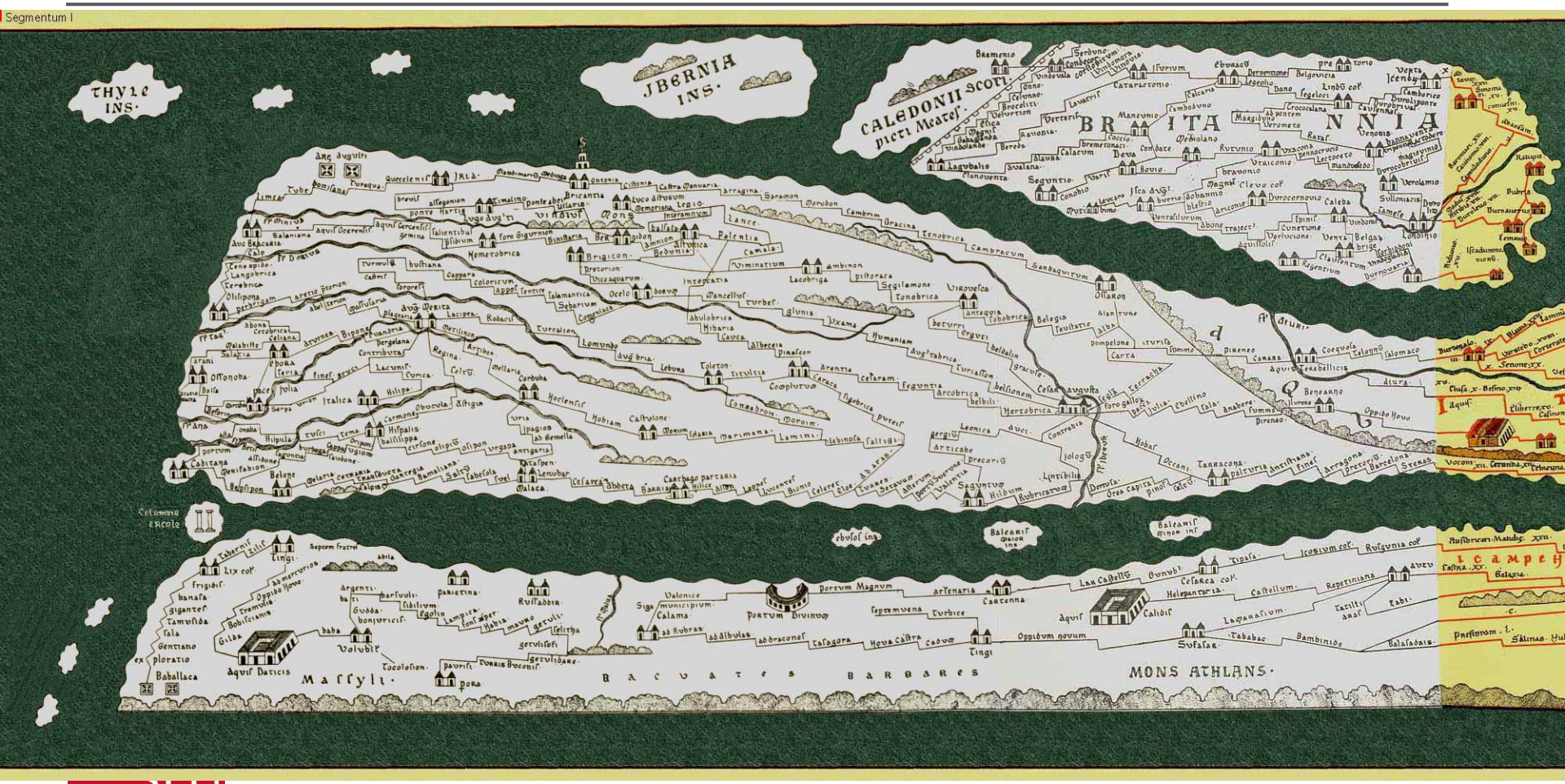
From: F. Nightingale, "Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army", 1858

Napoleon's Invasion of Russia



Mediaeval Europe

Tabula Peutingeriana, road map of ancient Rome

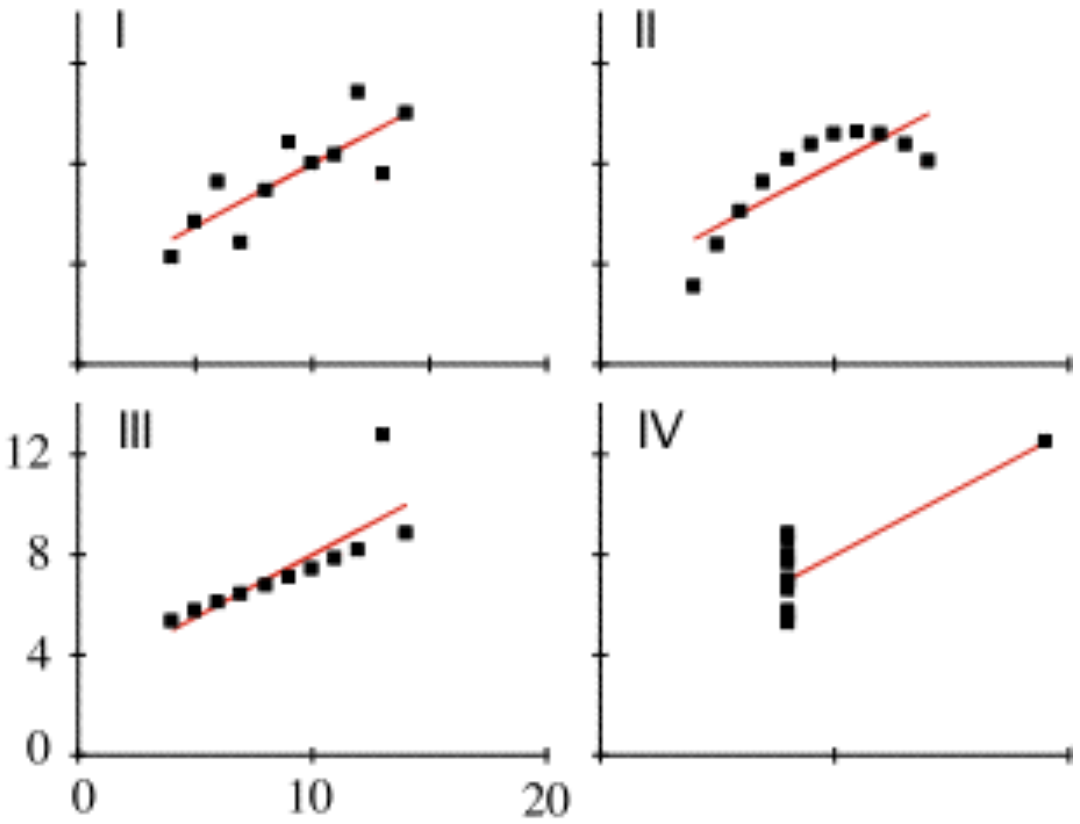


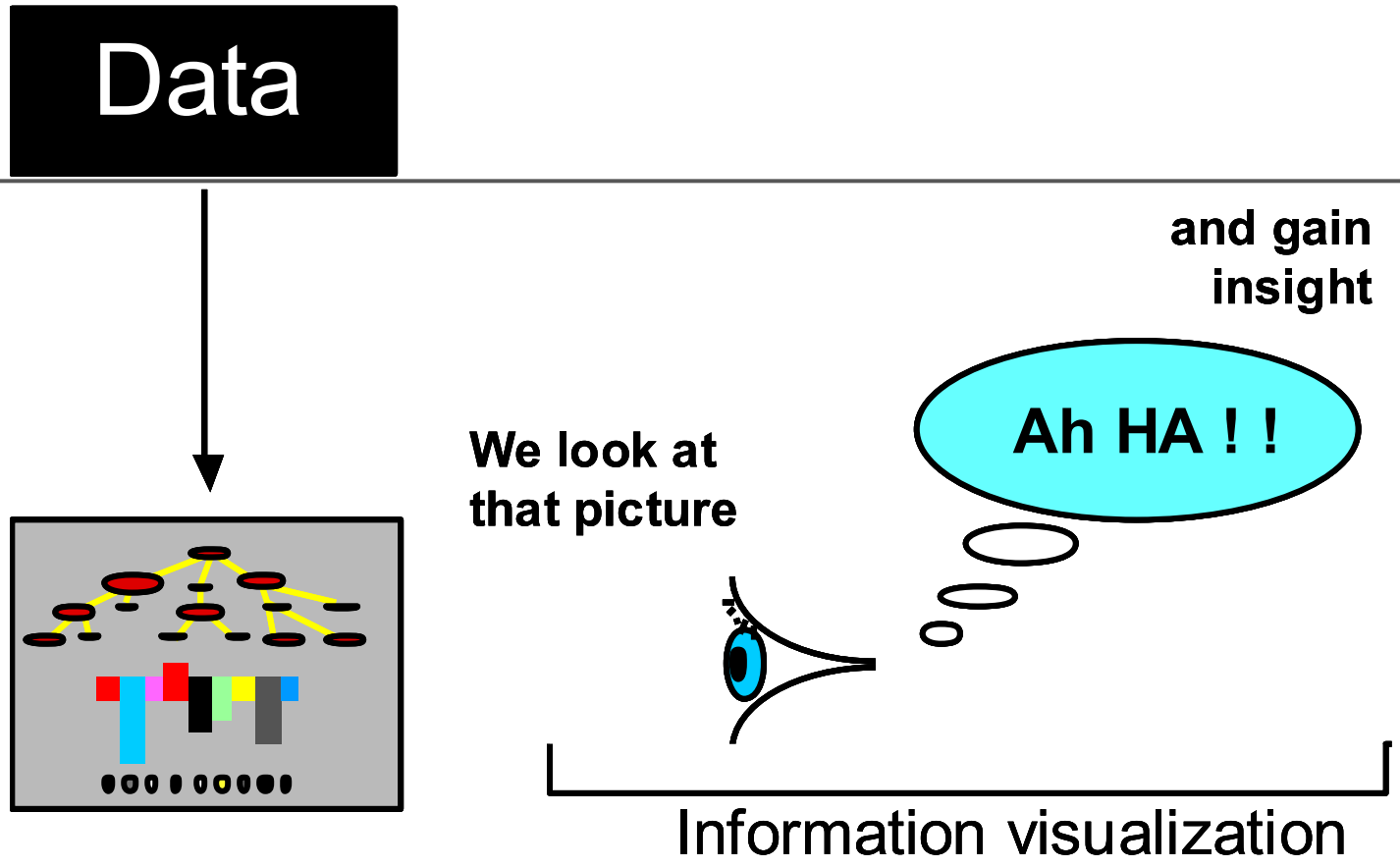
- Portray data, usually abstract data
- Use visual features to represent properties, quantities, attributes
  - Explicitly
  - derived
- Give rise to *emergent features*

Review: why it helps

- Mean of the x values = 9.0
- Mean of the y values = 7.5
- Equation of the least-squared regression line: 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

What the data look like …





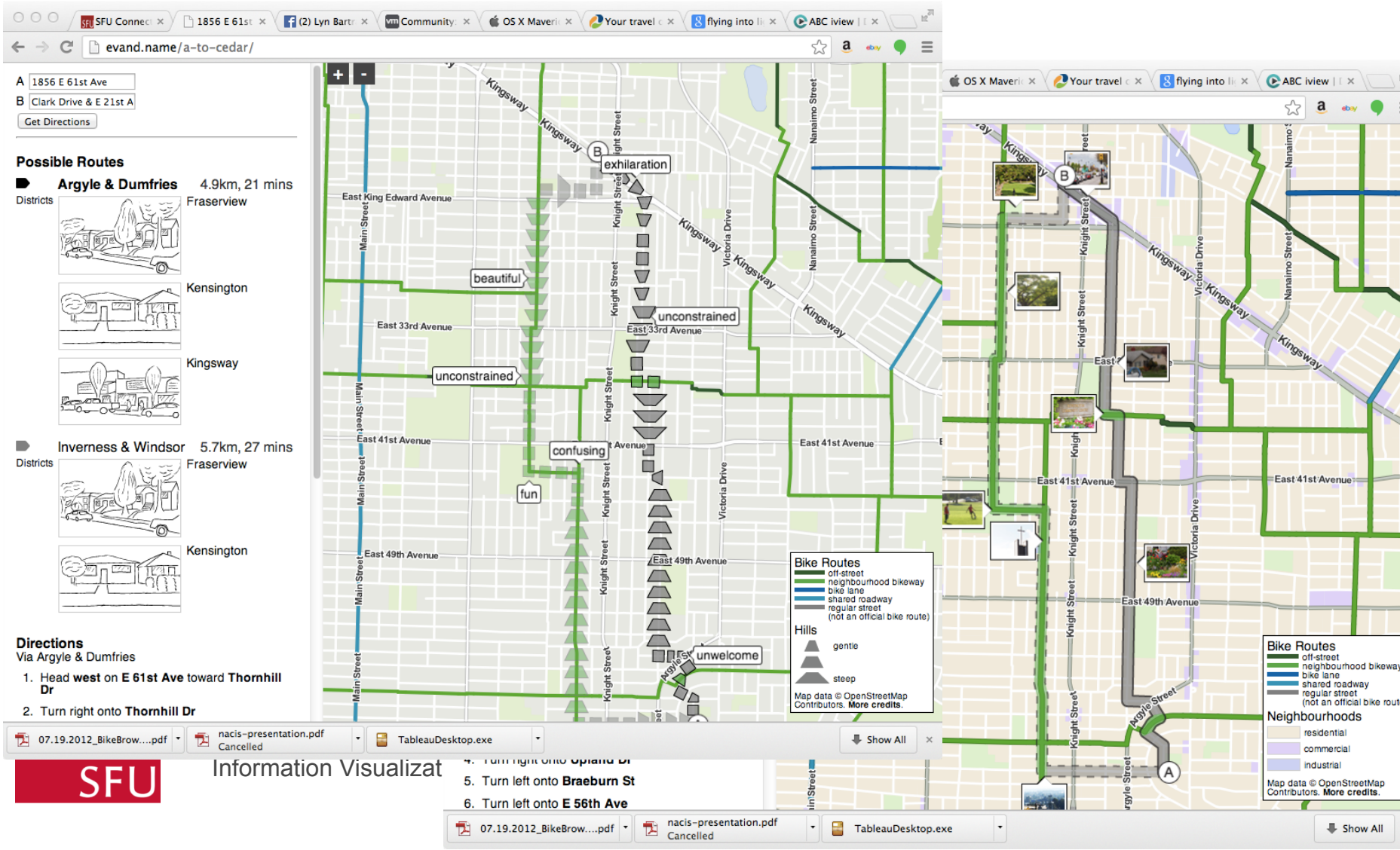
The process of information visualization. Graphically encoded data is viewed in order to form a **mental model** of that data

Recall: Why do we create visualizations

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

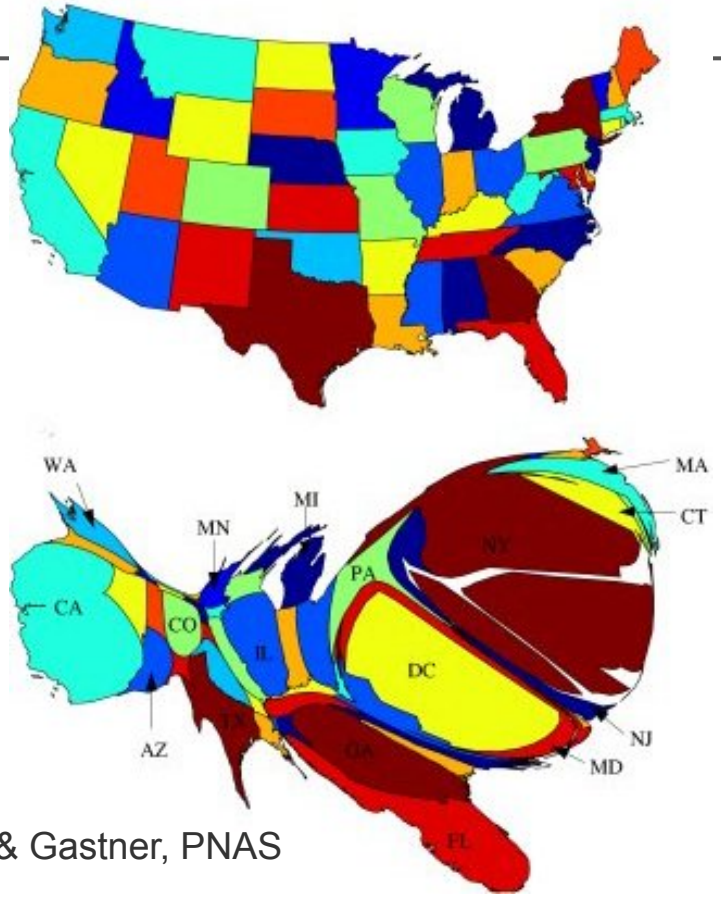
Organize and capture information

Combine different data sources



Answer (and discover) questions

- Where do the most news stories originate?
- Inspire!



Newman & Gastner, PNAS

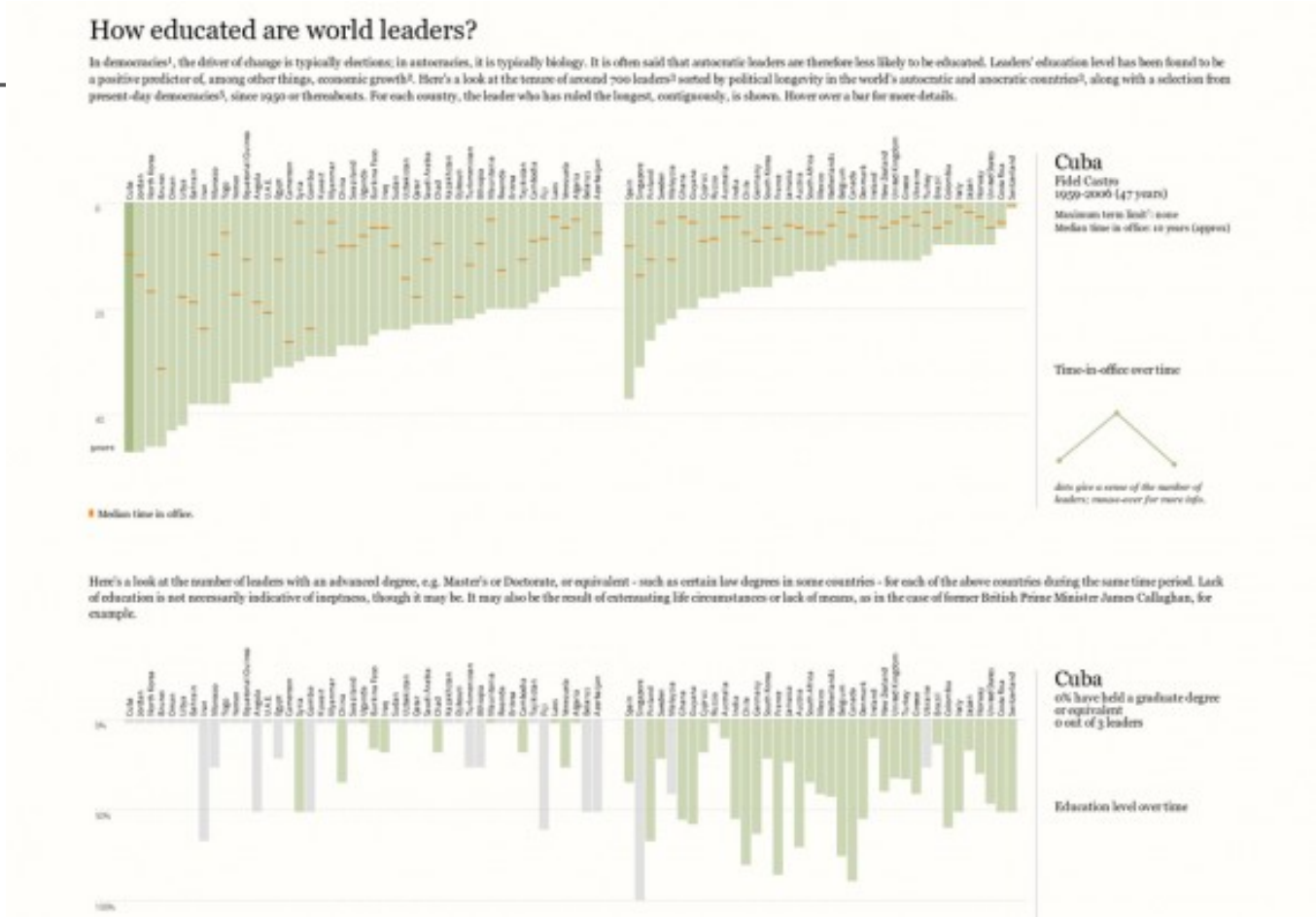
Make decisions/expand memory

- Train schedule

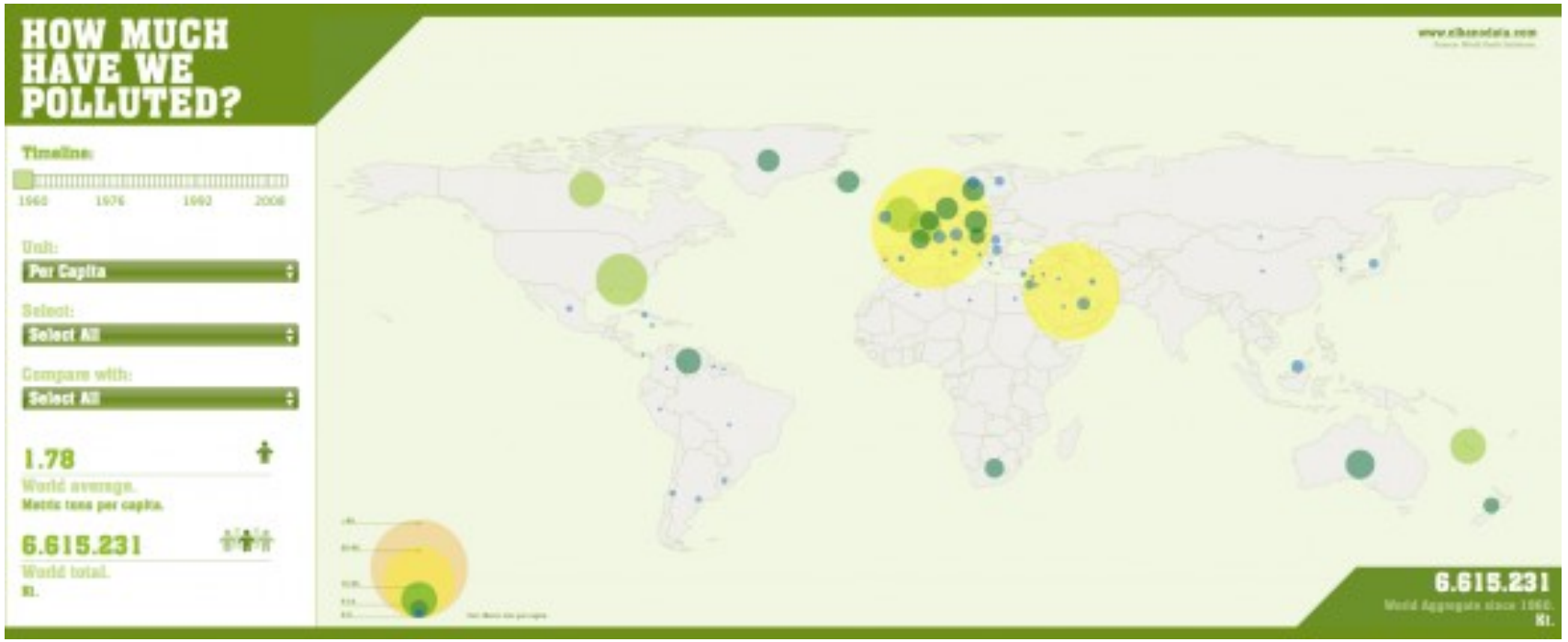
Pied-mont	Palmetto	Caro-linian	Silver Star	Silver Meteor	Crescent	◄ Train Name ►			Silver Meteor	Crescent	Silver Star	Caro-linian	Palmetto	Pied-mont
73	89	79	91	97	19	◄ Train Number ►			98	20	92	80	90	74
Daily	Daily	Daily	Daily	Daily	Daily	◄ Days of Operation ►			Daily	Daily	Daily	Daily	Daily	Daily
						◄ On Board Service ►								
Read Down						Mile			Read Up					
	R 67	R 67	R95/R195	R93/83/161	R93/83/161			Connecting Train Number	Symbol		R172/R164	R88/R176	R194/R94	R66	R66	
	9 45P	9 45P	6 05A	9 35A	9 35A	0	Dp	Boston, MA–South Sta. (ET)	● ♿ 9	Ar	3 15P	7 05P	9 05P	7 52A	7 52A	
	R 9 50P	R 9 50P	R 6 10A	R 9 40A	R 9 40A	1		Boston, MA–Back Bay Sta.	● ♿		D 3 10P	7 00P	D 9 00P	D 7 47A	D 7 47A	
	R10 00P	R10 00P	R 6 20A	R 9 51A	R 9 51A	11		Route 128, MA	● ♿		D 3 00P	6 49P	D 8 49P	D 7 30A	D 7 30A	
	10 25P	10 25P	6 55A	10 16A	10 16A	43		Providence, RI	● ♿ 9		2 27P	6 18P	8 19P	7 04A	7 04A	
	12 26A	12 26A	8 45A	12 11P	12 11P	156		New Haven, CT	◑ 9		12 36P	4 36P	6 33P	4 55A	4 55A	
	1 12A	1 12A	9 28A	12 56P	12 56P	195		Stamford, CT	○ 9	Ar	11 48A	3 48P	5 48P	4 04A	4 04A	
	2 01A	2 01A	10 20A	1 50P	1 50P	231	Ar	New York, NY–Penn Sta.	● ♿ 9	Dp	11 00A		5 00P	3 15A	3 15A	
	7 00A	7 00A	2 00P	5 20P	5 20P	456	Ar	Washington, DC	● ♿ 9	Dp	7 25A	11 25A	1 25P	10 00P	10 00P	
	6 15A	7 15A	11 08A	3 15P	2 15P	0	Dp	New York, NY–Penn Sta.	● ♿ 9	Ar	10 30A	2 02P	3 43P	8 58P	10 56P	
	R 6 31A	R 7 36A	R11 30A	R 3 38P	R 2 37P	10		Newark, NJ–Penn Sta.	● ♿ 9		D10 10A	D 1 43P	D 3 20P	D 8 37P	D10 35P	
	R 7 05A	8 13A	R12 10P	R 4 18P	R 3 15P	58		Trenton, NJ	◑ ♿ 9		D 9 30A	D 1 03P	D 2 42P	D 7 55P	D 9 58P	
	R 7 36A	8 48A	R12 45P	R 4 55P	R 3 55P	91		Philadelphia, PA–30th St. Sta.	● ♿ 9		D 8 55A	D12 25P	D 3 07P	D 7 22P	D 9 23P	
	R 8 01A	9 11A	R 1 10P	R 5 20P	R 4 19P	116		Wilmington, DE	● ♿ 9		D 8 30A	D12 01P	D 3 42P	D 6 57P	D 8 57P	
	R 8 51A	9 58A	R 2 00P	R 6 15P	R 5 17P	185		Baltimore, MD–Penn Sta.	● ♿ 9	Ar	D 7 40A	D11 12A	D12 51P	D 6 05P	D 8 06P	
	R 9 54A	10 55A	R 3 05P	R 7 30P	R 6 30P	225	Ar Dp	Washington, DC Charlottesville—see right	● ♿ 9	Dp Ar	D 6 32A	D10 10A	D11 53A	D 5 08P	D 7 05P	
	10 11A	11 12A	3 25P	R 7 50P	6 49P	234		Alexandria, VA	● ♿ 9		D 5 41A	D 9 43A	D11 09A	4 32P	6 20P	
					7 22P	258		Manassas, VA	○			8 46A				
					7 55P	293		Culpeper, VA	○			8 12A				
					8 52P	338		Charlottesville, VA	● ♿			7 20A				
					10 06P	398		Lynchburg, VA	● ♿			6 07A				
					11 14P	461		Danville, VA	○			4 57A				
		11 39A				260		Quantico, VA	○					4 01P		
		11 57A				280		Fredericksburg, VA	○					3 41P		
	11 49A 11 59A	1 02P 1 10P	5 09P 5 19P	9 40P 9 50P		334	Ar Dp	Richmond, VA–Staples Mill Rd.	● ♿ 9	Dp Ar	4 00A 3 50A		D 9 18A	2 46P 2 39P	4 40P 4 30P	
	12 29P	1 43P	5 57P	10 24P		362		Petersburg, VA	◑ ♿	Dp	3 07A		8 29A	1 54P	3 51P	
	1 56P	3 13P	7 29P	11 56P		460		Rocky Mount, NC	● ♿		1 43A		7 01A	12 30P	2 29P	
	2 14P	3 32P				476		Wilson, NC	● ♿					12 10P	2 11P	
	2 41P	4 03P				502		Selma-Smithfield, NC	○					11 41A	1 39P	
7 05A		4 42P 4 50P	9 13P			531	Dp	Raleigh, NC	● ♿ 9	Dp			5 40A	11 06A 10 58A		8 40P
7 16A		5 03P	9 27P			540		Cary, NC	○ ♿				5 11A	10 43A		8 21P
7 35A		5 24P				557		Durham, NC	● ♿ 9					10 23A		8 02P
8 11A		6 01P				591		Burlington, NC	○					9 43A		7 26P
8 35A		6 32P			12 15A 12 22A	615	Ar Dp	Greensboro, NC Winston-Salem—see right	● ♿	Dp Ar		3 58A 3 51A		9 21A		7 05P
8 52A		6 49P			12 39A	628		High Point, NC	○ ♿			3 30A		8 58A		6 45P
9 26A		7 25P			1 17A	662		Salisbury, NC	○ ♿			2 49A		8 25A		6 13P
9 42A		7 42P				677		Kannapolis, NC	○					8 07A		5 57P
10 14A		8 14P			2 20A	704	Ar	Charlotte, NC	● ♿	Dp		2 03A		7 40A		5 30P
	3 27P			1 29A		550	Dp	Fayetteville, NC	● ♿	Ar	11 59P				12 54P	
	4 14P					603	Dp	Dillon, SC	○	Ar					12 05P	
	5 06P 5 11P			3 20A 3 28A		633	Ar Dp	Florence, SC (Myrtle Beach)	● ♿	Dp Ar	10 41P 10 31P				11 31A 11 26A	
	5 47P			4 05A		672		Kingstree, SC	○		9 38P				10 40A	
	6 46P			5 06A		728		Charleston, SC	● ♿		8 44P				9 44A	
	7 35P			5 56A		782		Yemassee, SC	○ ♿		7 48P				8 48A	
			10 39P			599		Southern Pines, NC (Pinehurst)	○				4 02A			
			11 21P			628		Hamlet, NC	○				3 25A			
			12 50A			701		Camden, SC	○				1 53A			
			1 44A			734		Columbia, SC	● ♿				1 12A			
			2 41A			784		Denmark, SC	○				11 57P			
	8 34P		4 29A 4 34A	6 44A 6 50A		829 *871	Ar Dp	Savannah, GA (*mileage via Columbia)	● ♿	Dp Ar	6 59P 6 53P		10 34P 10 28P		8 00A	
				7 44A		881	Dp	Jesup, GA (Brunswick)	○	Ar	5 59P					

Continuation of service to/from Florida continues at right

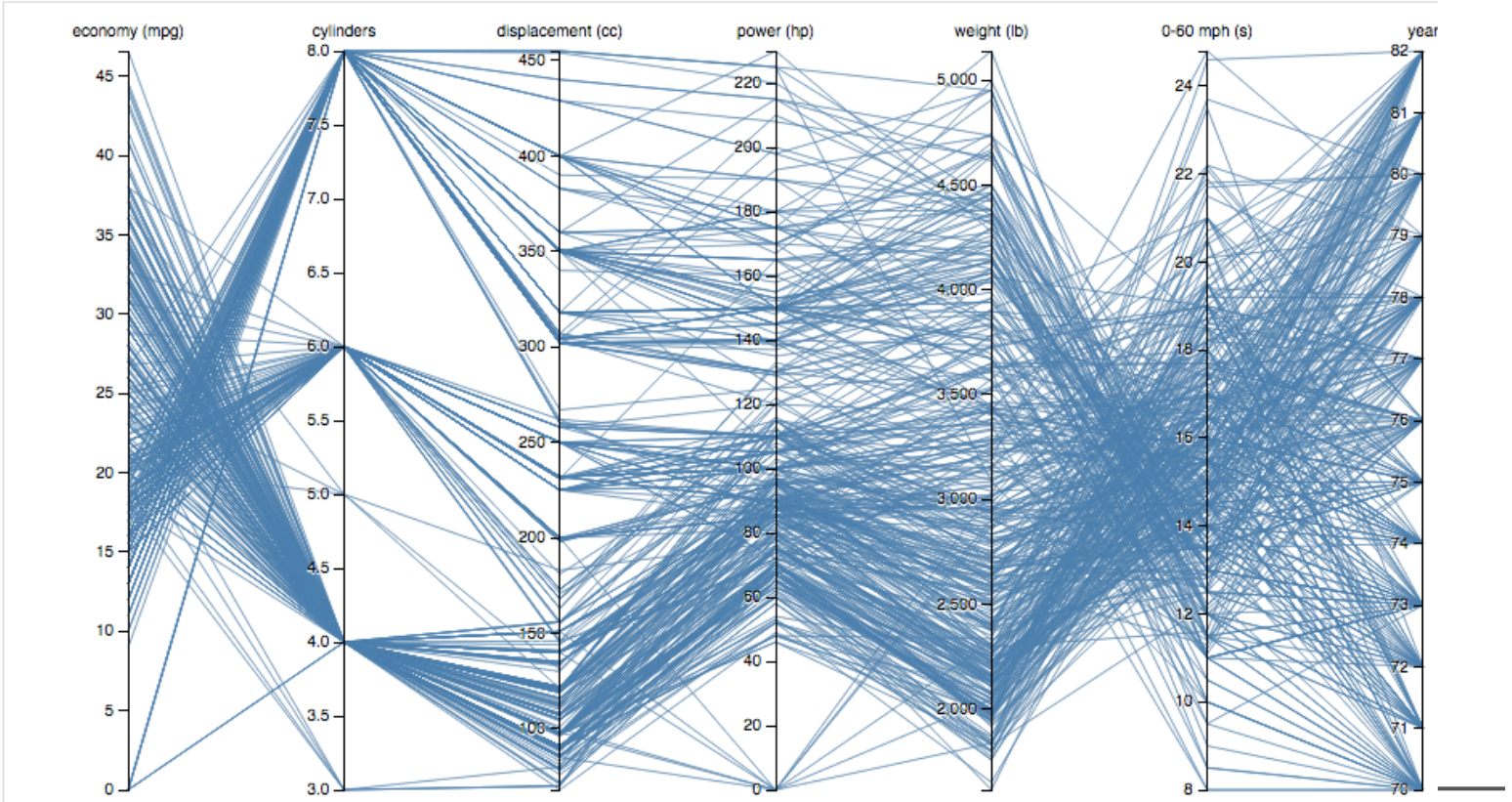
See data in context/expand graphical calculation



find patterns, compare



Find patterns, expand calculations, find questions



Inspire and compel/tell a story

[Gun ownership in Westchester County, USA]

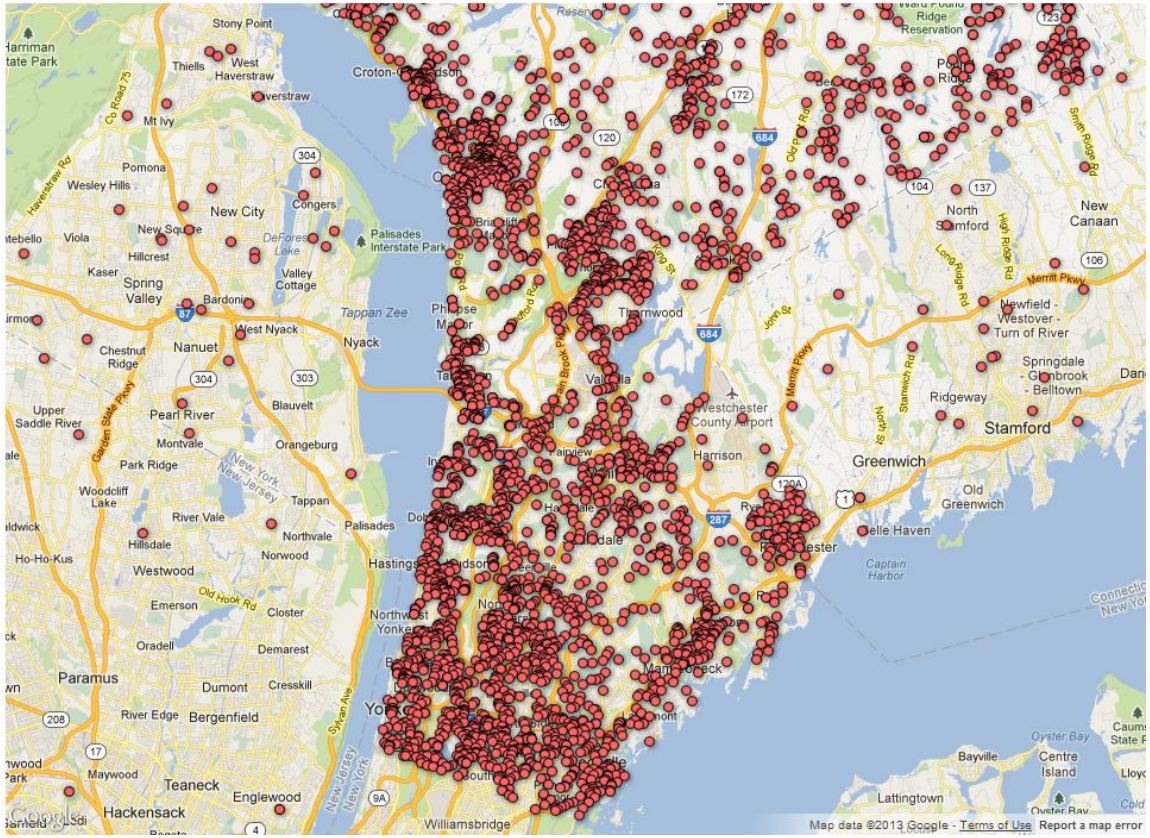


Image courtesy of S. Few, www.perceptualedge.com

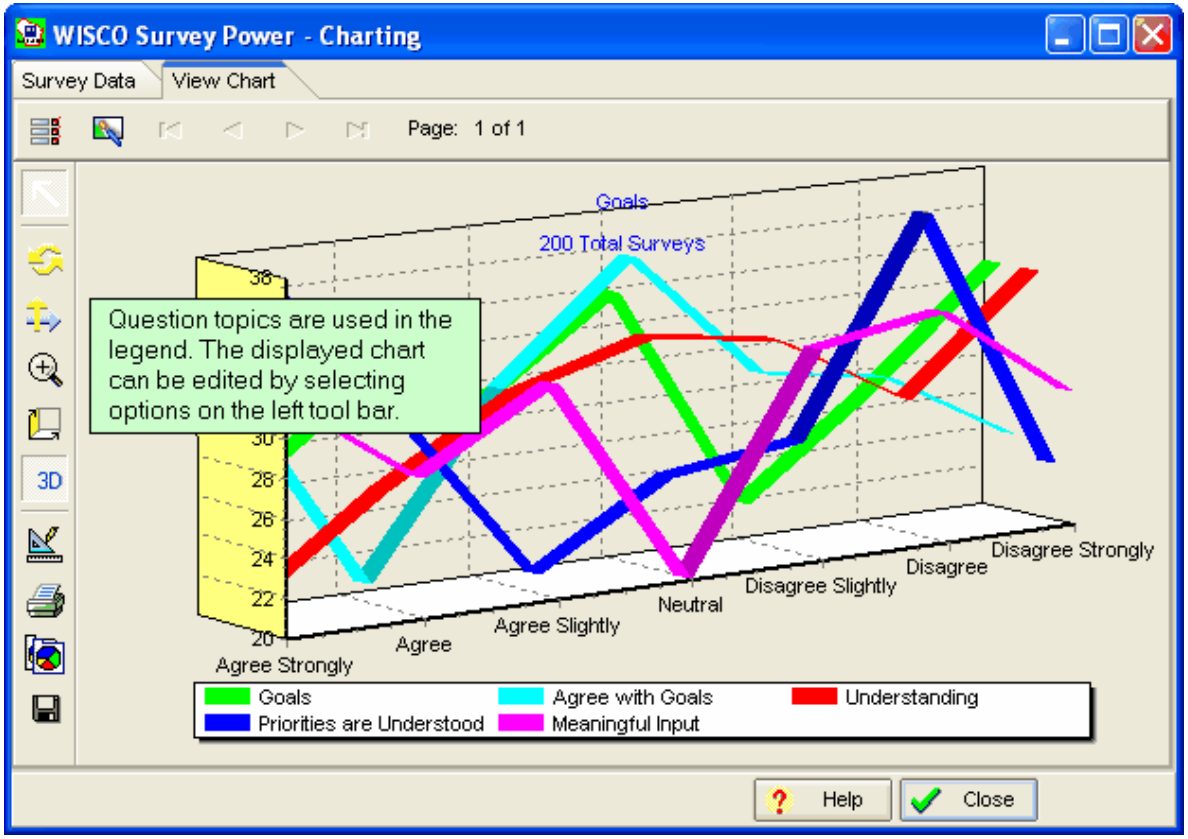


Image courtesy of S. Few, www.perceptualedge.com

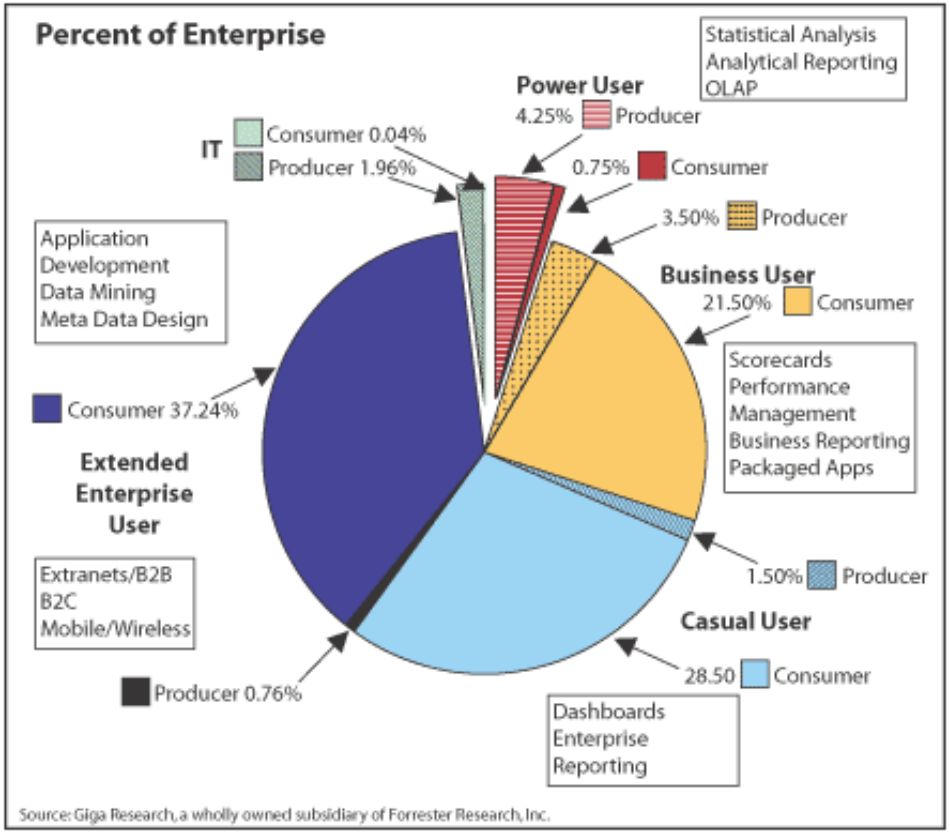
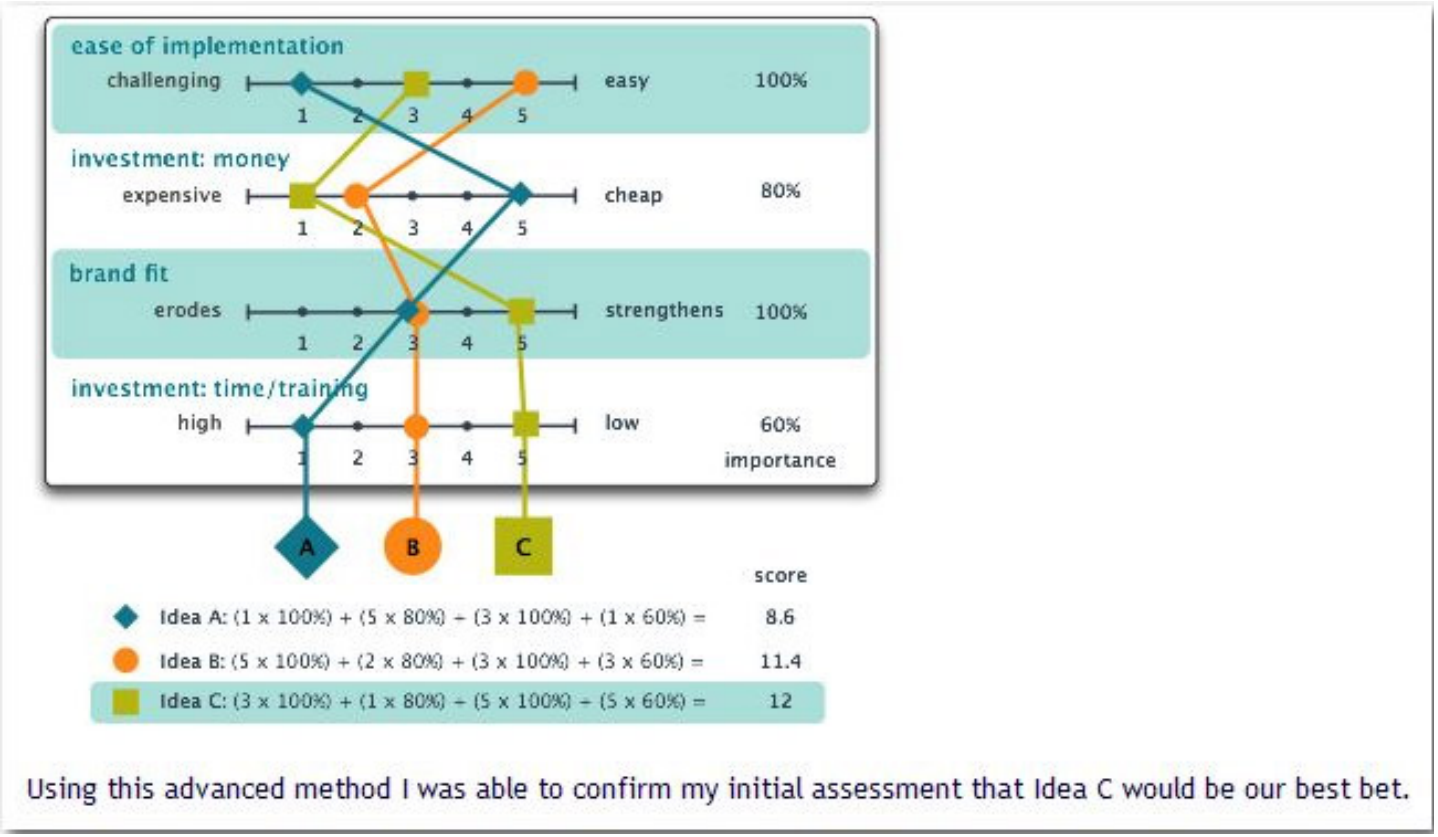


Image courtesy of S. Few, www.perceptualedge.com



What's really going on here?

- The purpose of visualization is INSIGHT not IMAGES (Stasko)
- Cognitive process of building a mental image and model and internalising understanding

"The use of computer-supported, interactive visual representations of data to amplify cognition." [Card, Mackinlay Shneiderman '98]

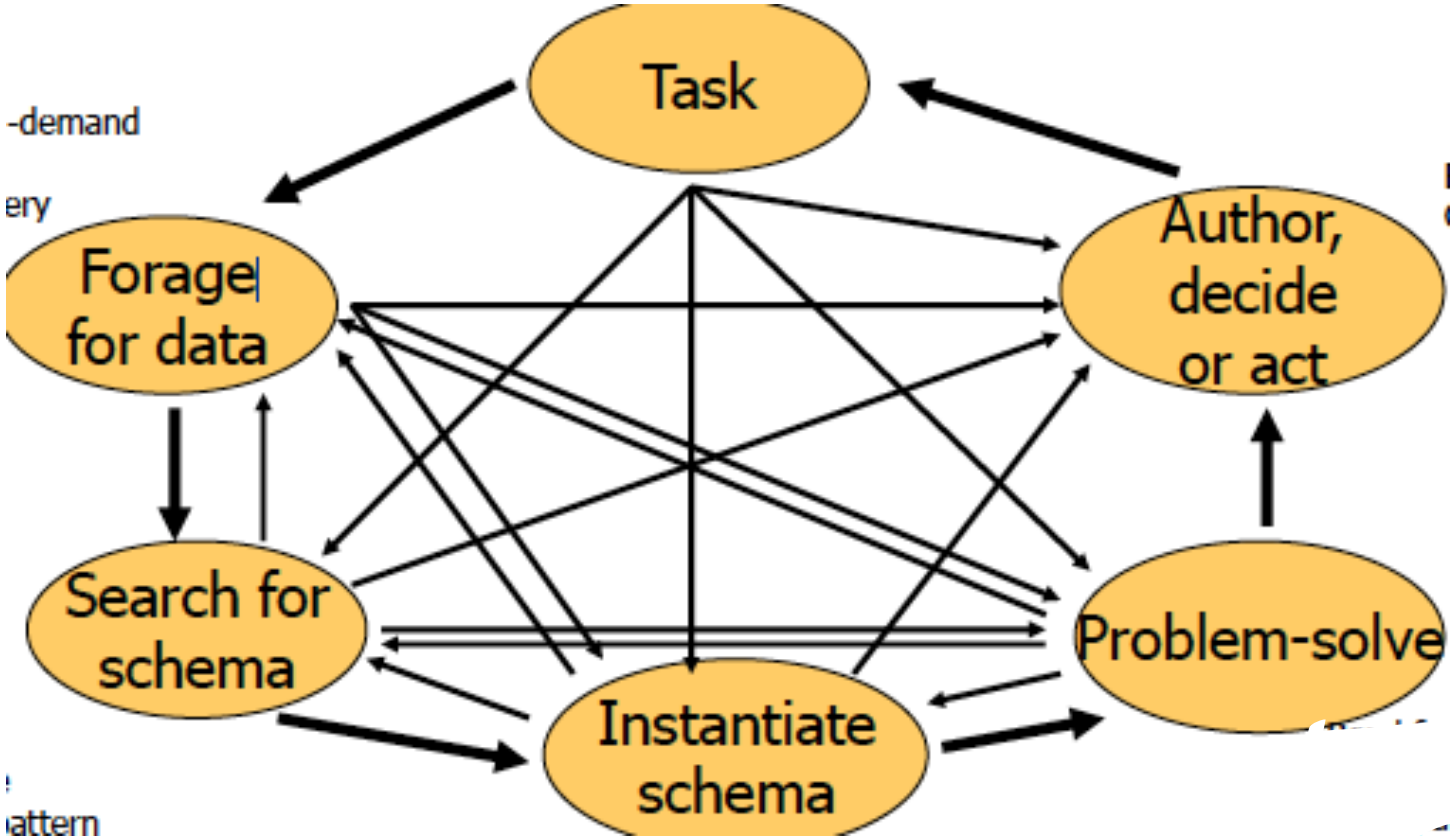
Distributed Cognition

- Cognitive system is composed of people and the artifacts they use
- Cognition isn't only internal
- Changes in **external** representation spur changes in **internal** representation and understanding
- It is **interaction** with the external representations that drives this process

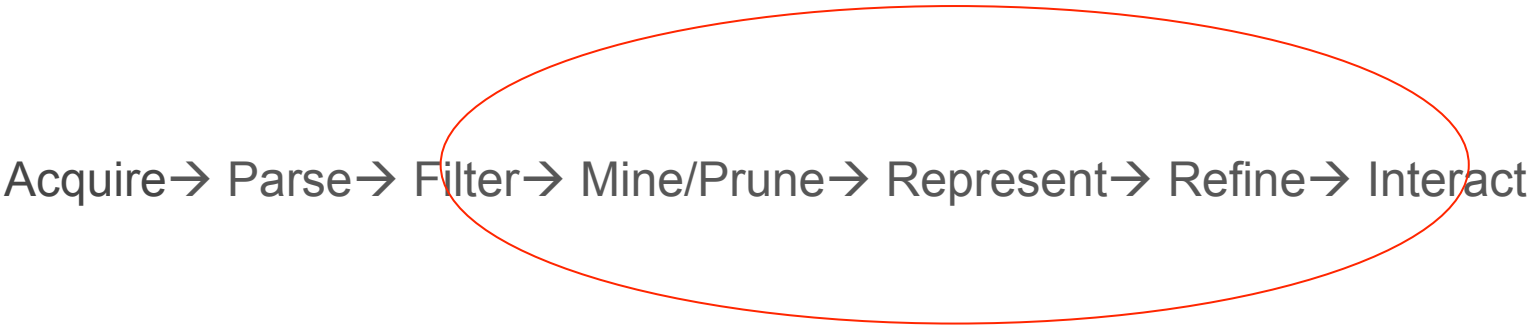
Recap: how vis amplifies cognition

- Increasing memory and processing resources available
- Reducing search for information
- Enhancing the recognition of patterns
- Enabling perceptual inference operations
- Using perceptual attention mechanisms for monitoring
- Encoding info in a manipulable medium

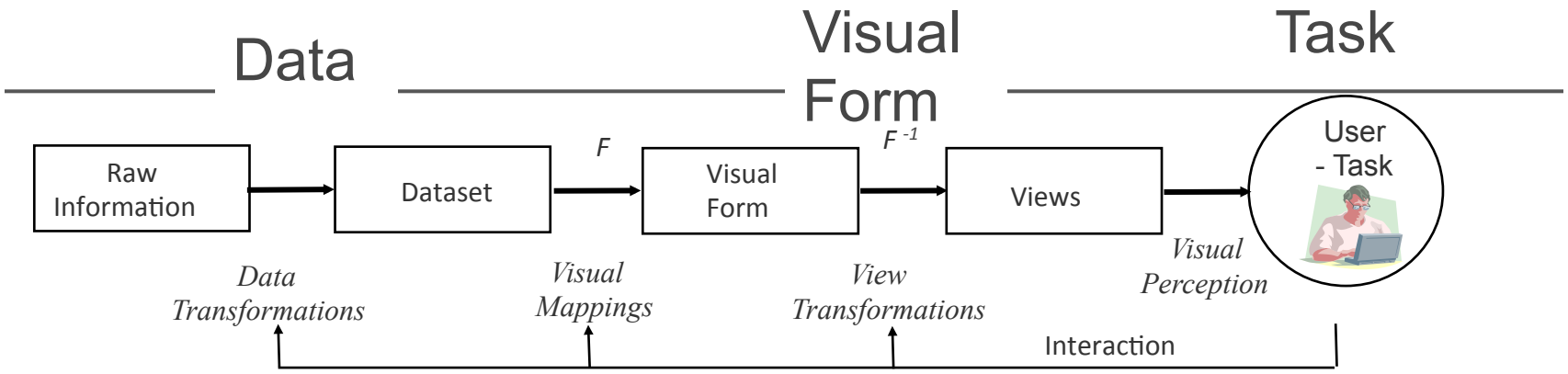
Knowledge Crystallization



More simply


Acquire→ Parse→ Filter→ Mine/Prune→ Represent→ Refine→ Interact

Visualization Stages

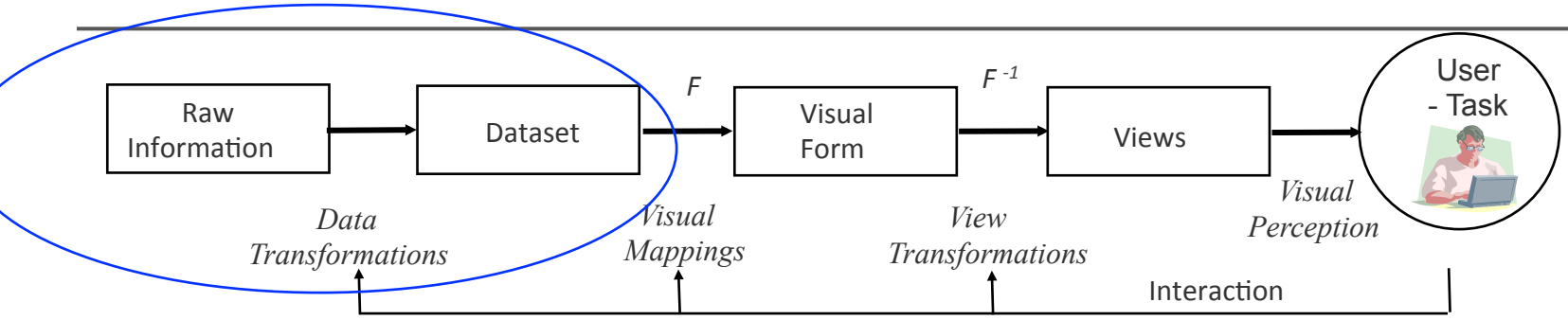


Example: house real estate listing data

- Price
- Bedrooms
- Lot size
- Type
- etc

Visualization Stages

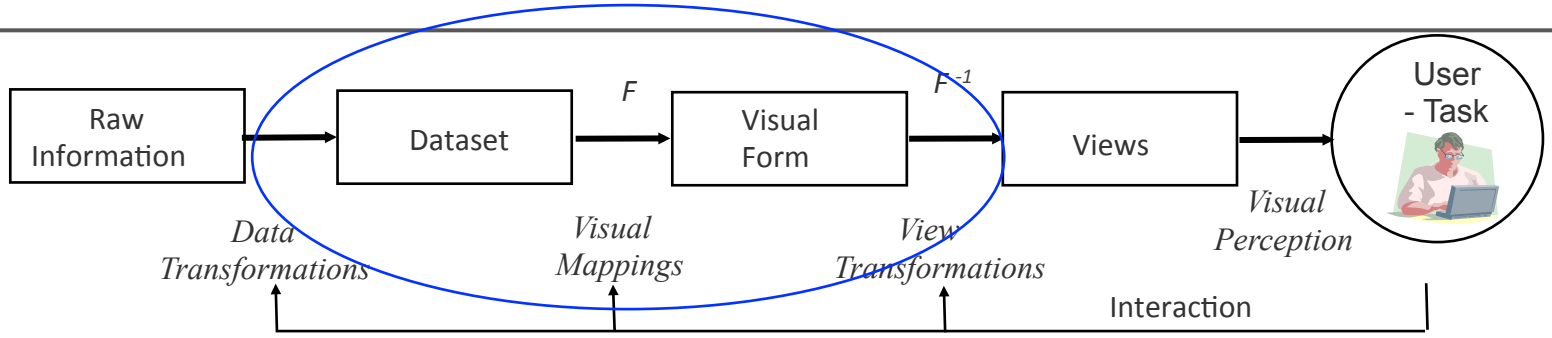
Data transformation – create a visual spatial model



- Data transformation
  - Map raw data into data tables – e.g. text to similarity matrix

Visualization Stages

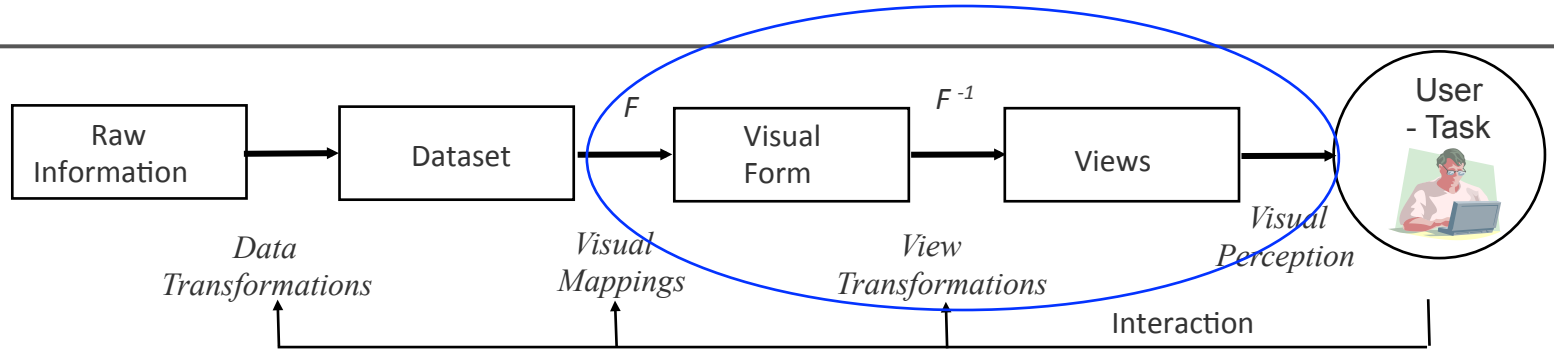
Visual mapping– create a visual spatial model



- Data transformation
  - Map raw data into data tables – e.g. text to similarity matrix
- Visual Mappings:
  - Transform data tables into visual structures – e.g., house price, #bedrooms to 2 dims – x, y

Visualization Stages

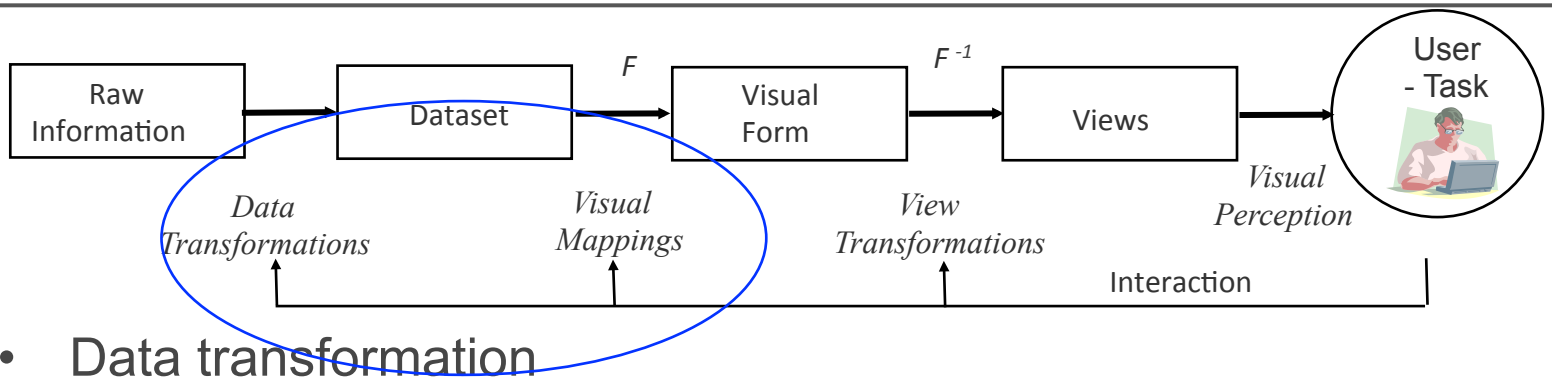
Display the data that now have visual form



- Data transformation
  - Map raw data into data tables – e.g. text to similarity matrix
- Visual Mappings:
  - Transform data tables into visual structures – e.g. 2 dims – x, y
- View Transformations:
  - Create views of the Visual Structures by specifying graphical parameters such as position, scaling, and clipping

Visualization Stages

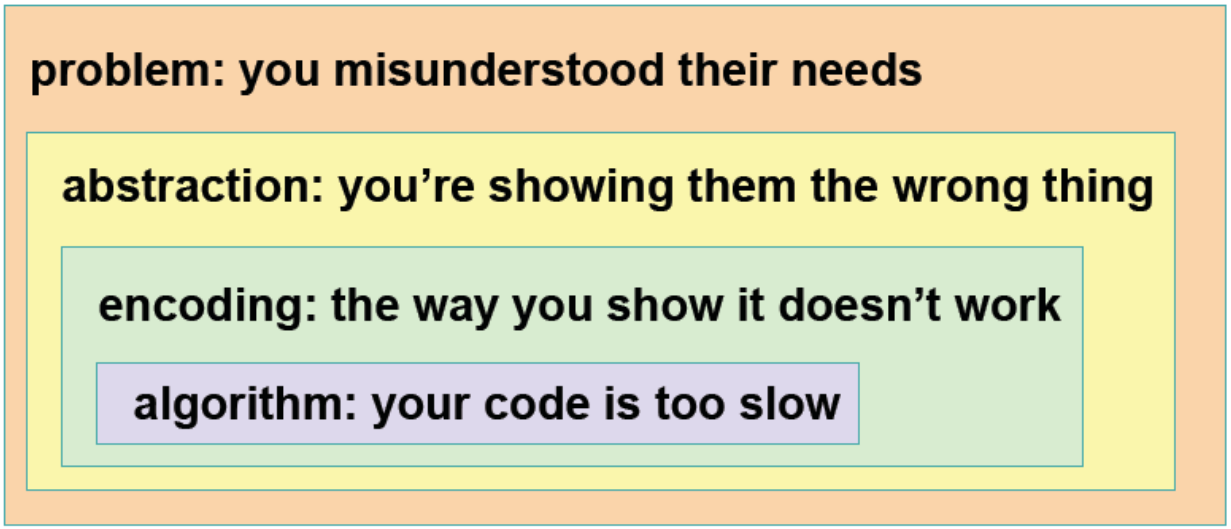
The user may change transformations and mappings



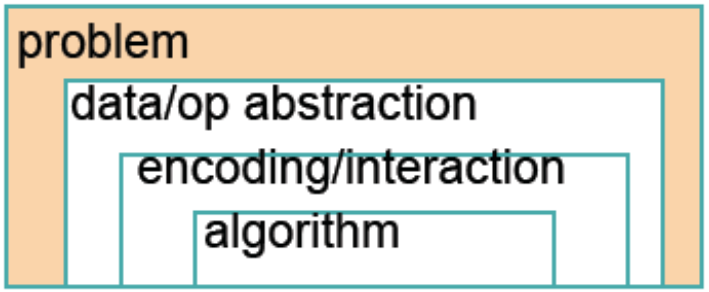
- Data transformation
  - Map raw data into data tables – e.g. text to similarity matrix
- Visual Mappings:
  - Transform data tables into visual structures – e.g. 2 dims – x, y
- View Transformations:
  - Create views of the Visual Structures by specifying graphical parameters such as position, scaling, and clipping

How do we find the right design?

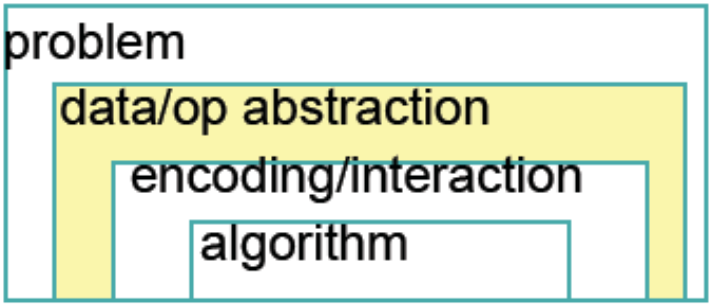
- 4 levels of design [Munzner 2014]
- Validate against the right “threat”



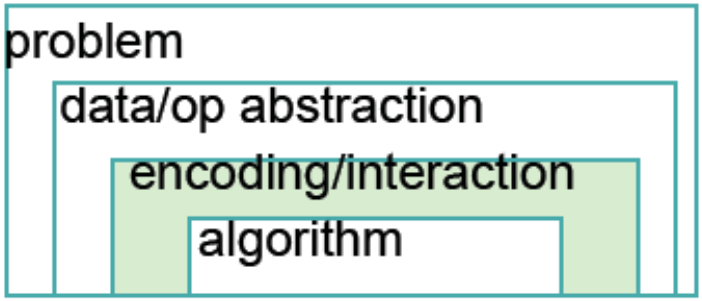
Solve the right problem



- Characterise the domain problem
  - identify a problem amenable to vis
  - provide novel capabilities
  - speed up existing workflow
- validation
  - immediate: interview and observe target users
  - downstream: notice adoption rates



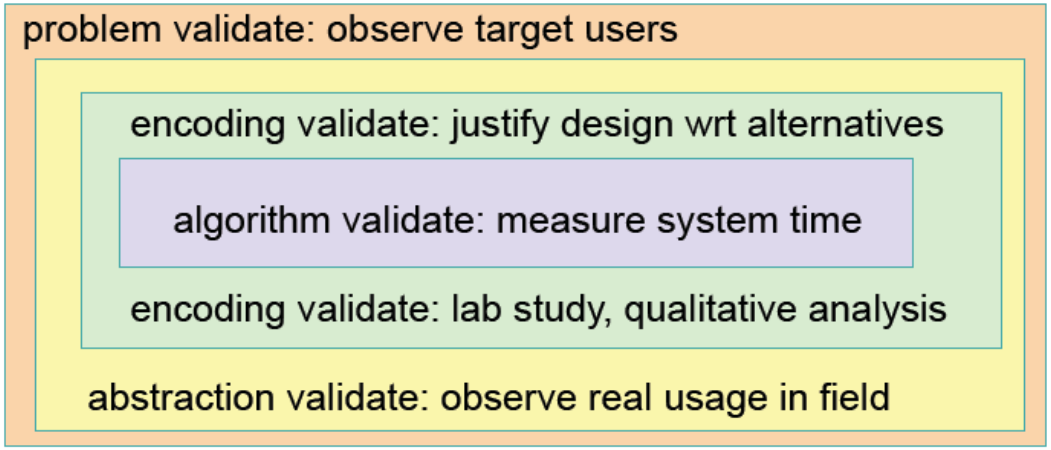
- abstract from domain-specific to generic operations/ tasks
  - sorting, filtering, browsing, comparing, finding trend/outlier, characterizing distributions, finding correlation
- data types
  - tables of numbers, relational networks, spatial data
  - transform into useful configuration: derived data model
  - more next time
- validation
  - deploy in the field and observe usage



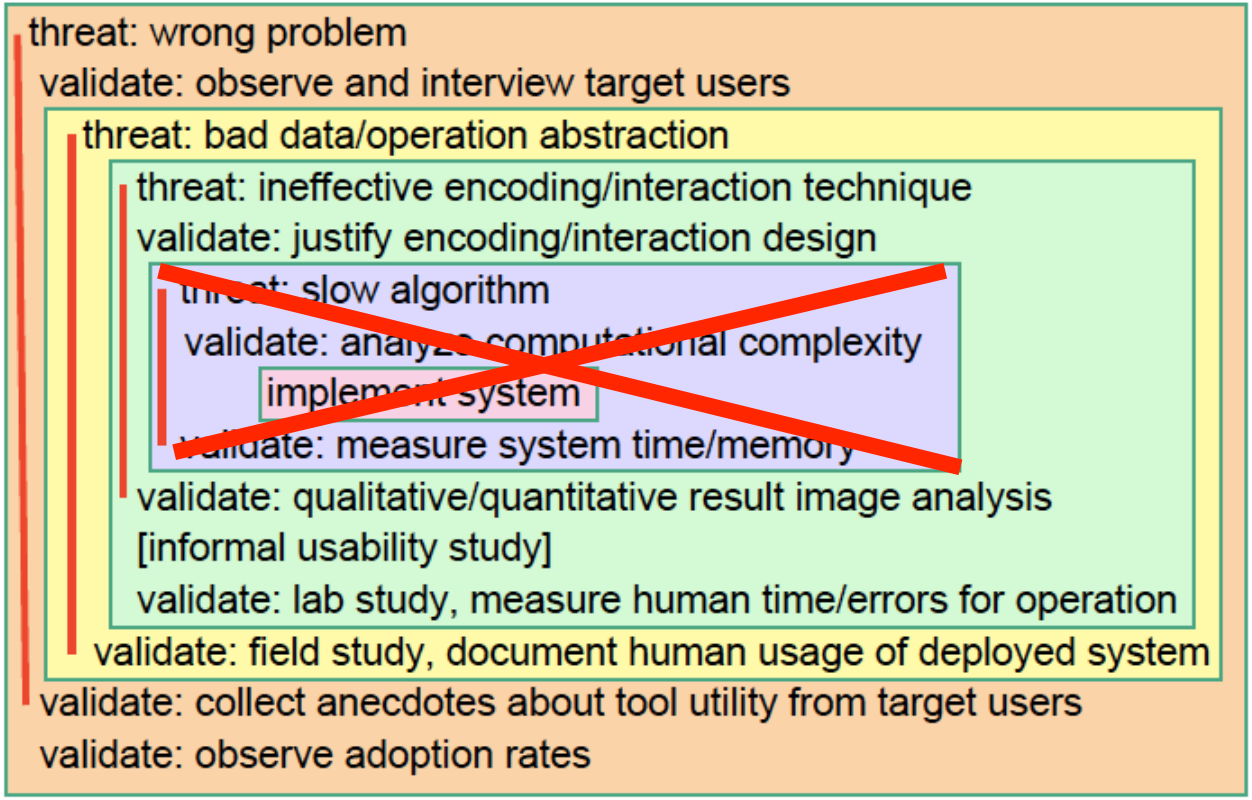
- visual encoding: drawings they are shown
- interaction: how they manipulate drawings
- validation
  - immediate: careful justification wrt known principles
  - downstream: qualitative or quantitative analysis of results
  - downstream: lab study measuring time/error on given task

Validation

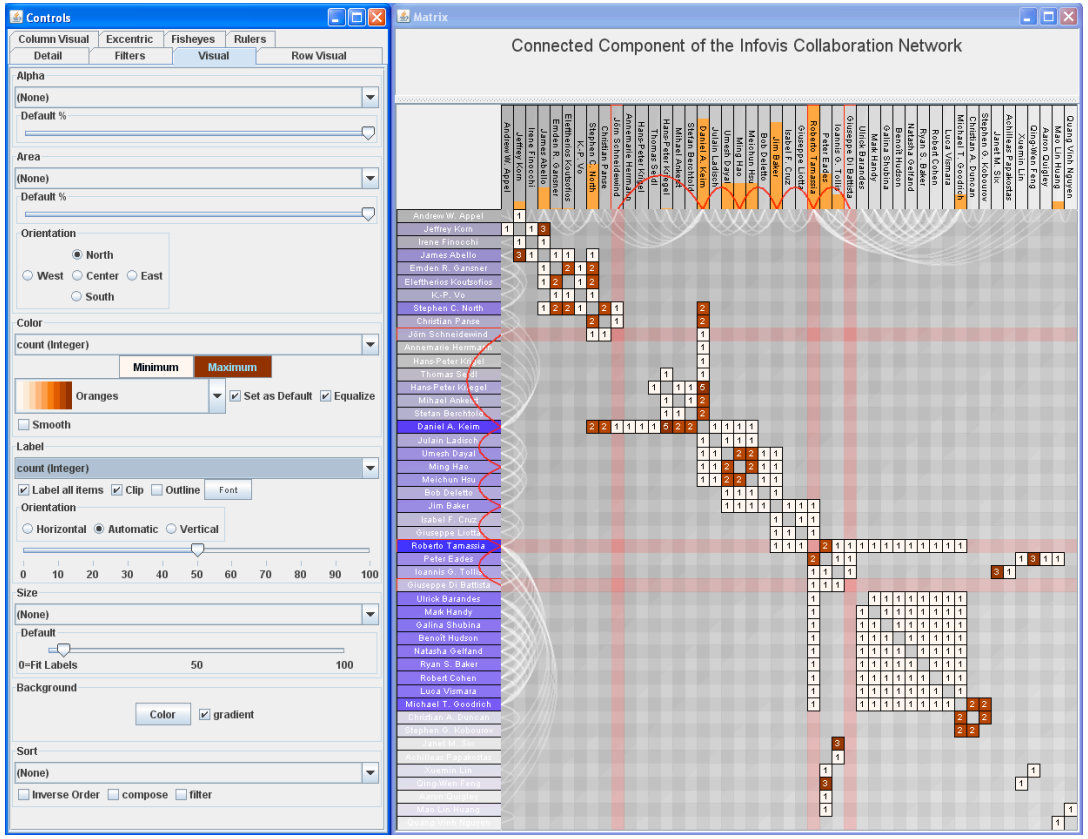
- Can't necessarily answer "Is it worth it?"
- Can try to address "where is it failing"?
- Evaluation is a hard problem, more later



Human in the loop stages



Matrix Explorer case study



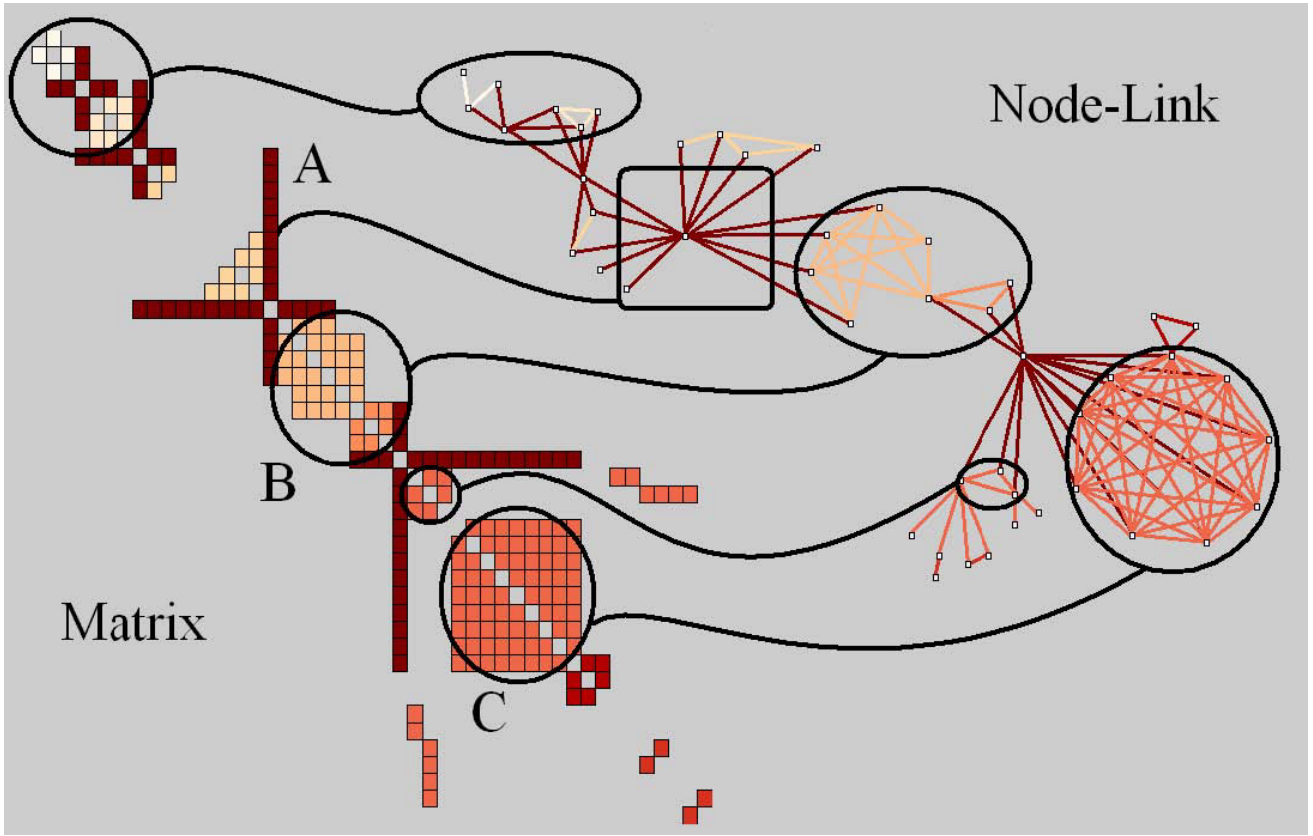
[MatrixExplorer: a Dual Representation System to Explore Social Networks. Henry and Fekete. IEEE TVCG 12(5):677-684 (Proc InfoVis 2006)]

- domain: social network analysis
  - early: participatory design to generate requirements
  - later: qualitative observations of tool use by target users
- techniques
  - interactively map attributes to visual variables
    - user can change visual encoding on the y axis
  - filtering
  - selection
  - sorting by attribute

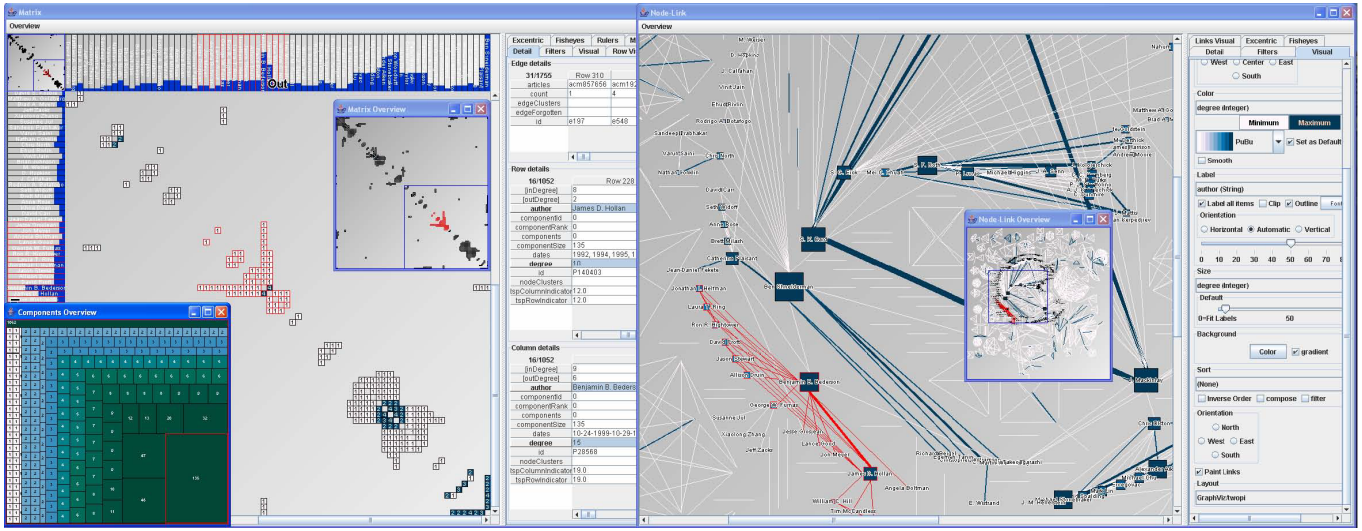
requirements

- use multiple representations
- handle multiple connected components
- provide overviews
- display general dataset info
- use attributes to create multiple views
- display basic and derived attributes
- minimize parameter tuning
- allow manual finetuning of automatic layout
- provide visible reminders of filtered-out data
- support multiple clusterings, including manual
- support outlier discovery
- find where consensus between different clusterings
- aggregate, but provide full detail on demand

Techniques: dual views



- overviews: matrix, node-link, connected components
- details: matrix, node-link
- controls



[Fig 1. Henry and Fekete. MatrixExplorer: a Dual-Representation System to Explore Social Networks. IEEE TVCG 12(5):677-684 (Proc InfoVis 2006)

Data Sketching exercise

- Data set 1 : Titanic casualties
- Cabin class, Age, Gender, Survived, Survival

- What kinds of insights might you seek from these data?
- How would you represent it?

Data sketching exercise

Life Expectancy data

- #physiciians/per capita , country, #Tvs/capita

Add in –

- Change in survival rates over time (20 years0
- Change in physicians

More speculation

- Highway deaths on the Labour Day weekend were much higher than anticipated in BC. You want to find an explanation.

- Decide what kinds of data you need
- Sketch how you would visualize it