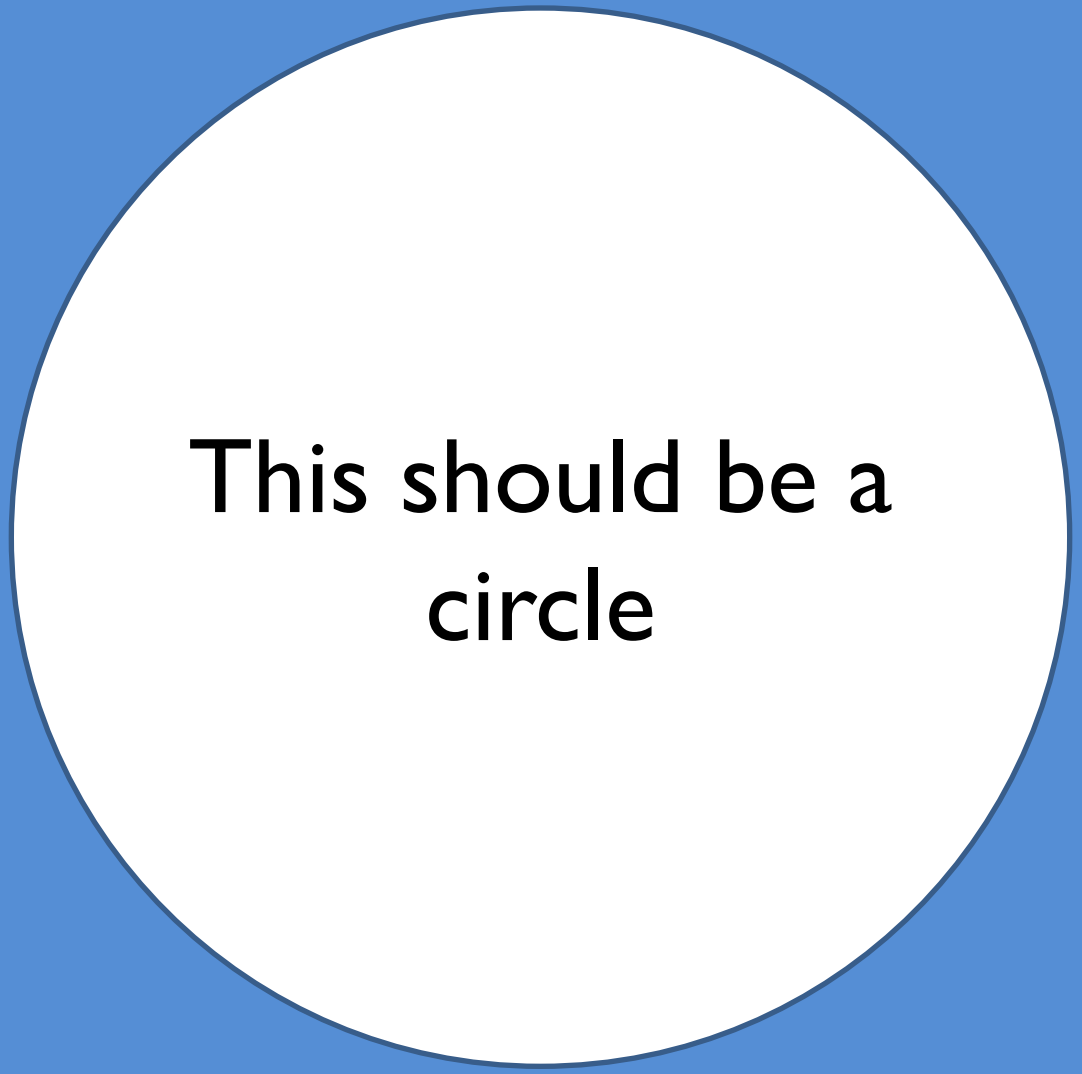

This should be a
circle

Information Visualization

Jack van Wijk
Eindhoven University of Technology

Electronics & Automation

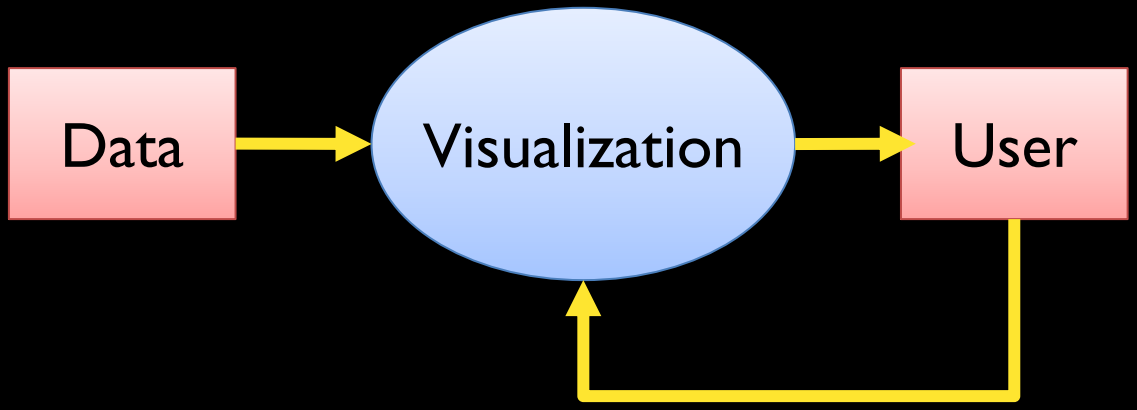
June 2/3/4, 2015

Information Visualization

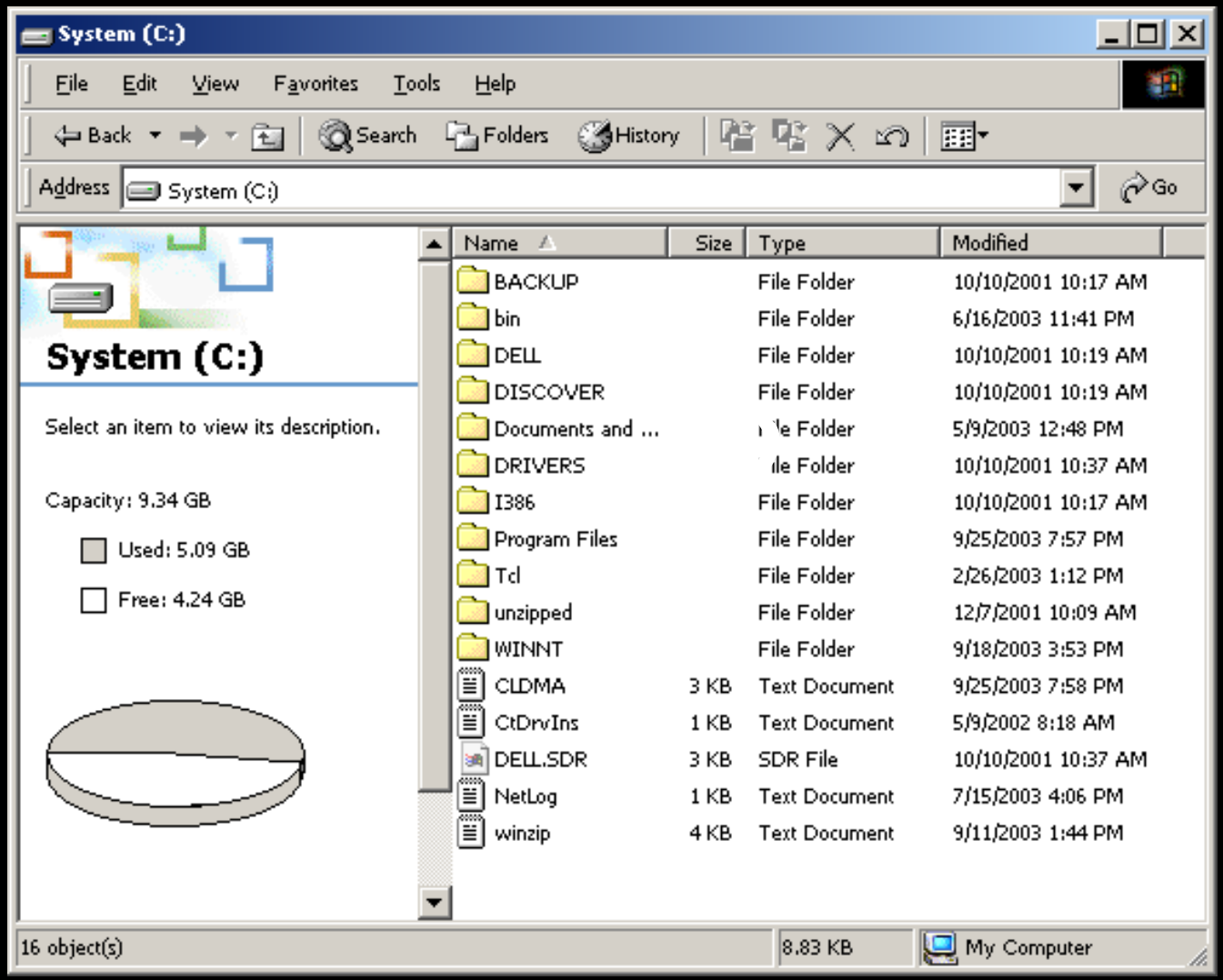
- What is it?
- Presentation
- Perception
- Interaction
- Data

Information Visualization

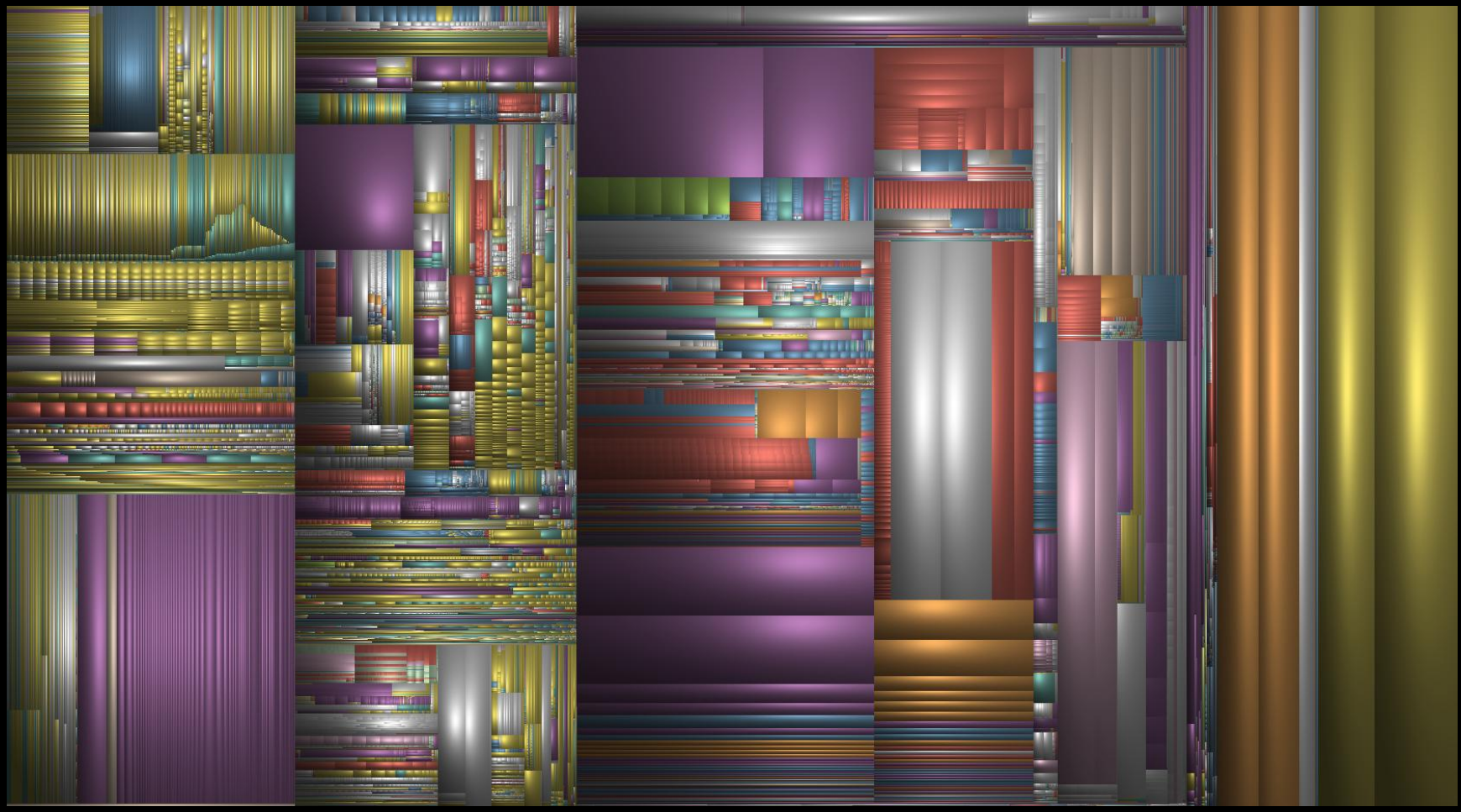
- The use of computer-supported, interactive, visual representations of abstract data to amplify cognition (*Card et al., 1999*)



Why is my hard disk full?



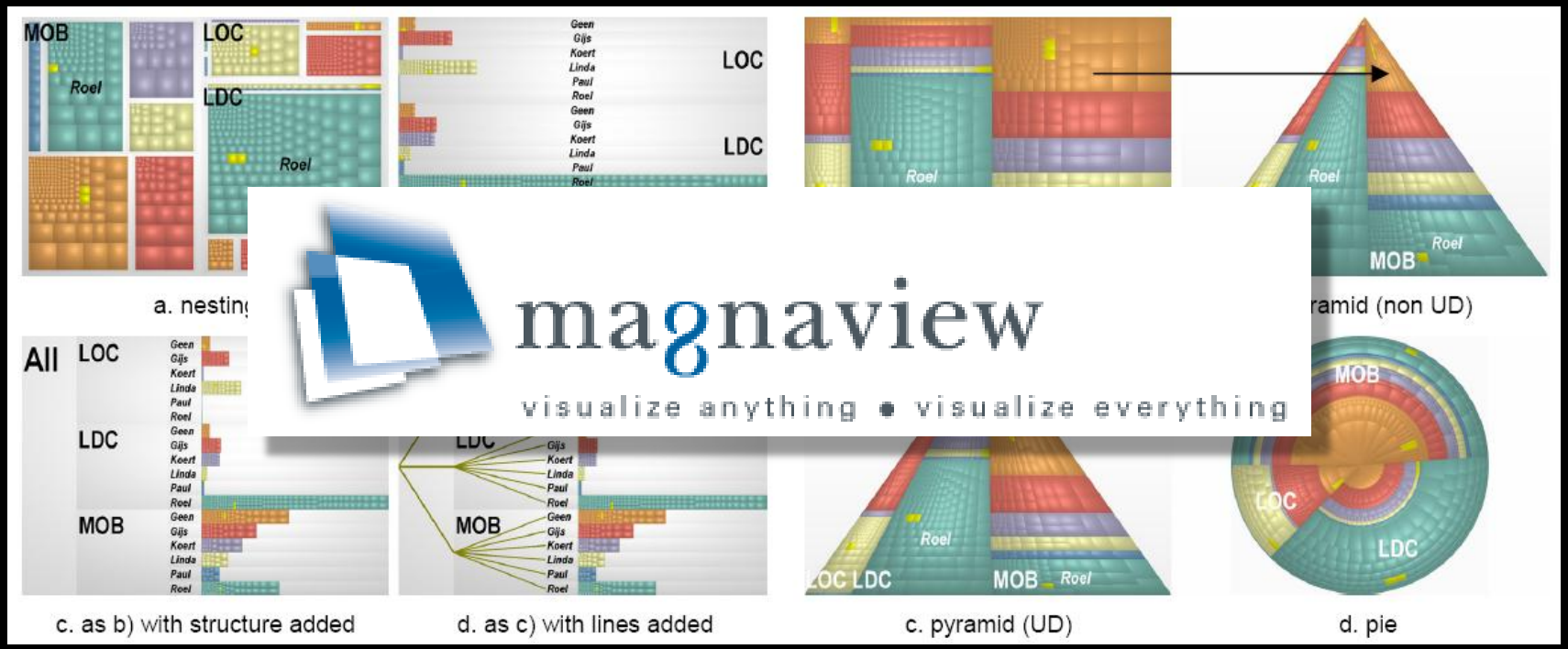
SequoiaView



Van Wijk and Van de Wetering, 1999

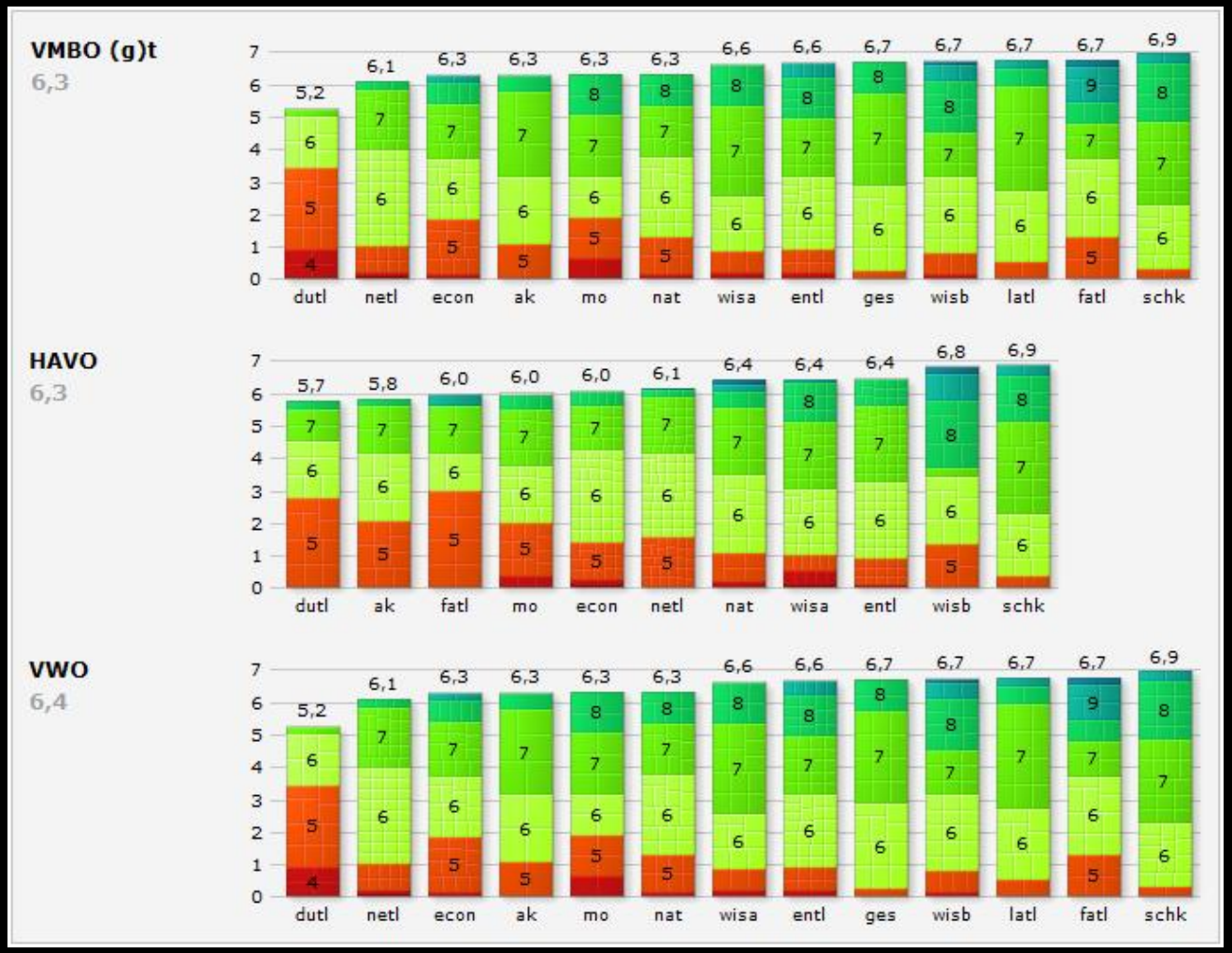
Generalized treemaps

- Idea: combine treemaps and business graphics
- Many options



Vliegen, Van Wijk, and Van der Linden, 2006

Visualization high school data

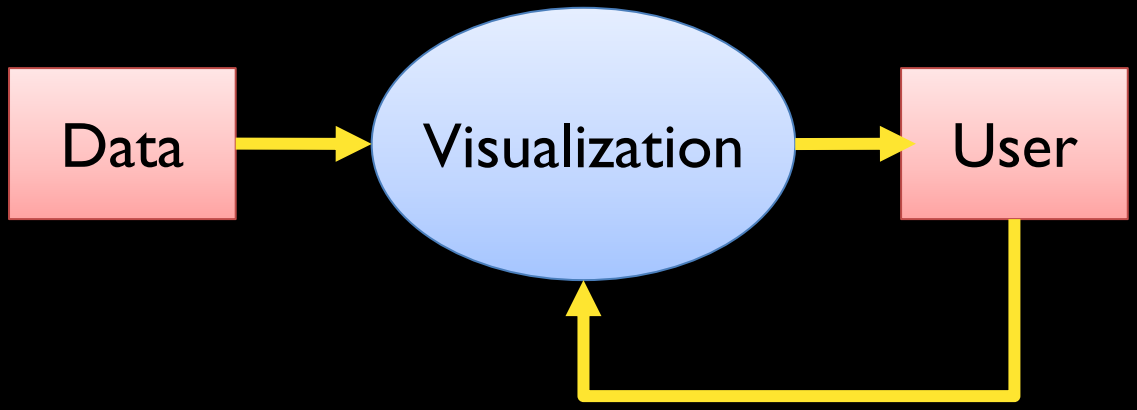


Cum Laude by MagnaView

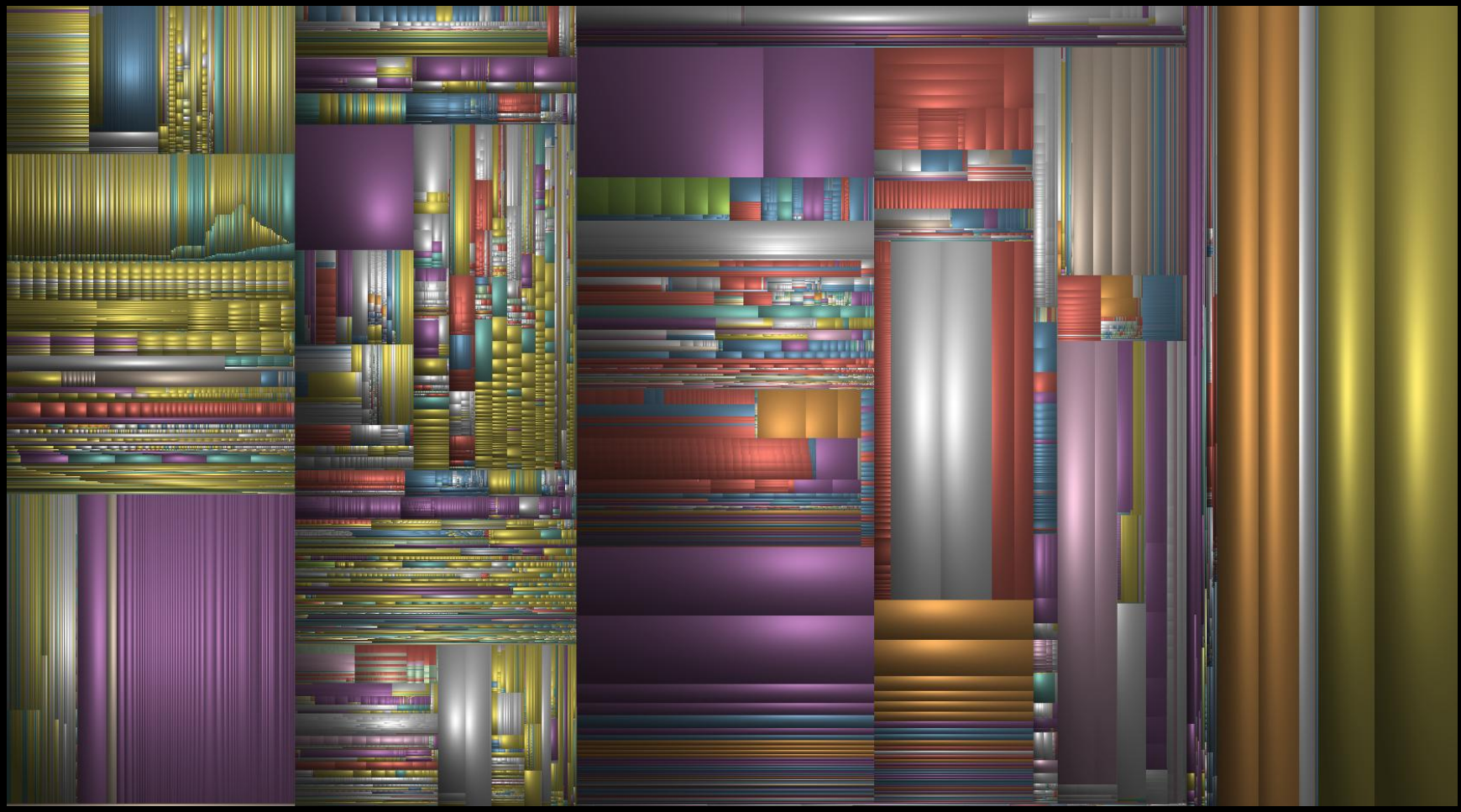
Information Visualization

- The use of computer-supported, interactive, visual **representations** of abstract data to amplify cognition

  (*Card et al., 1999*)



SequoiaView



Van Wijk and Van de Wetering, 1999

Botanically inspired treevis

What happens if we map abstract trees to botanical trees?

Kleiberg et al., 2001

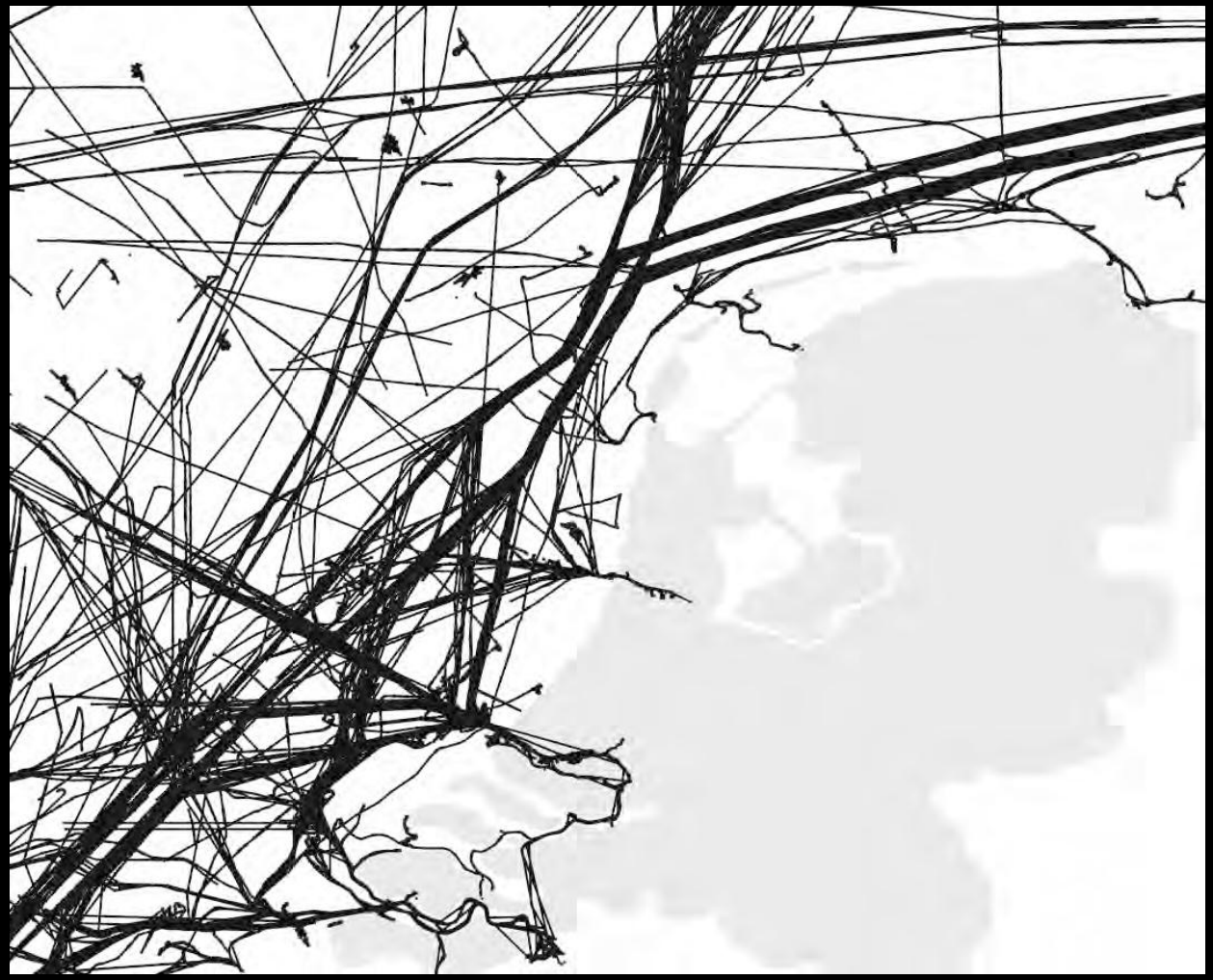
Botanically inspired treevis

Kleiberg, Van de Wetering, van Wijk, 2001

Botanically inspired treevis

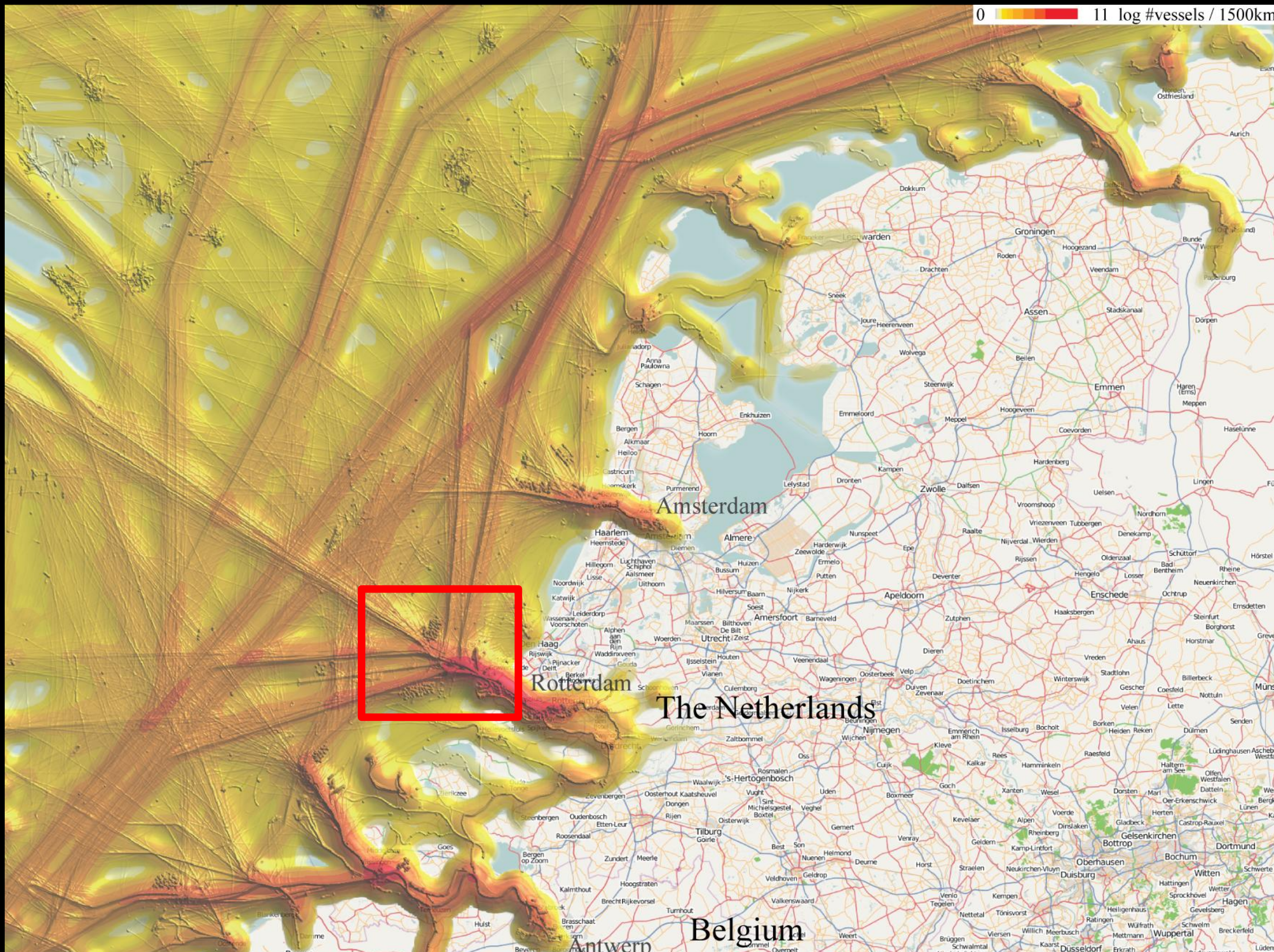
Kleiberg, Van de Wetering, van Wijk, 2001

Visualization of vessel traffic

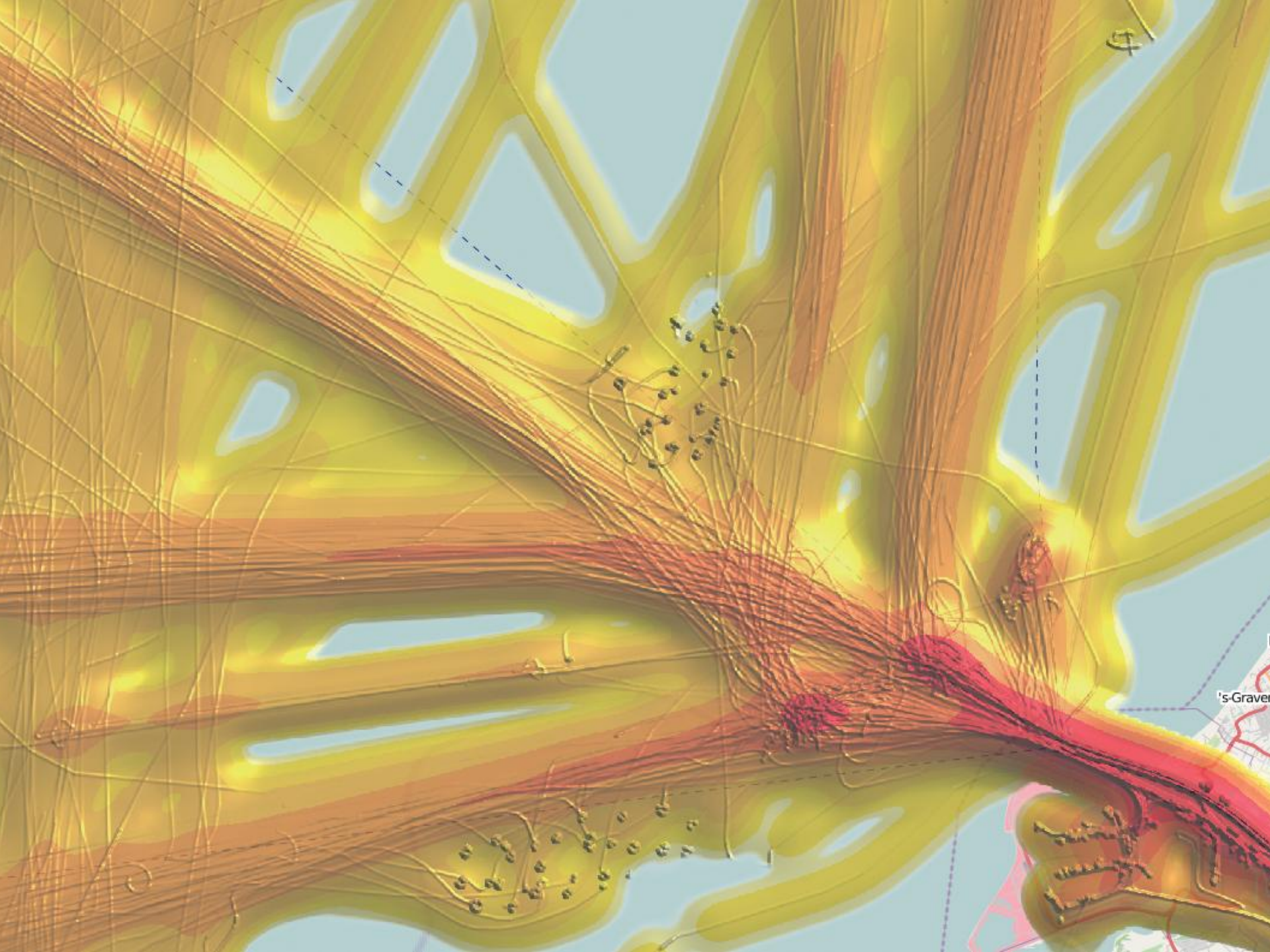


Willems et al., 2009

Visualization of vessel traffic

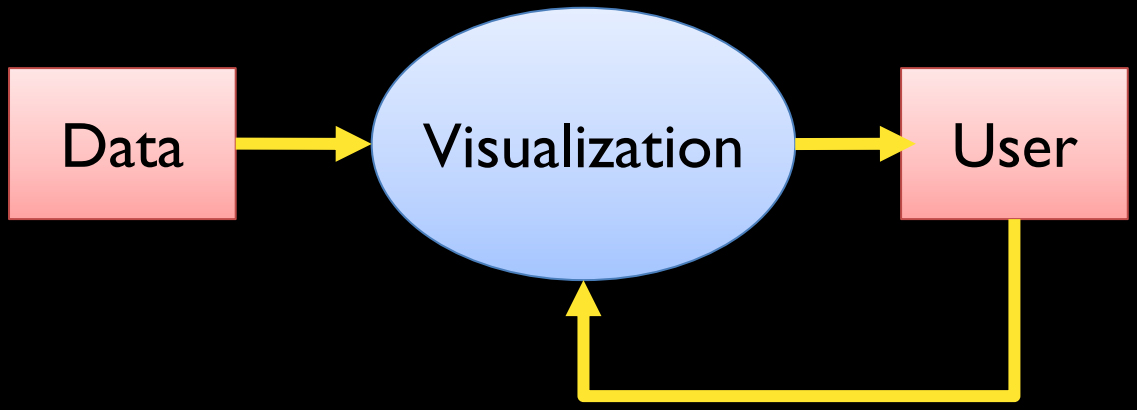


Willems et al., 2009

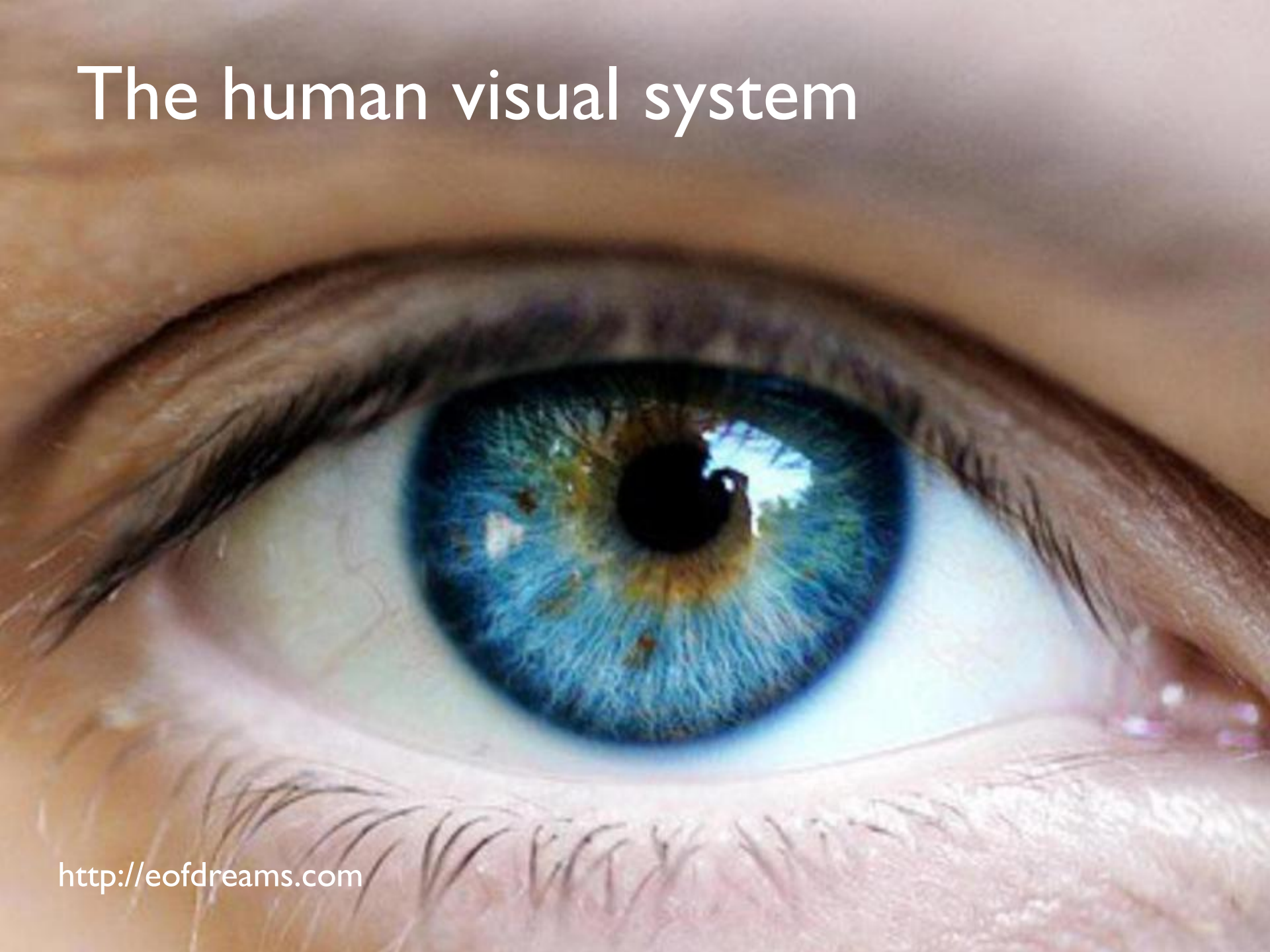


Information Visualization

- The use of computer-supported, interactive, **visual** representations of abstract data to amplify cognition
- (*Card et al., 1999*)

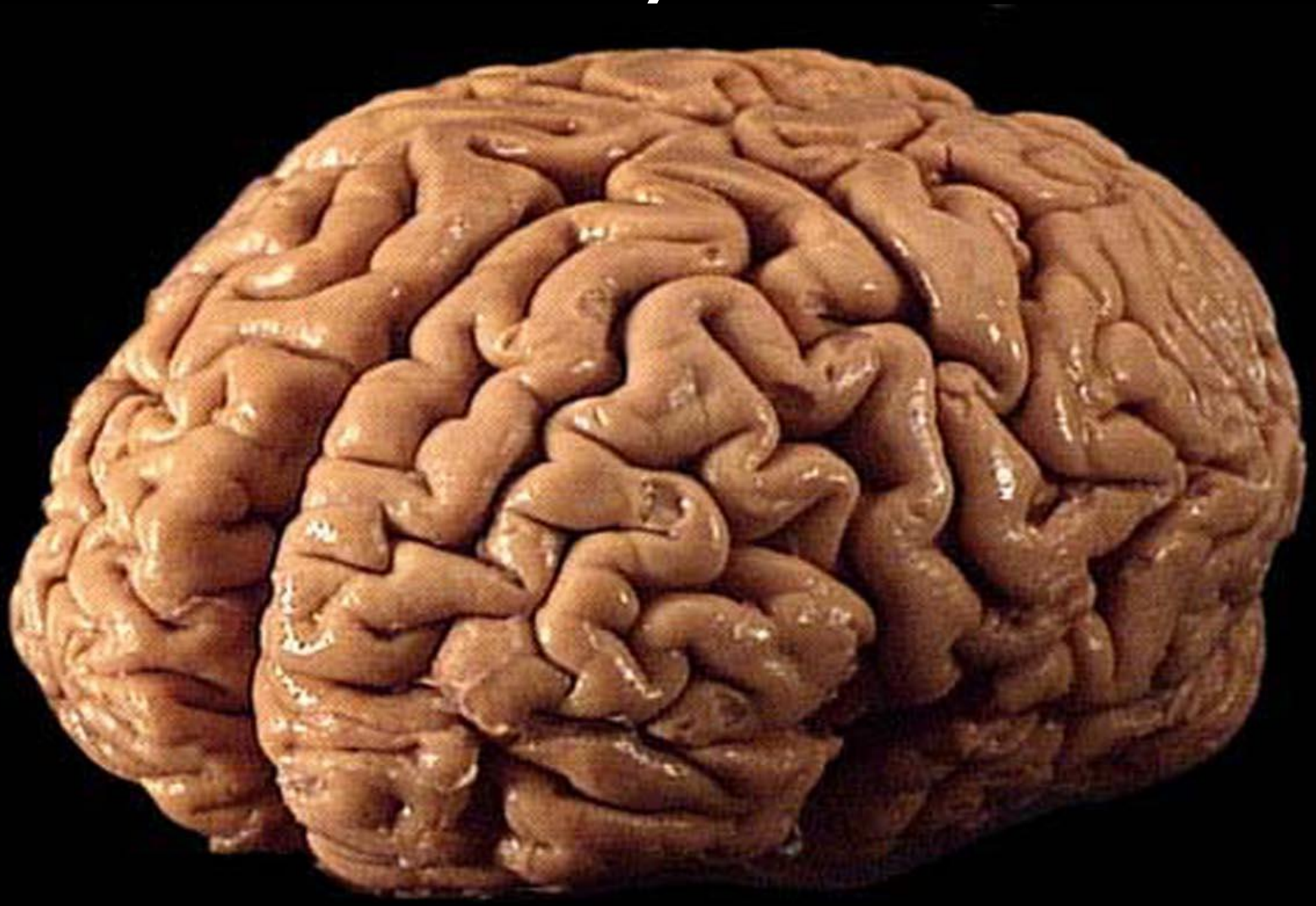


The human visual system



http://eofdreams.com

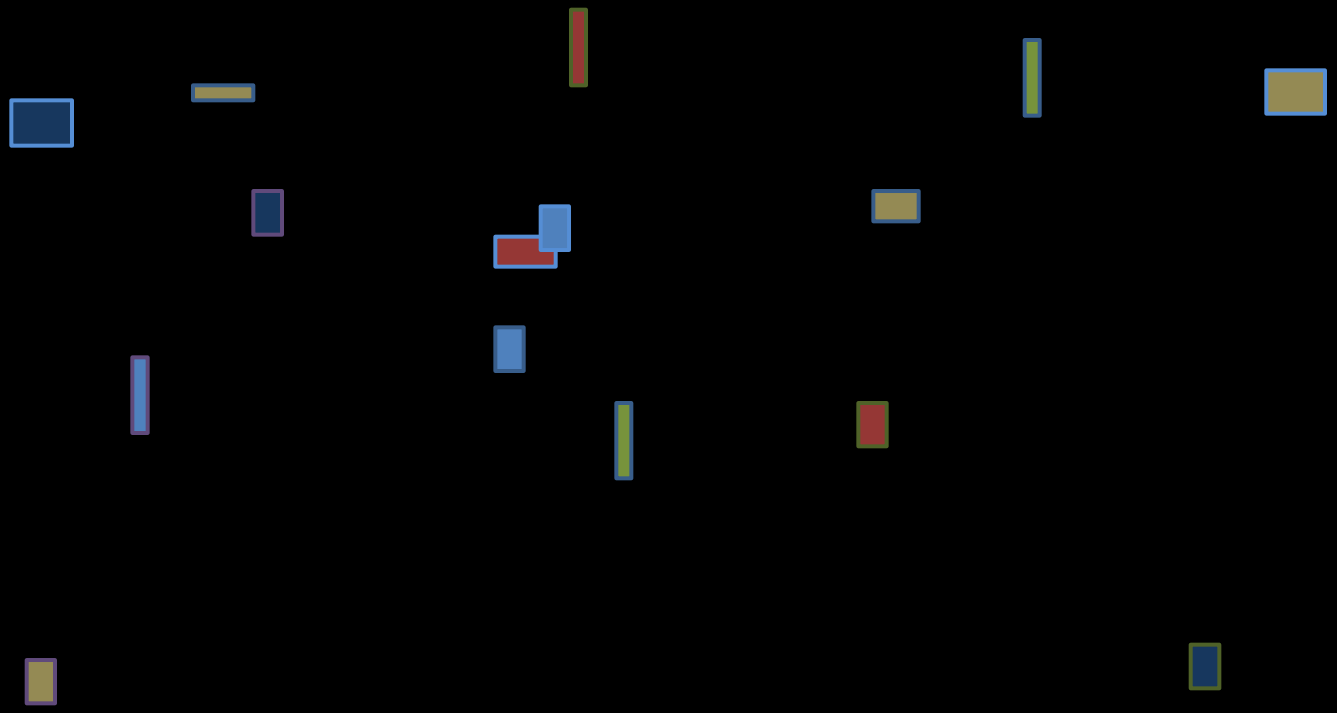
The human visual system



http://vinceantonucci.com

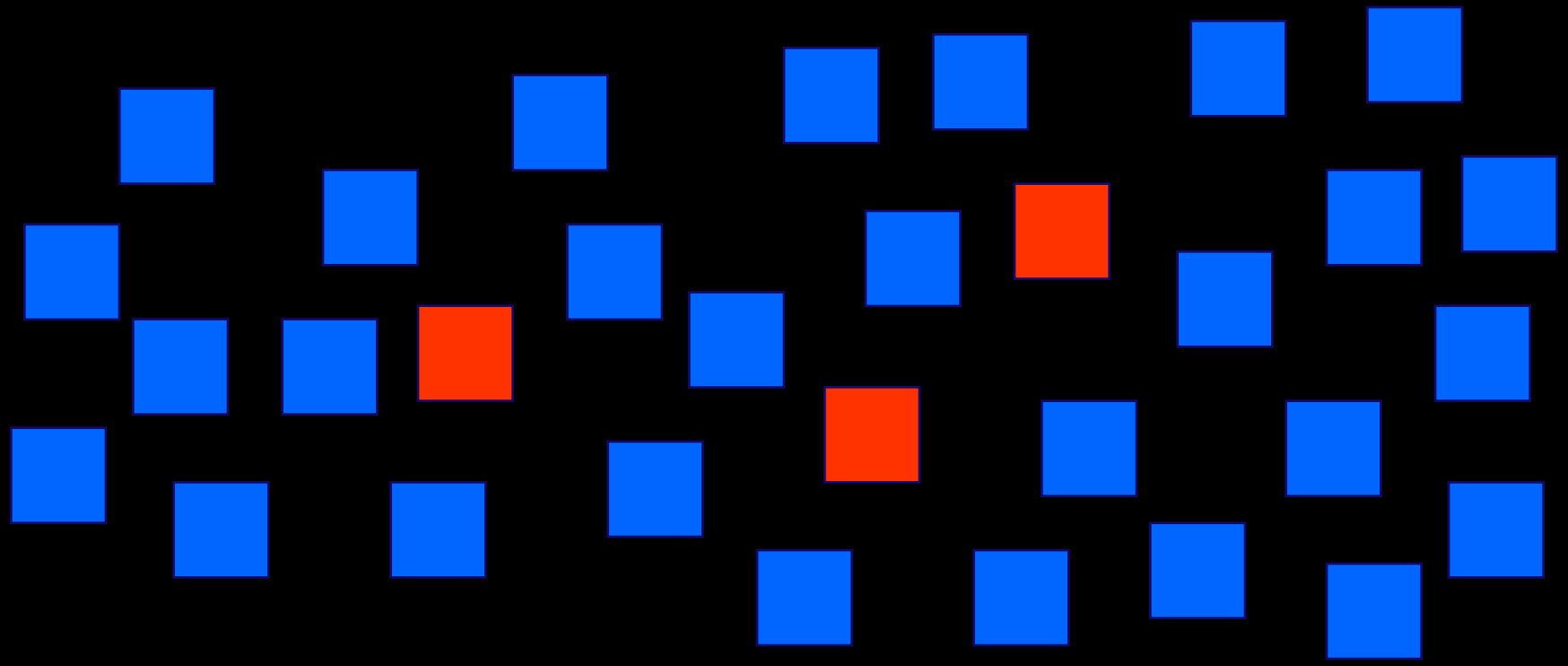
ORANJEBOOM

Translating data into pictures



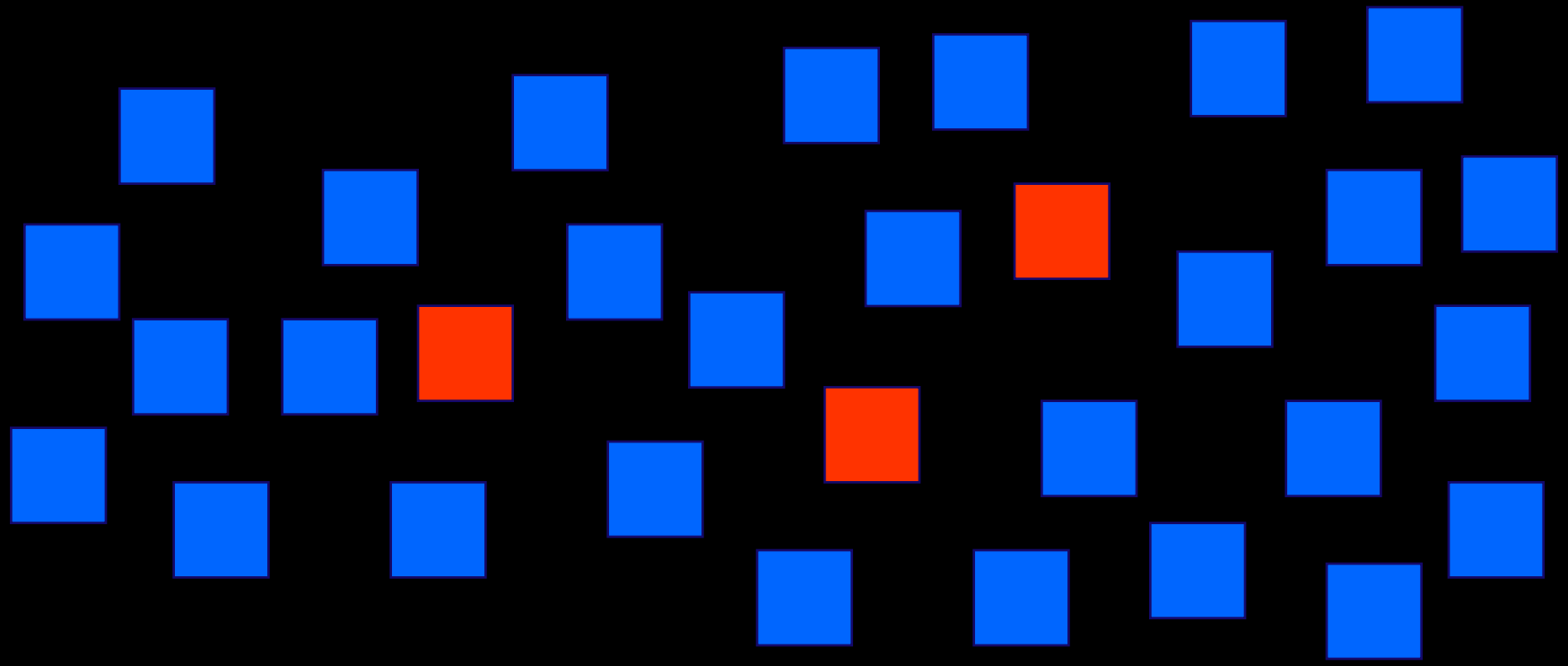
Position, width, height, colors encode six variables…

Perception of symbols



- How many red objects?

Perception of symbols



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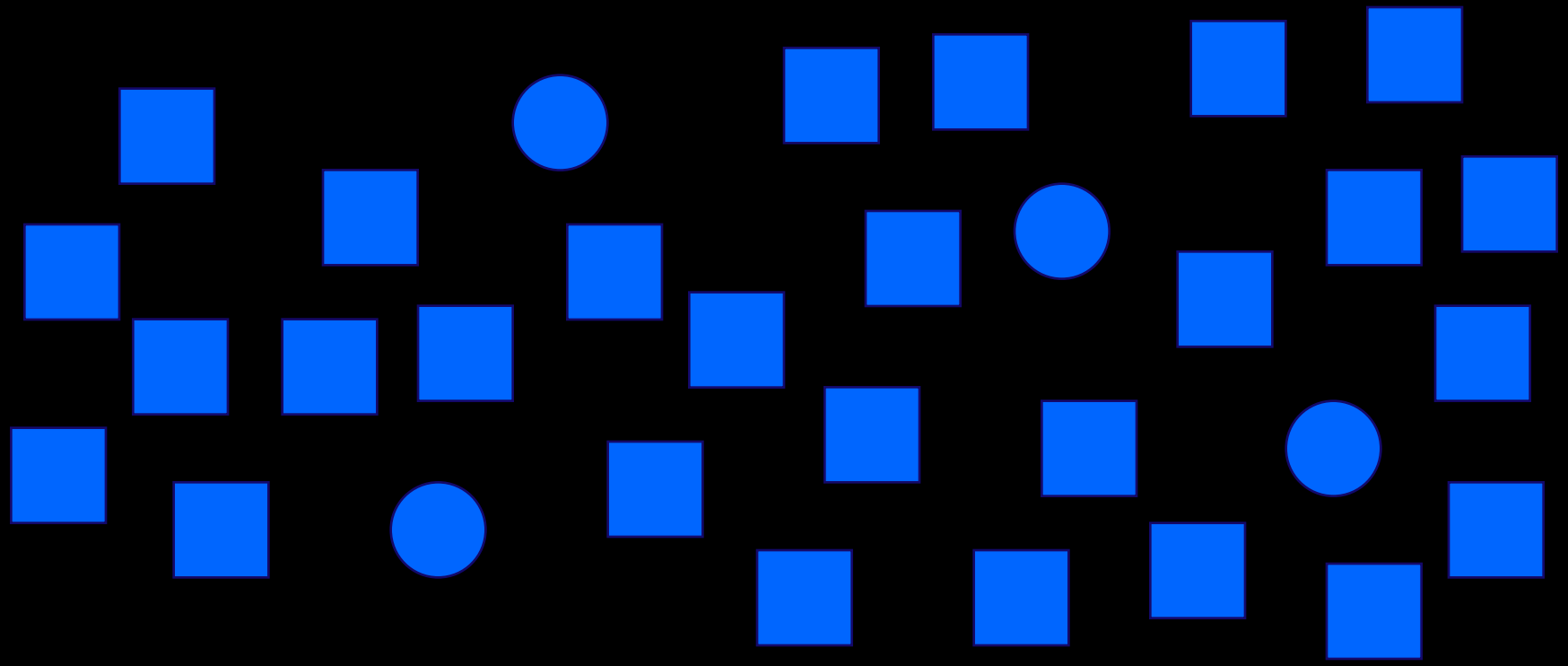
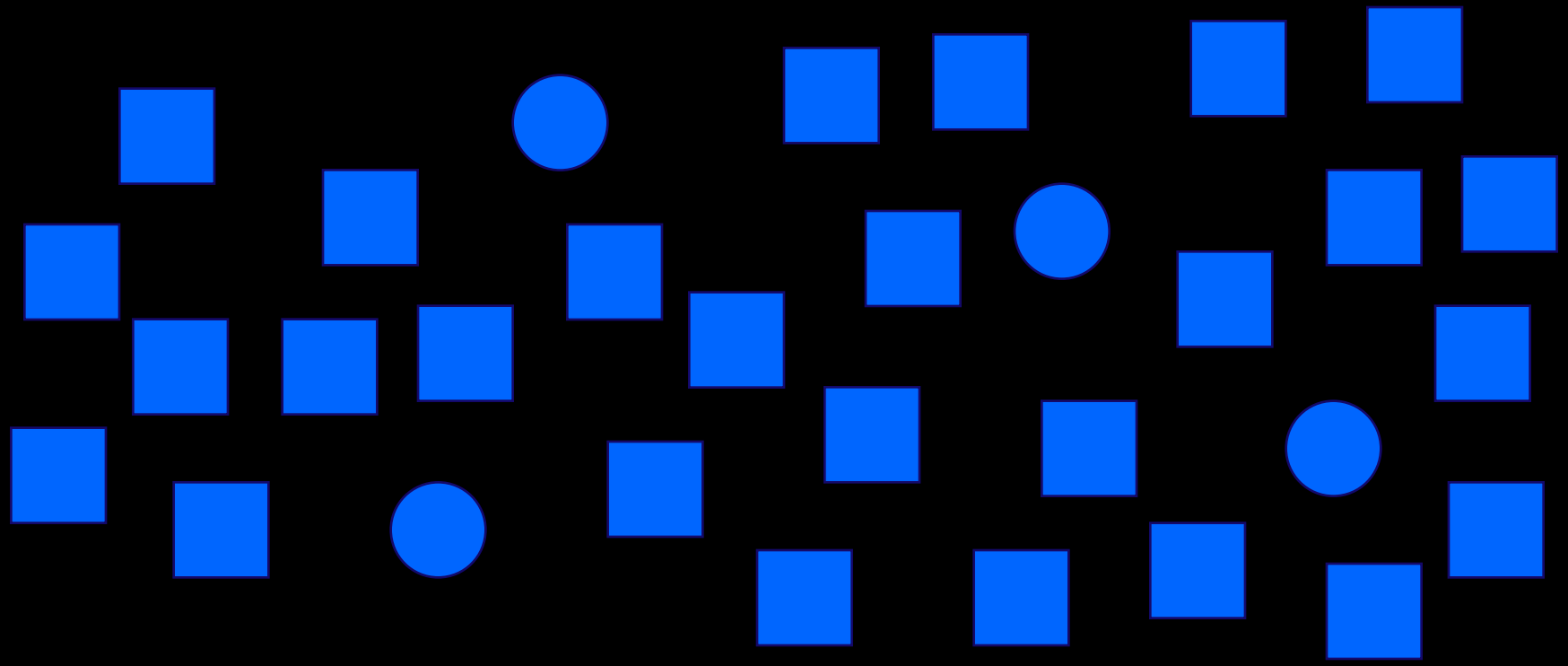


- How many circles?

Perception of symbols



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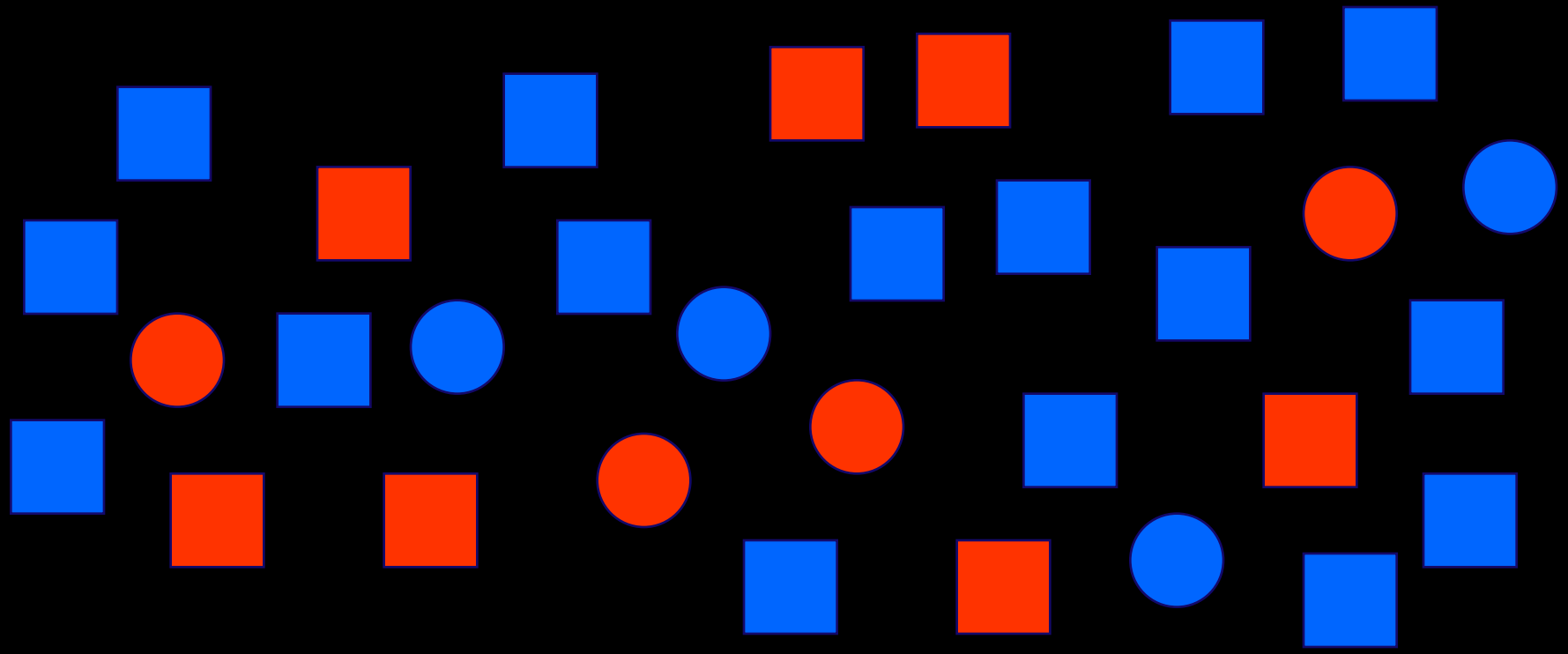
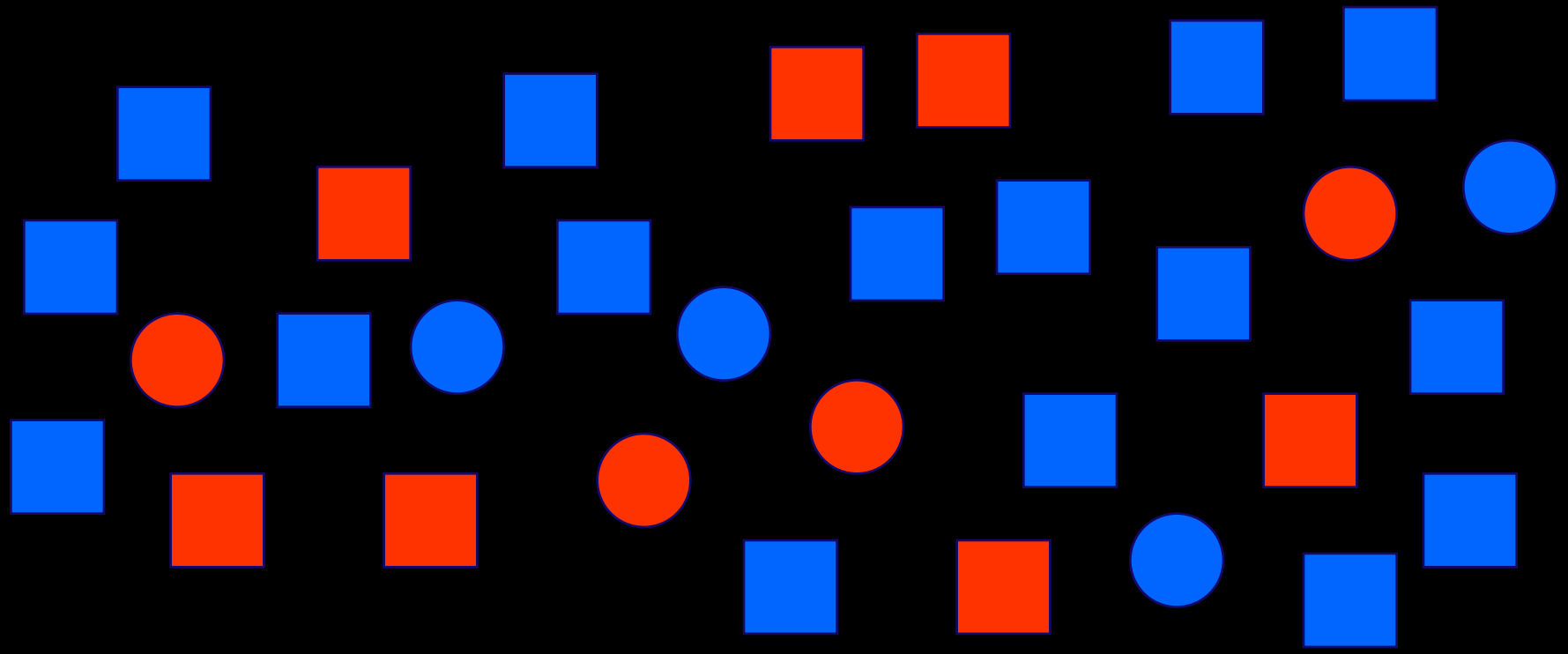


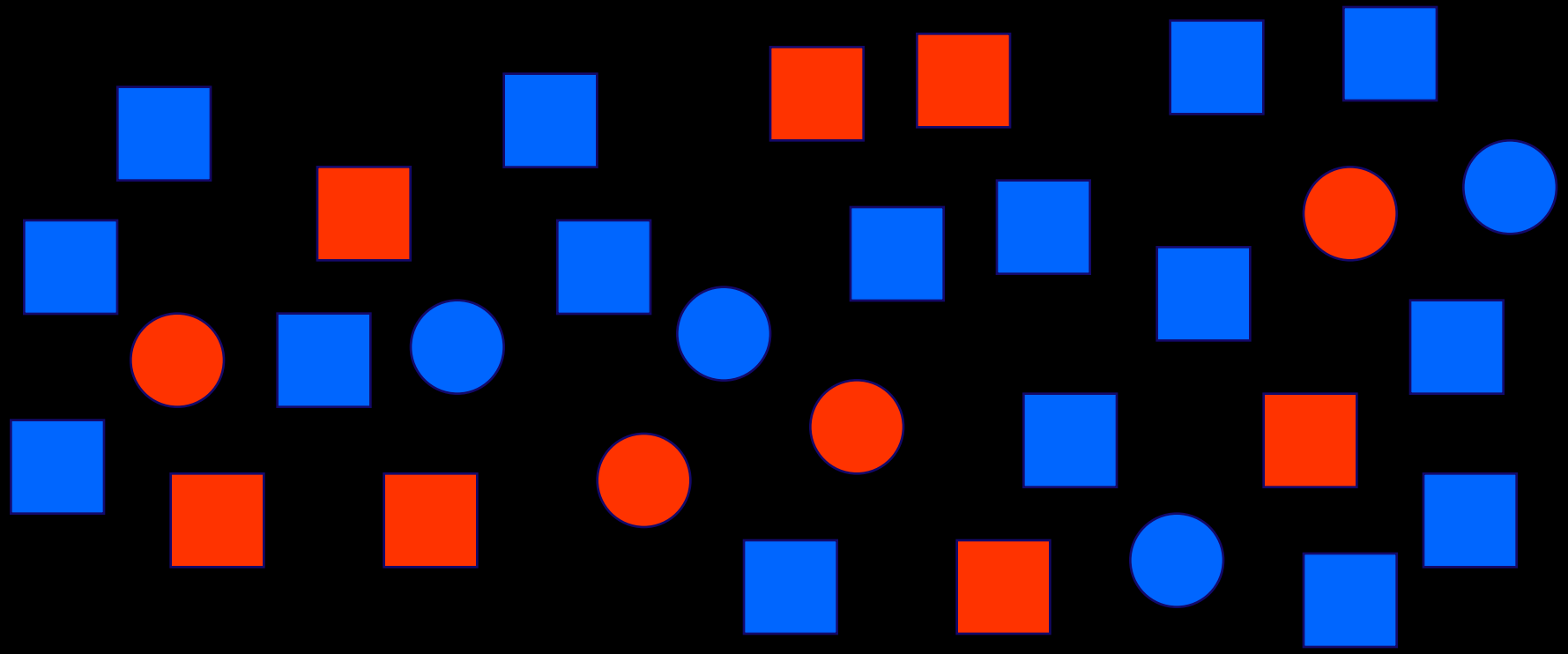
- How many blue circles?

Perception of symbols



- How many blue circles?

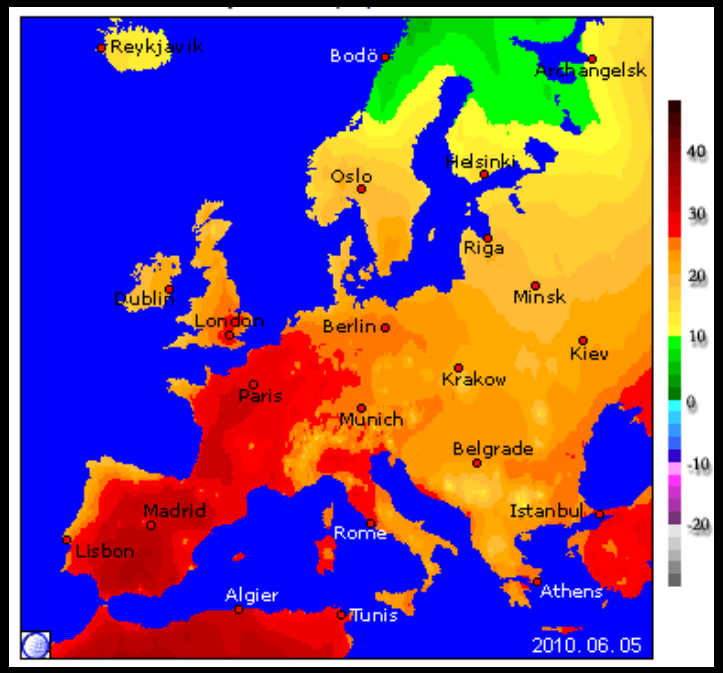
Limits to perception of symbols



- Combinations of attributes cannot be perceived pre-attentively

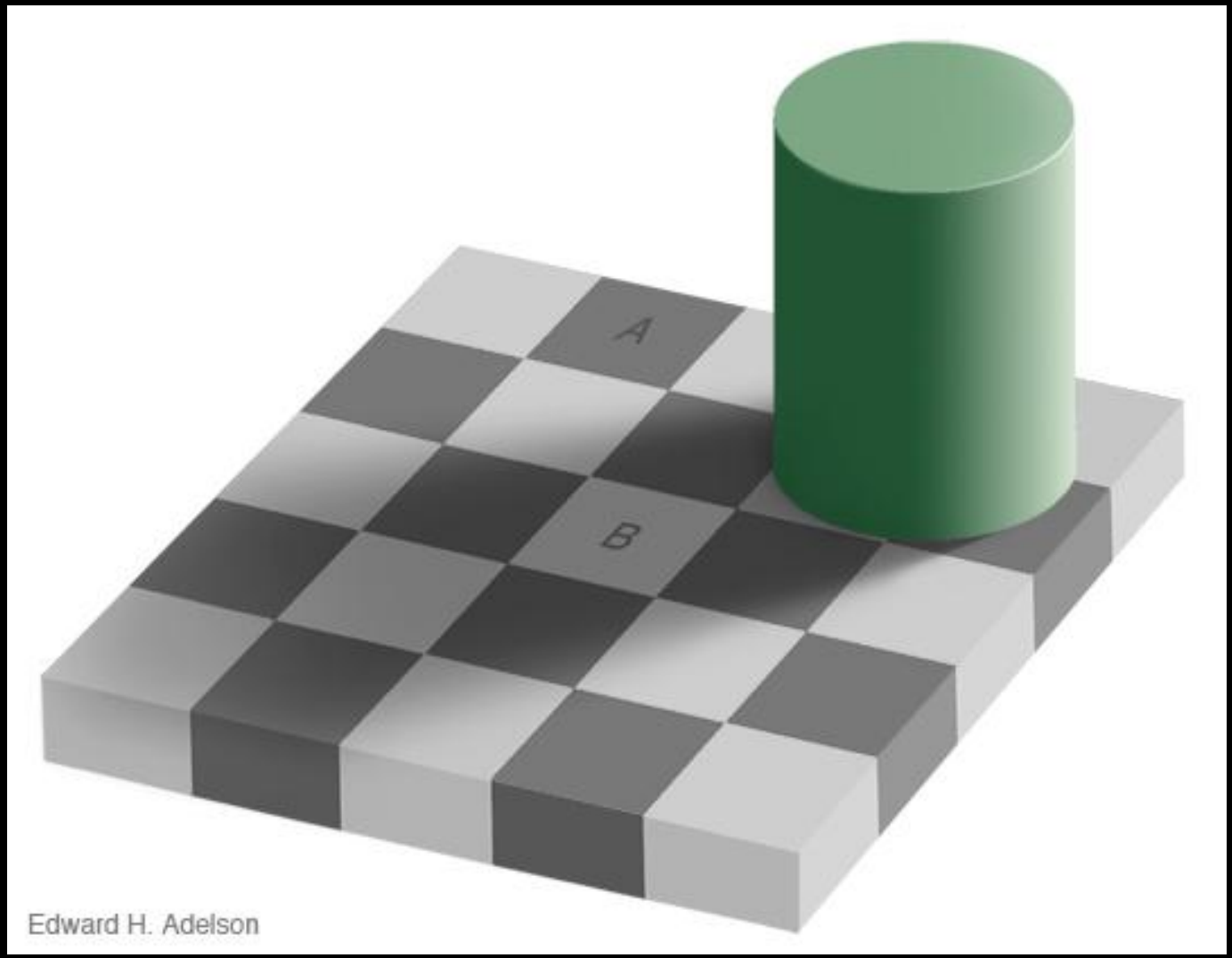
Color for encoding information

- Translate data into colors
- The human as light meter?

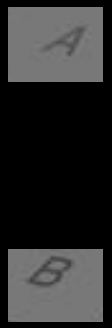


www.weerdirect.nl

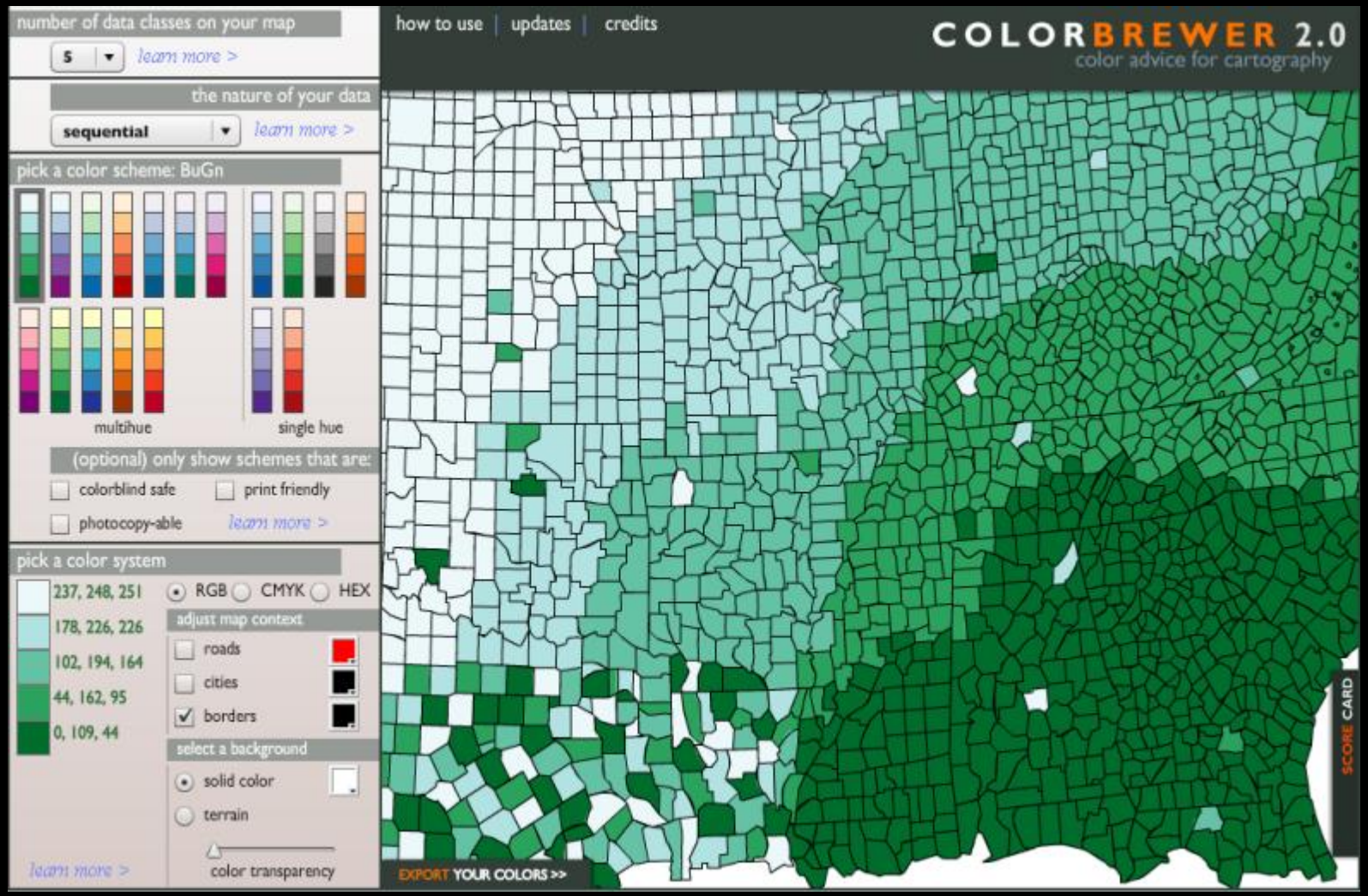
Adelson checkerboard illusion



Adelson checkerboard illusion

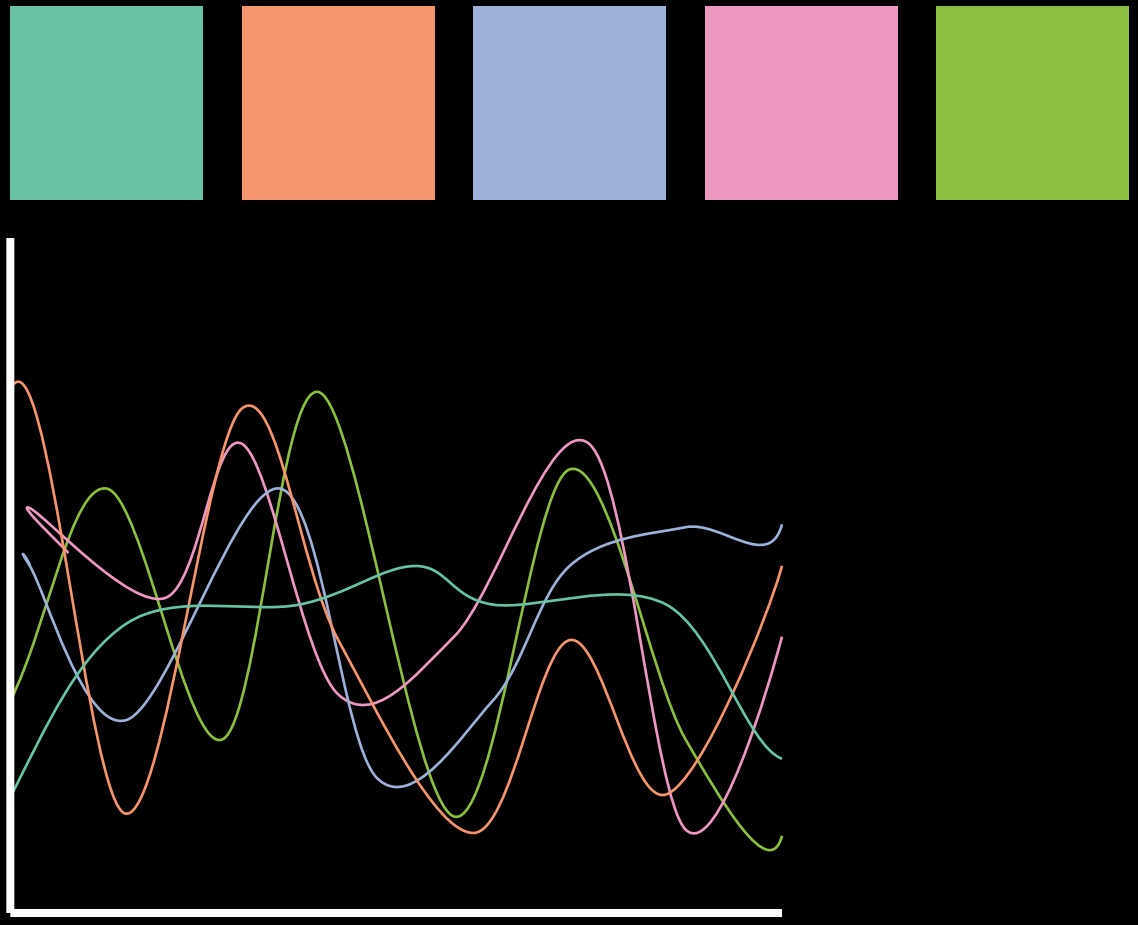


Use ColorBrewer for palettes



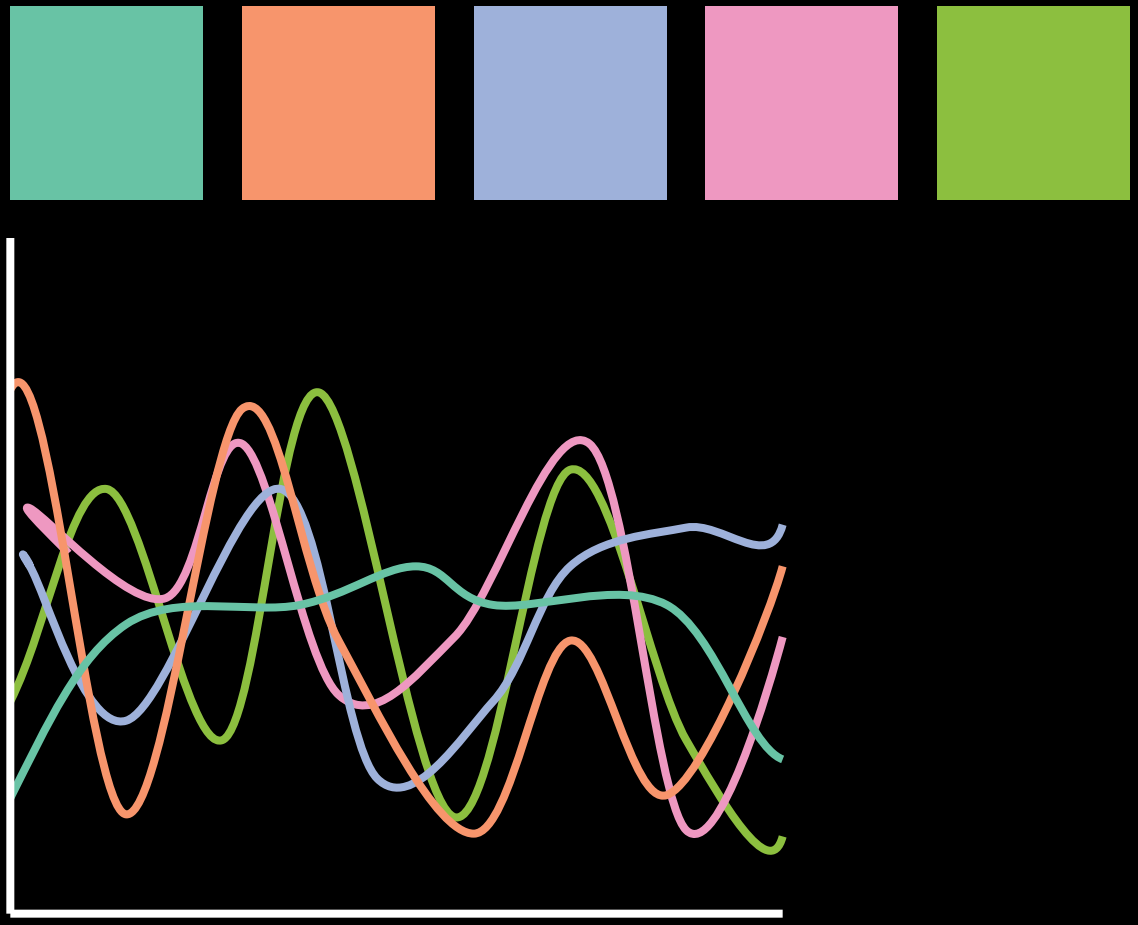
Cynthia Brewer: http://colorbrewer2.org

Size matters



Maureen Stone: In Color Perception, Size Matters, CG&A 2012

Size matters



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Information Visualization

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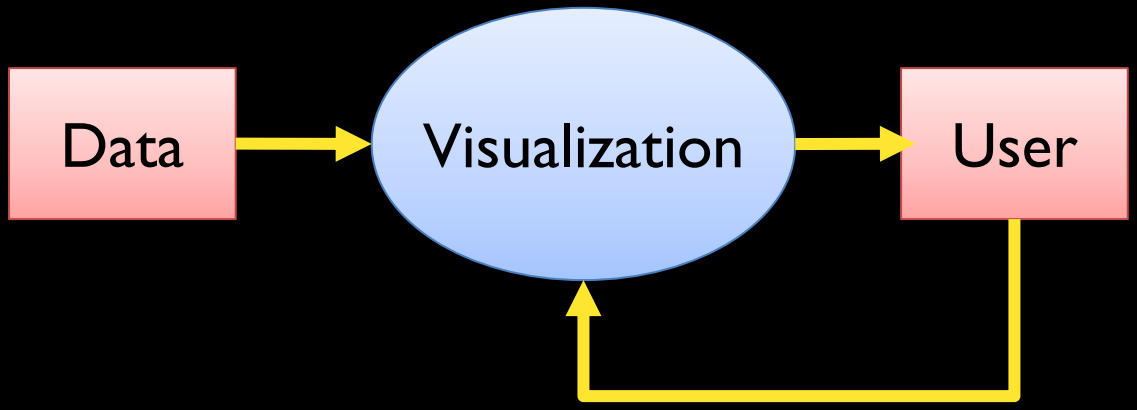
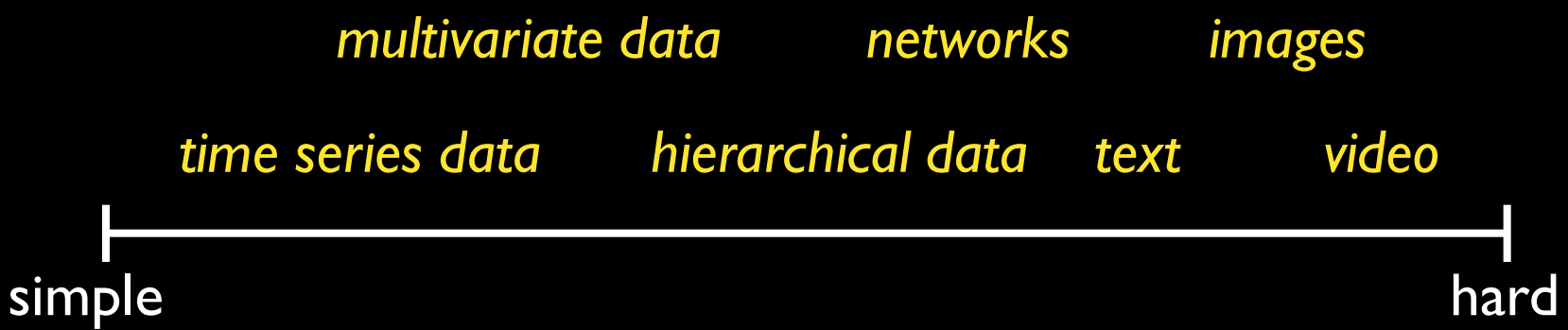


Data types



- Vary in complexity
- One data set, many interpretations
- Think about your data: What does it mean? What do I want to see?
- Example

Items

name

age

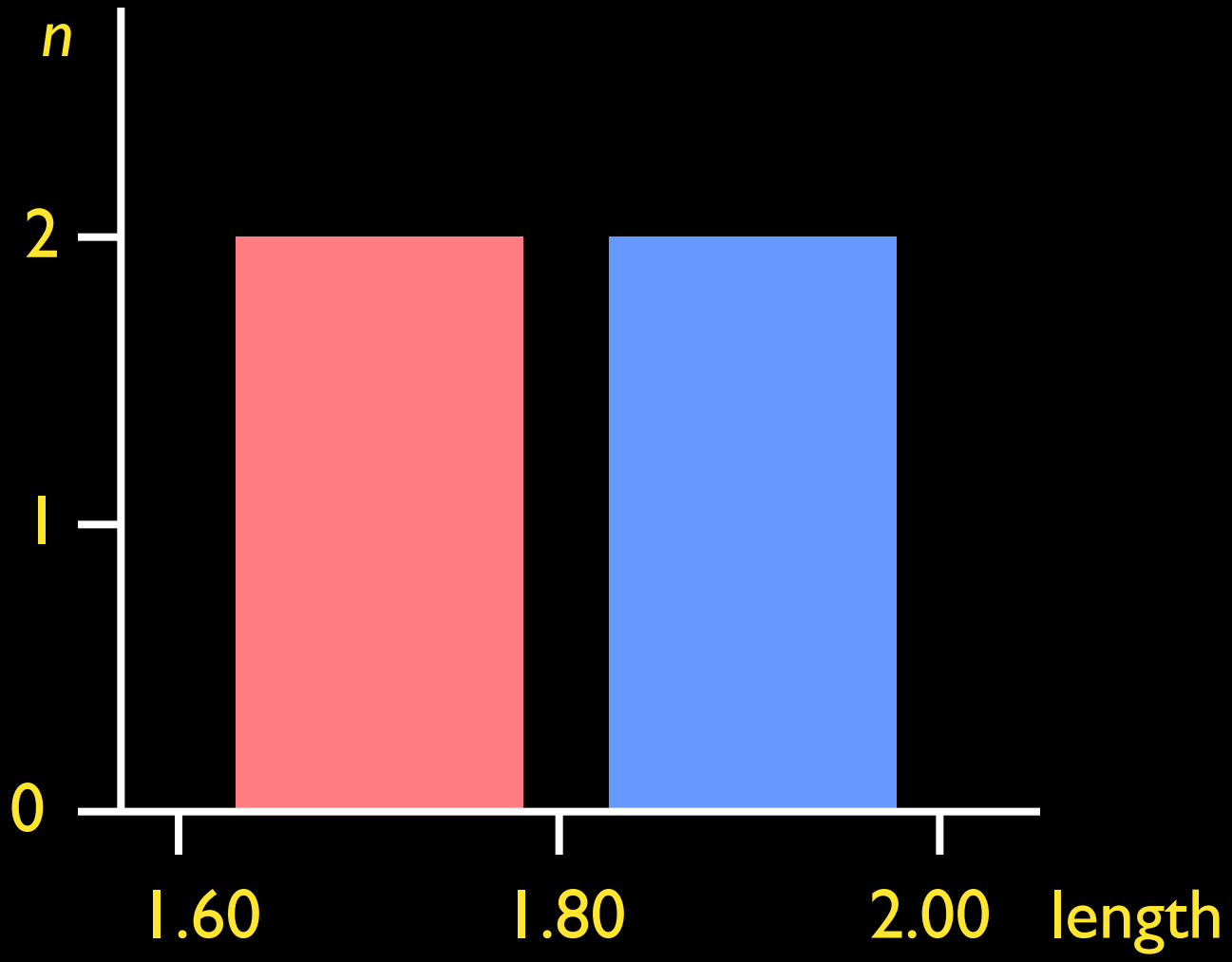
length

sex

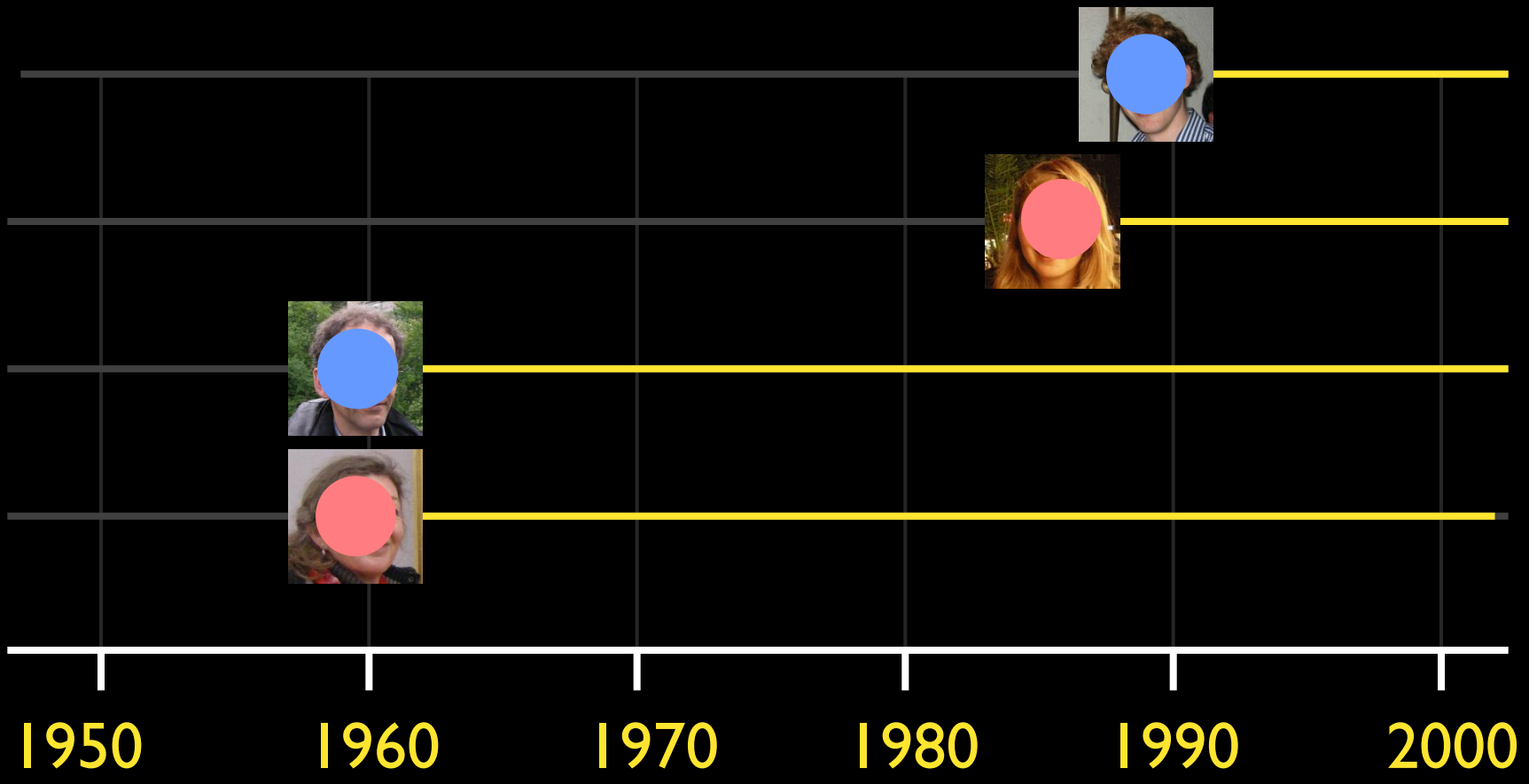
Multivariate data: tables

	name	age	length	sex
	Simone	*55*	*1.68*	*F*
	Jack	*55*	*1.85*	*M*
	Merel	*27*	*1.72*	*F*
	Ivo	*25*	*1.95*	*M*

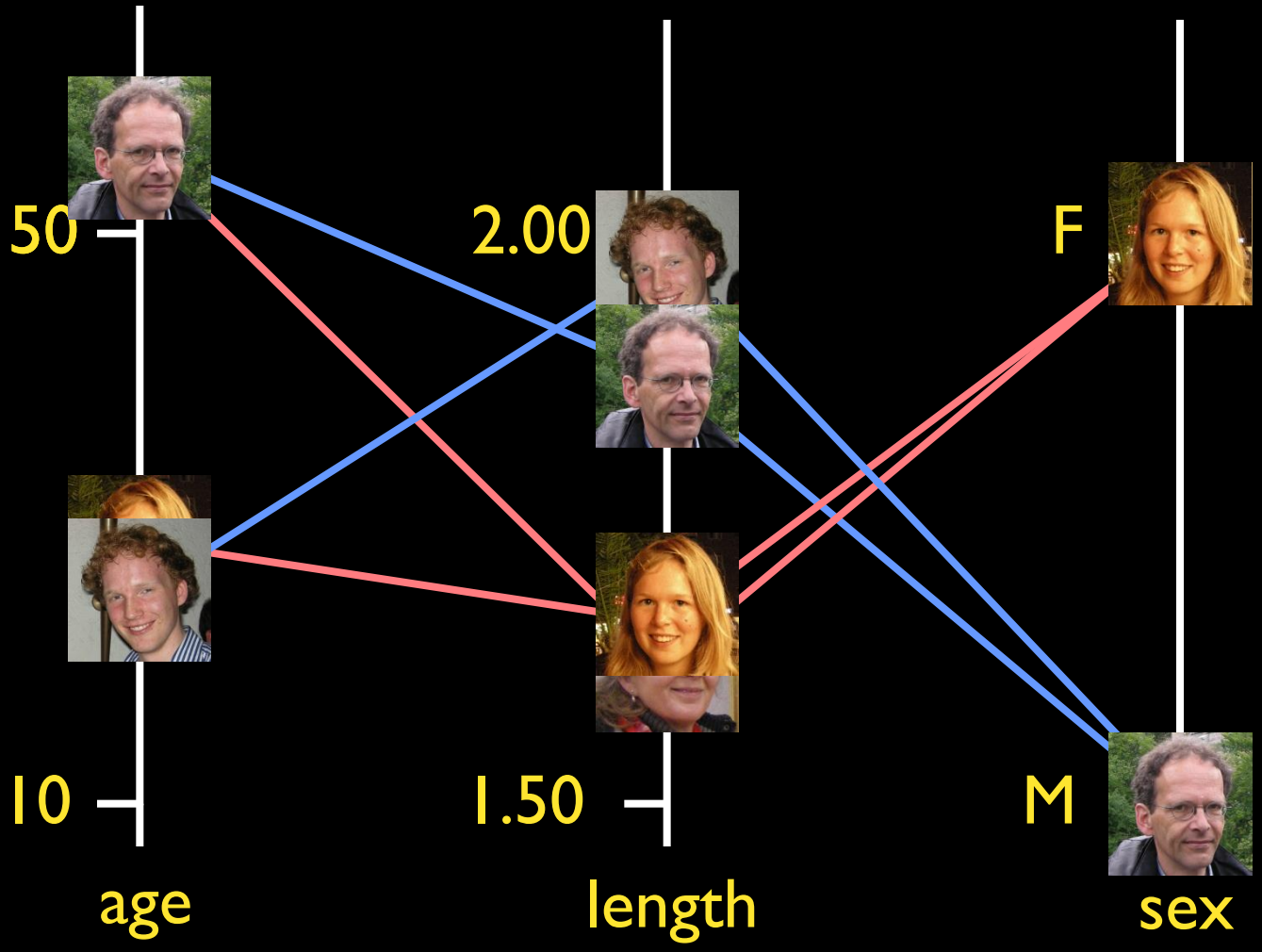
Distribution per attribute



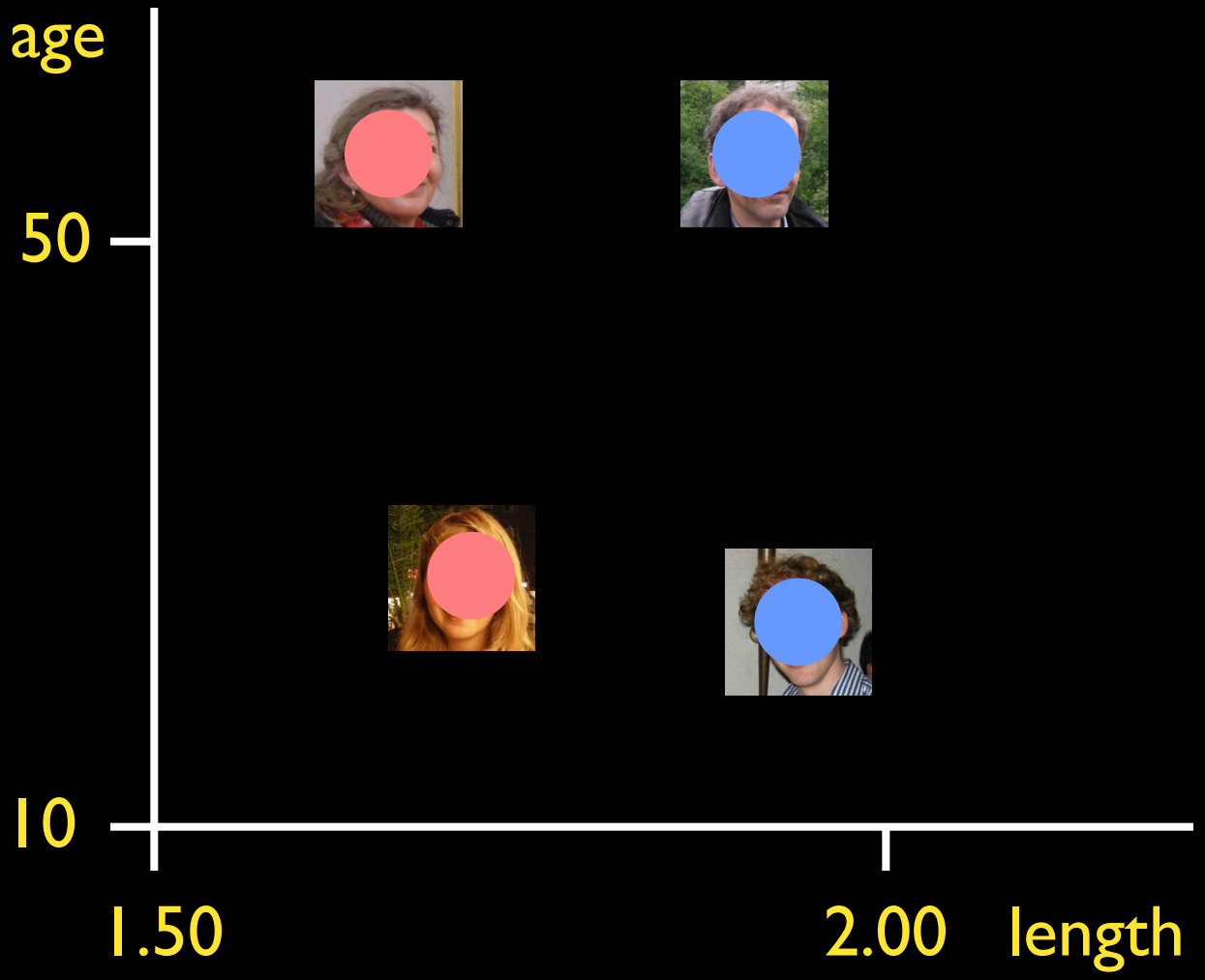
Events



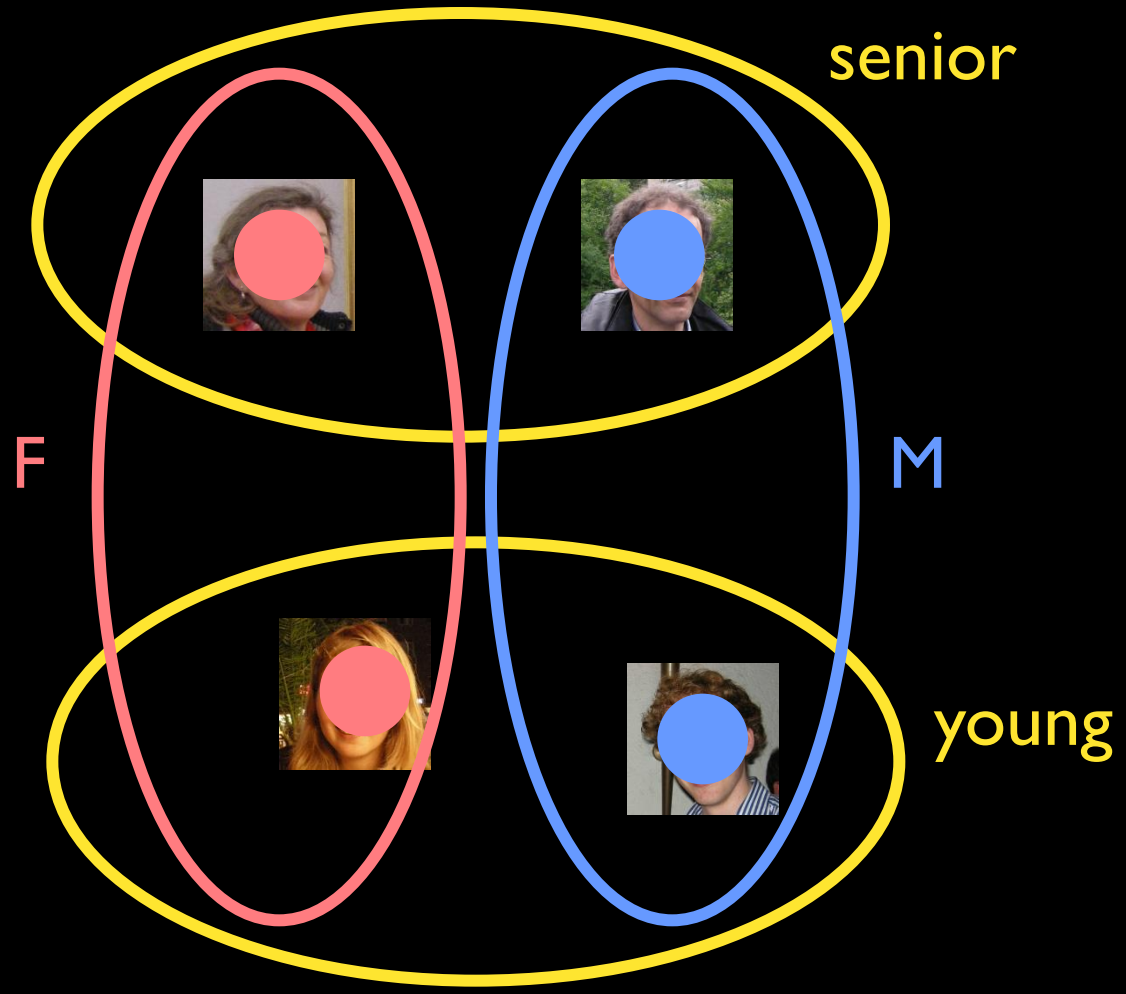
Multivariate data: Parallel Coordinates Plot



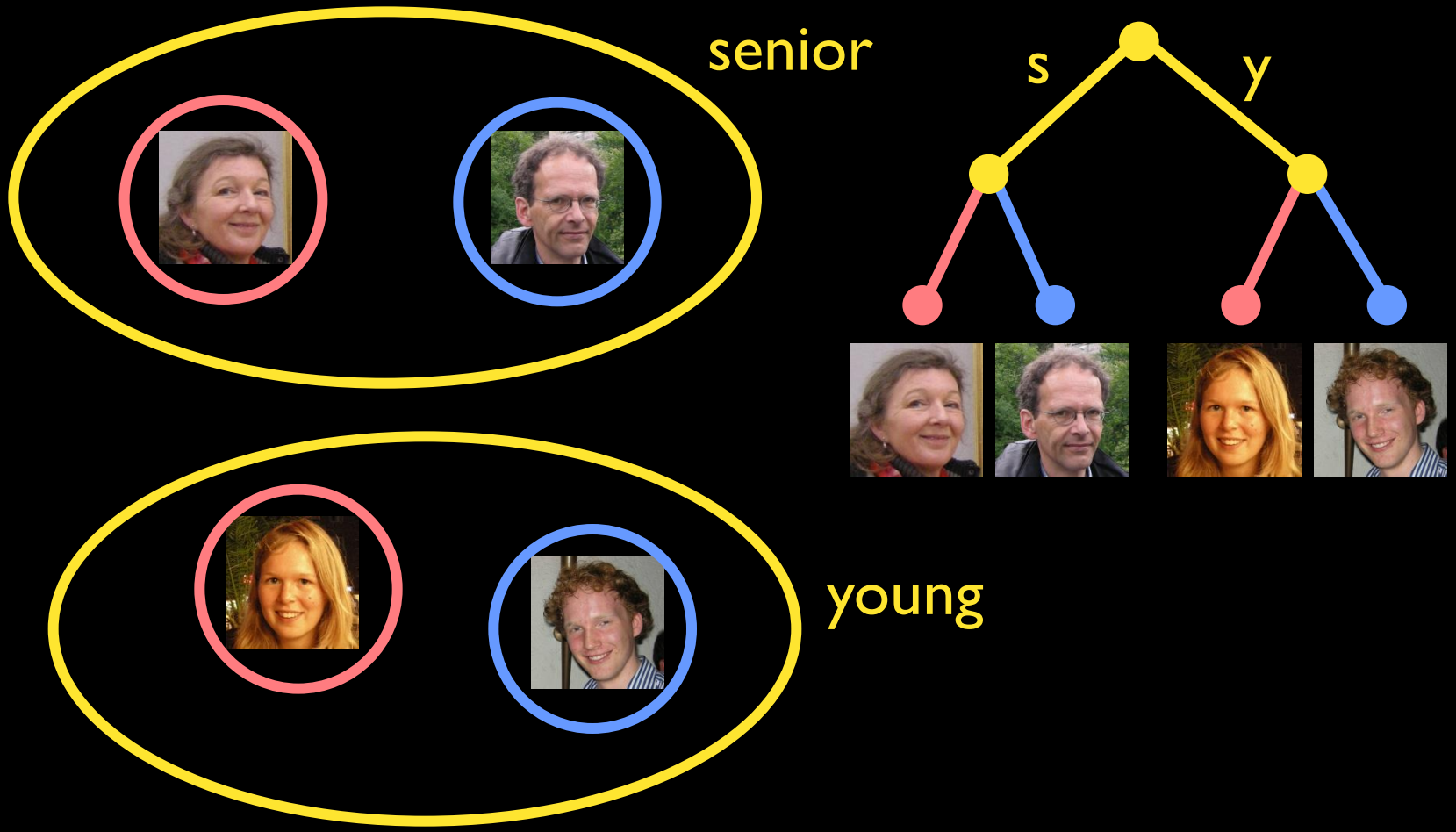
Multivariate data: scatterplot



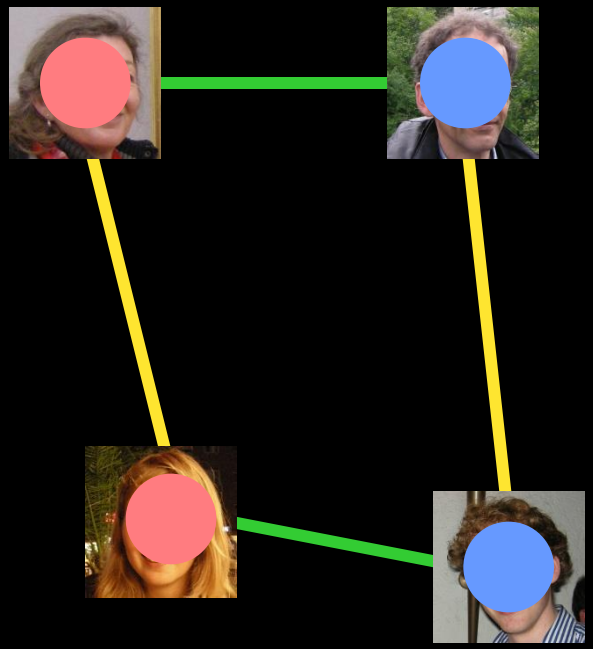
Sets



Hierarchy



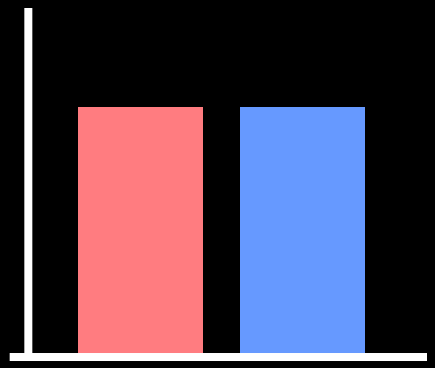
Network

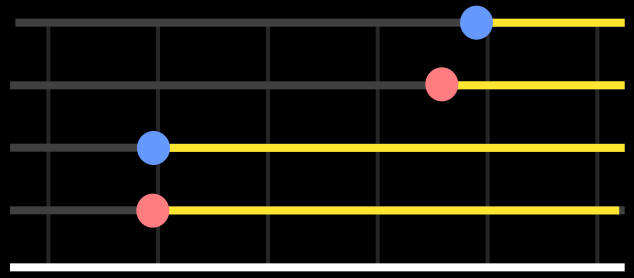


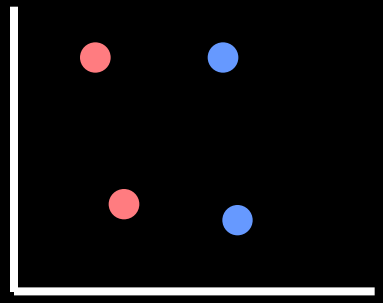
same sex

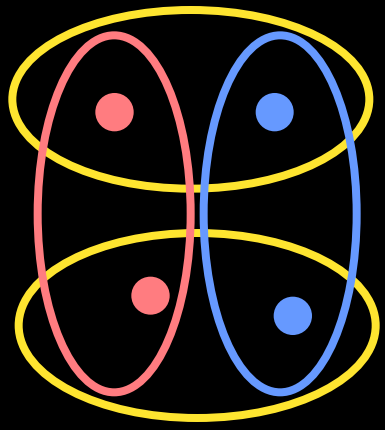
similar age

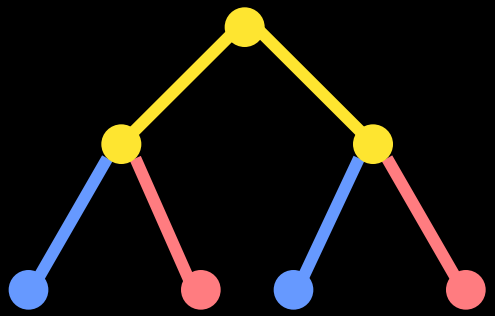
One data set, many interpretations

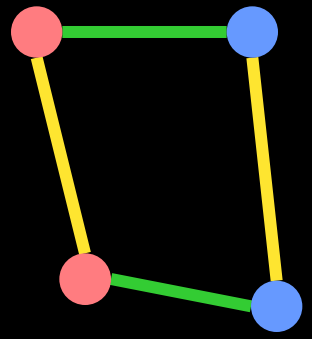




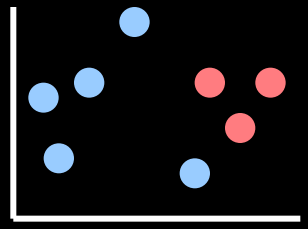






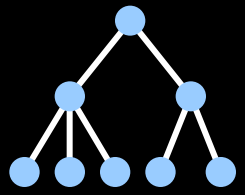


Abstract data: main types



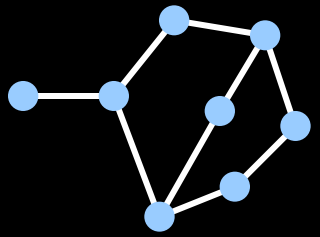
Multivariate visualization:

scatterplot



Tree visualization:

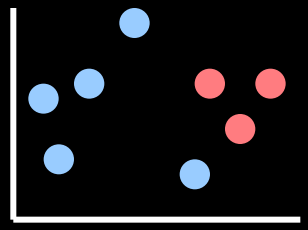
tree diagram



Graph visualization:

node link diagram

Abstract data: often a mix



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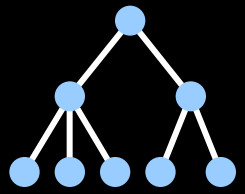
scatterplot



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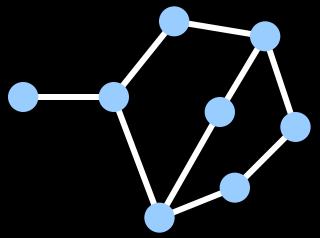
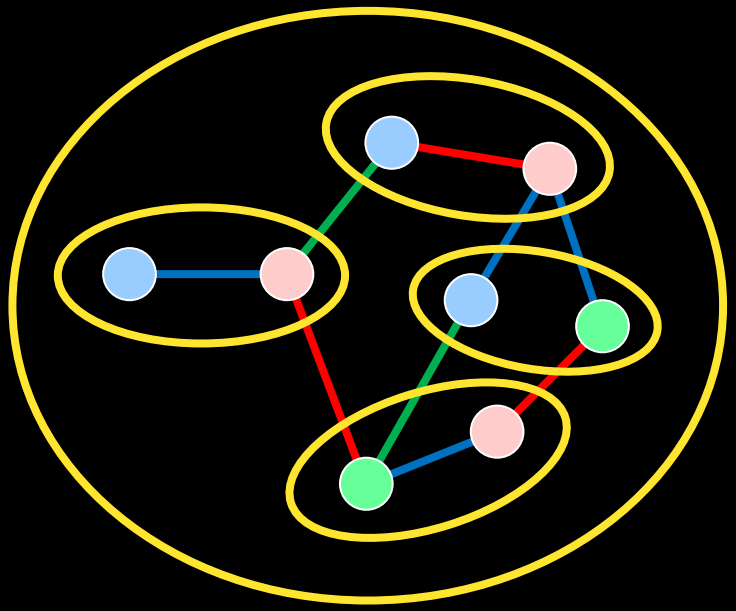
tree diagram



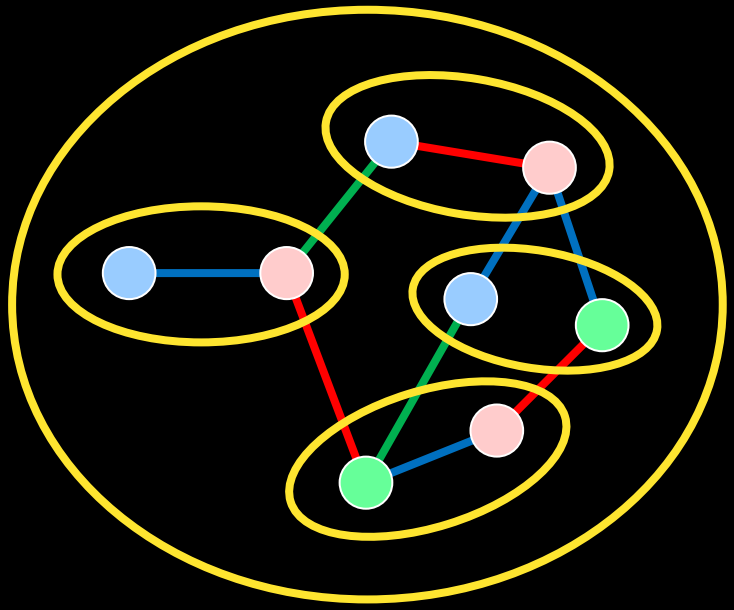
Graph visualization:

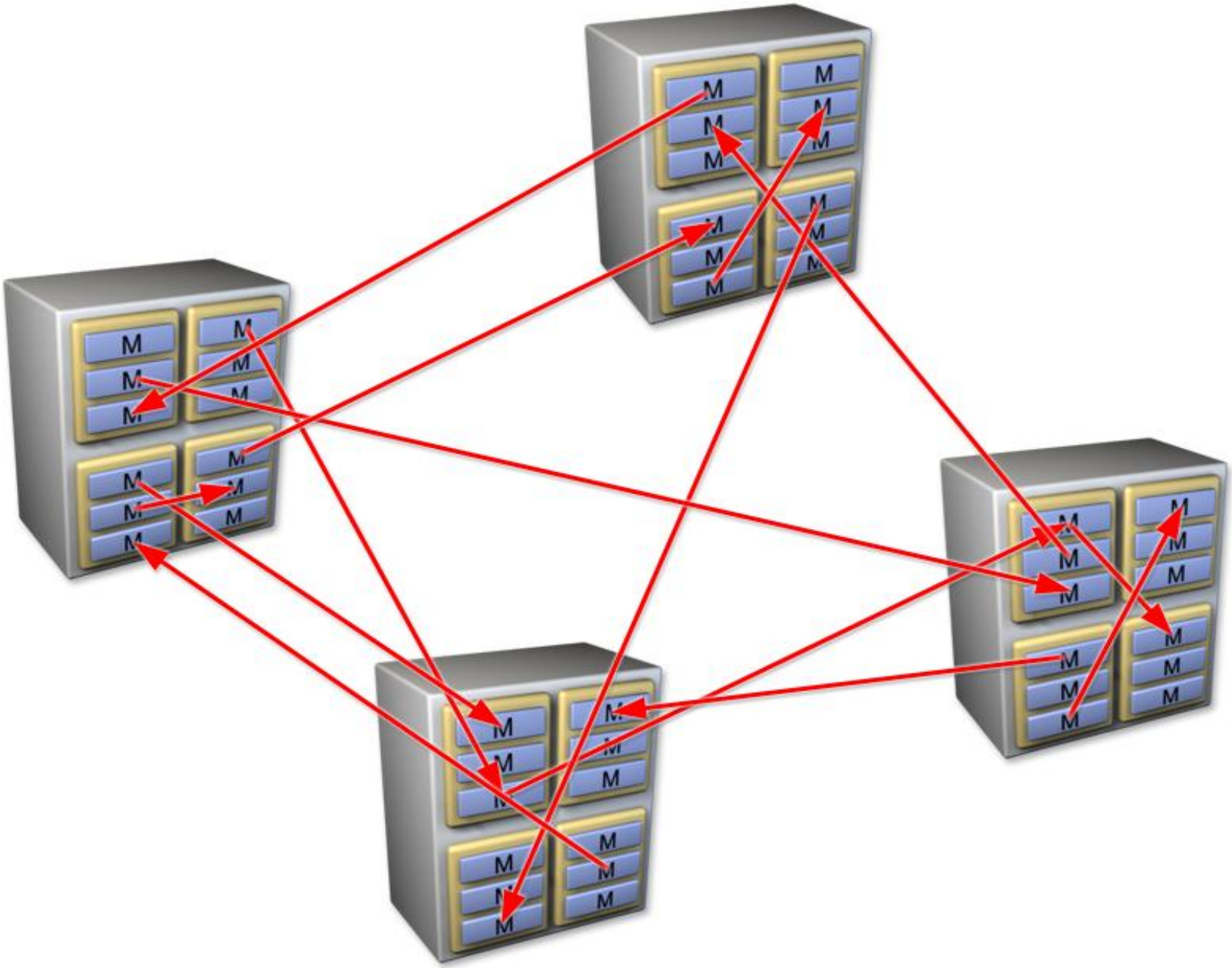
node link diagram

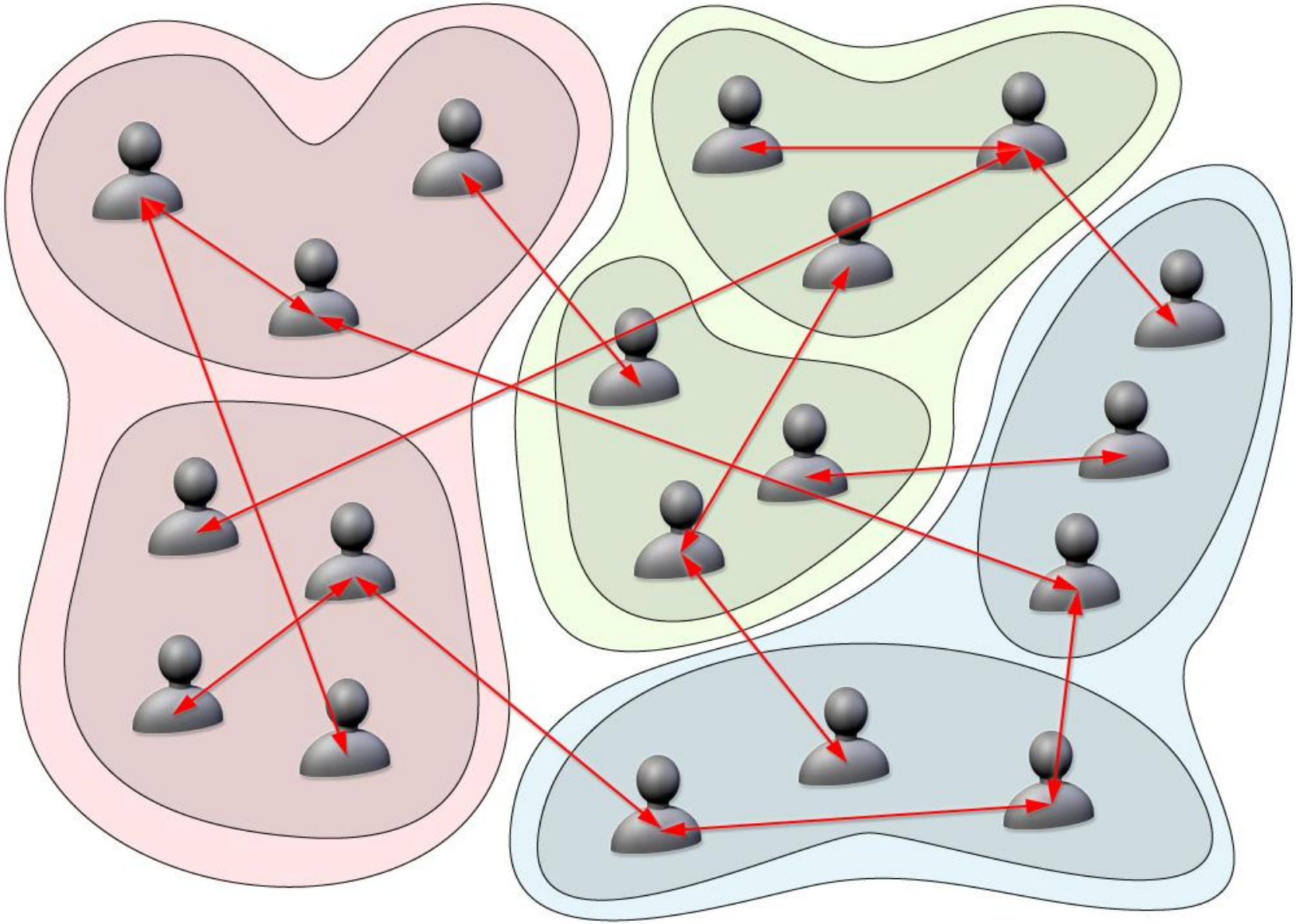


Trees+networks+multivariate data

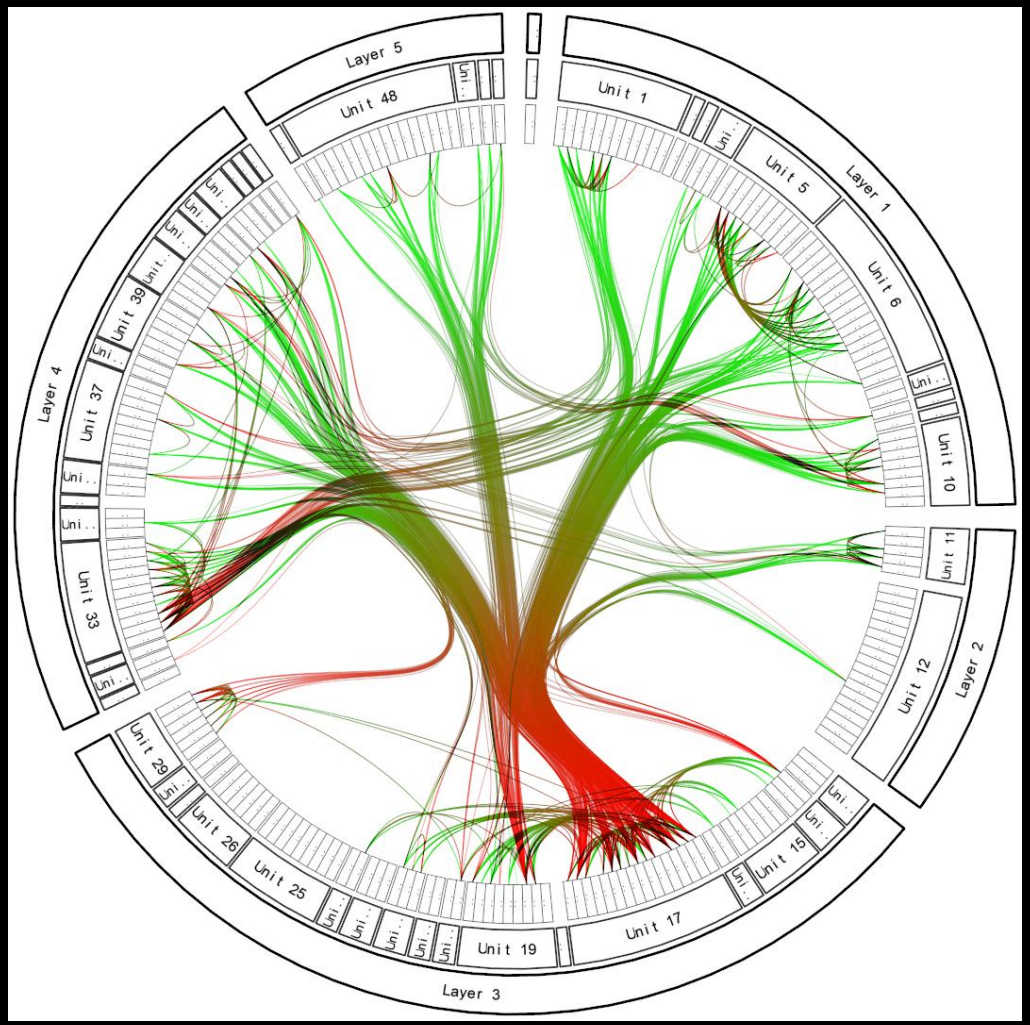
- Everywhere!




M



Hierarchy + network

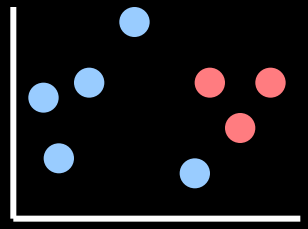


Holten, 2006

Spin-off: SynerScope

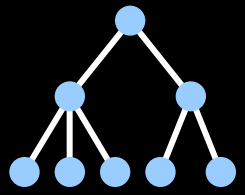
- www.synerscope.com
- Transaction analysis, fraud detection

Abstract data: main types



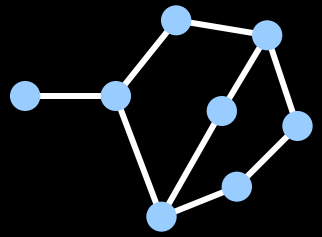
Multivariate visualization:

scatterplot



Tree visualization:

tree diagram



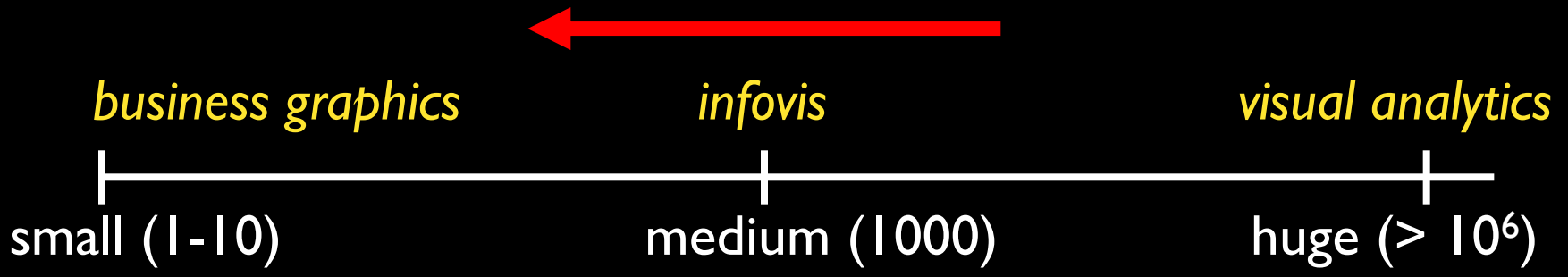
Graph visualization:

node link diagram

Challenge:

What if we have thousands of data-items?

Data size

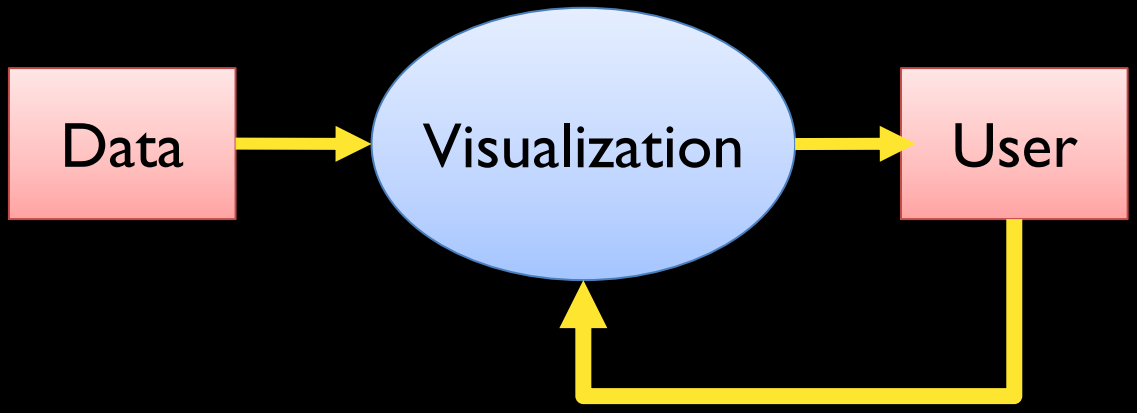


Try to move to the left:

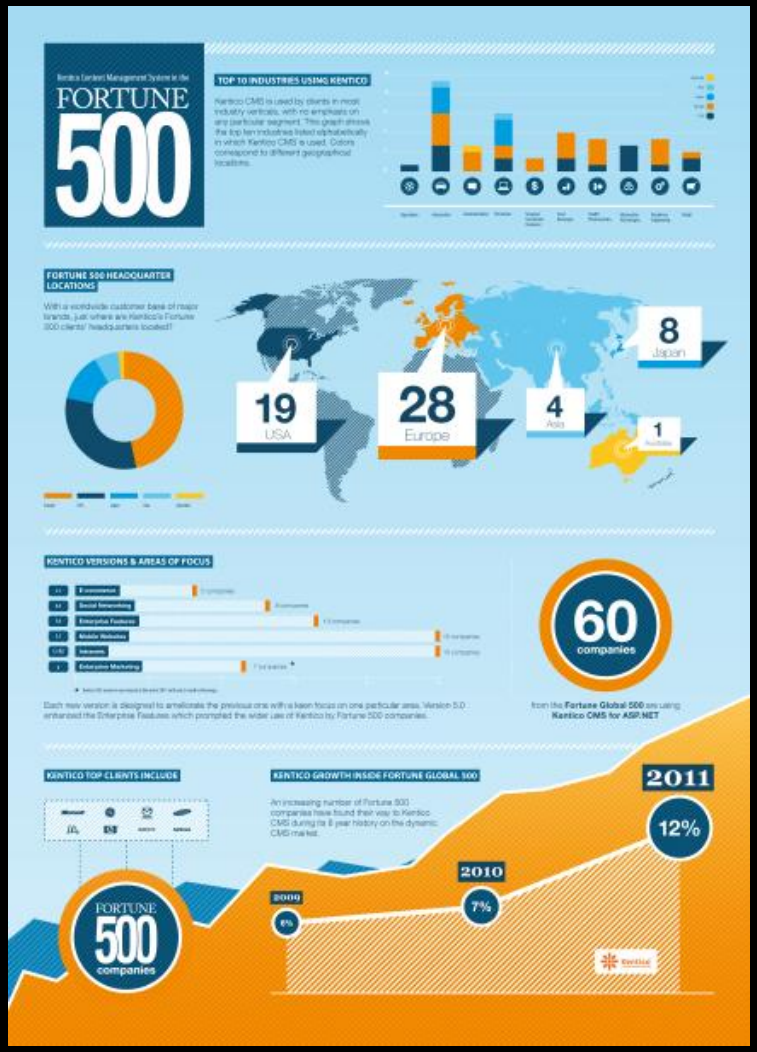
- Use interaction to select relevant data

Information Visualization

- The use of computer-supported, **interactive,** visual representations of abstract data to amplify cognition. (*Card et al., 1999*)



Infographics vs InfoVis

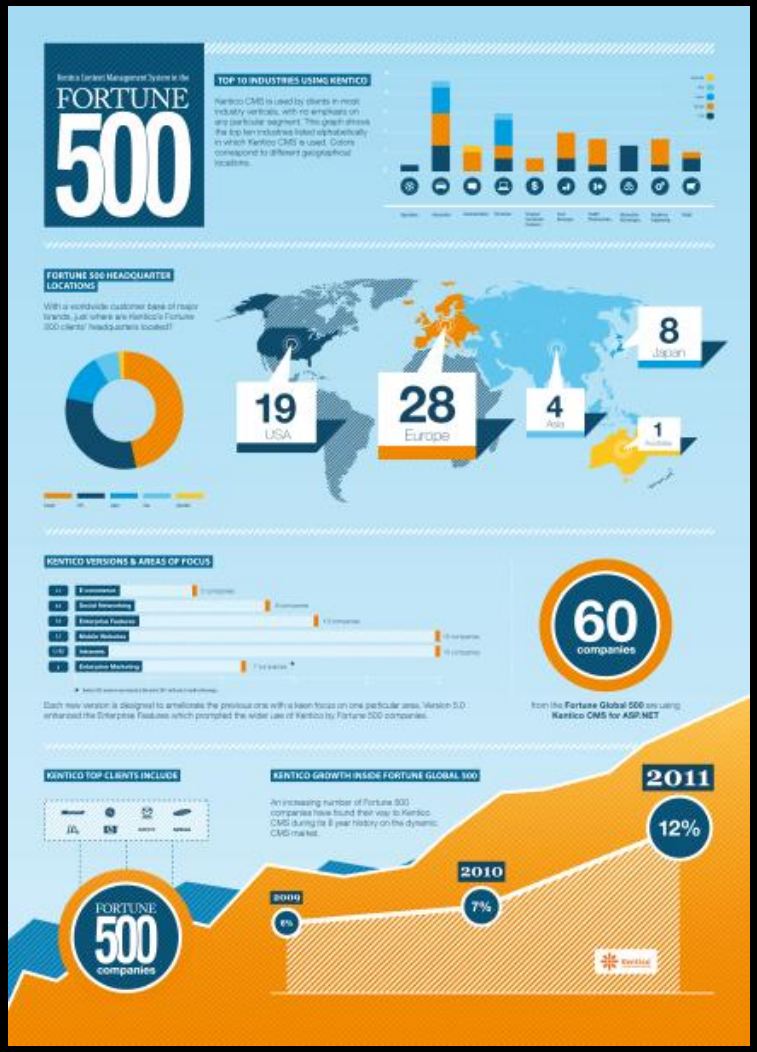


Infographics:

- Static
- Explanation
- Made by data journalist
- Viewed by lay audience

Kentico.com

Infographics vs InfoVis

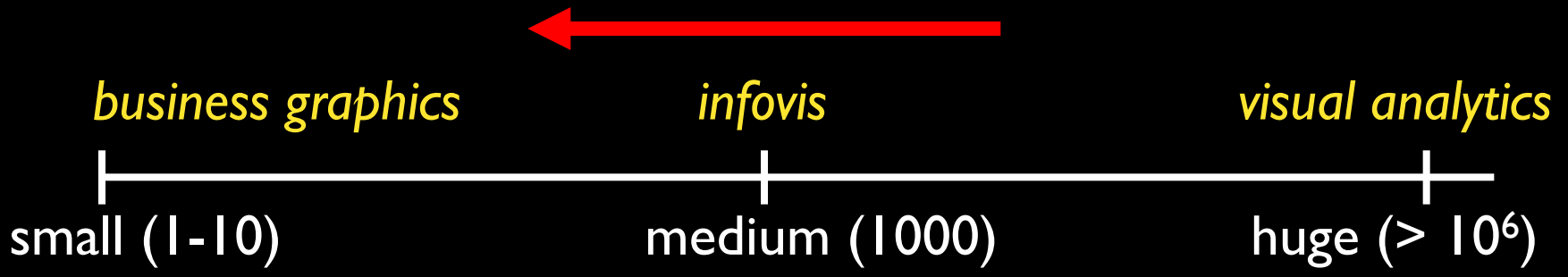


Infographics:

- Static vs interactive
- Explanation vs explorative
- Made by data journalist vs domain expert
- Viewed by lay audience vs domain expert

Kentico.com

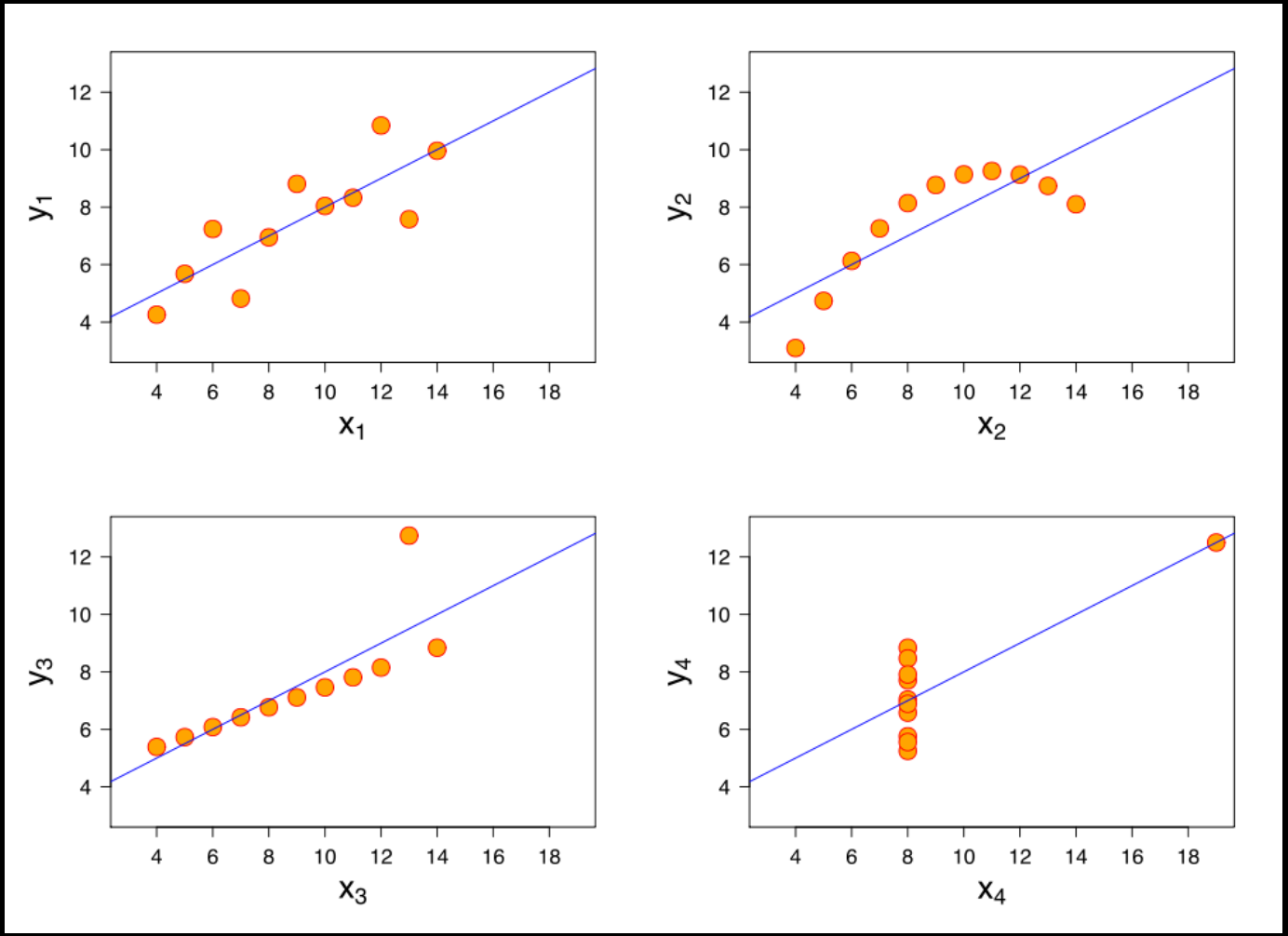
Data size



Try to move to the left:

- Use interaction to select relevant data
- Use statistics / machine learning (without loosing essential information…)

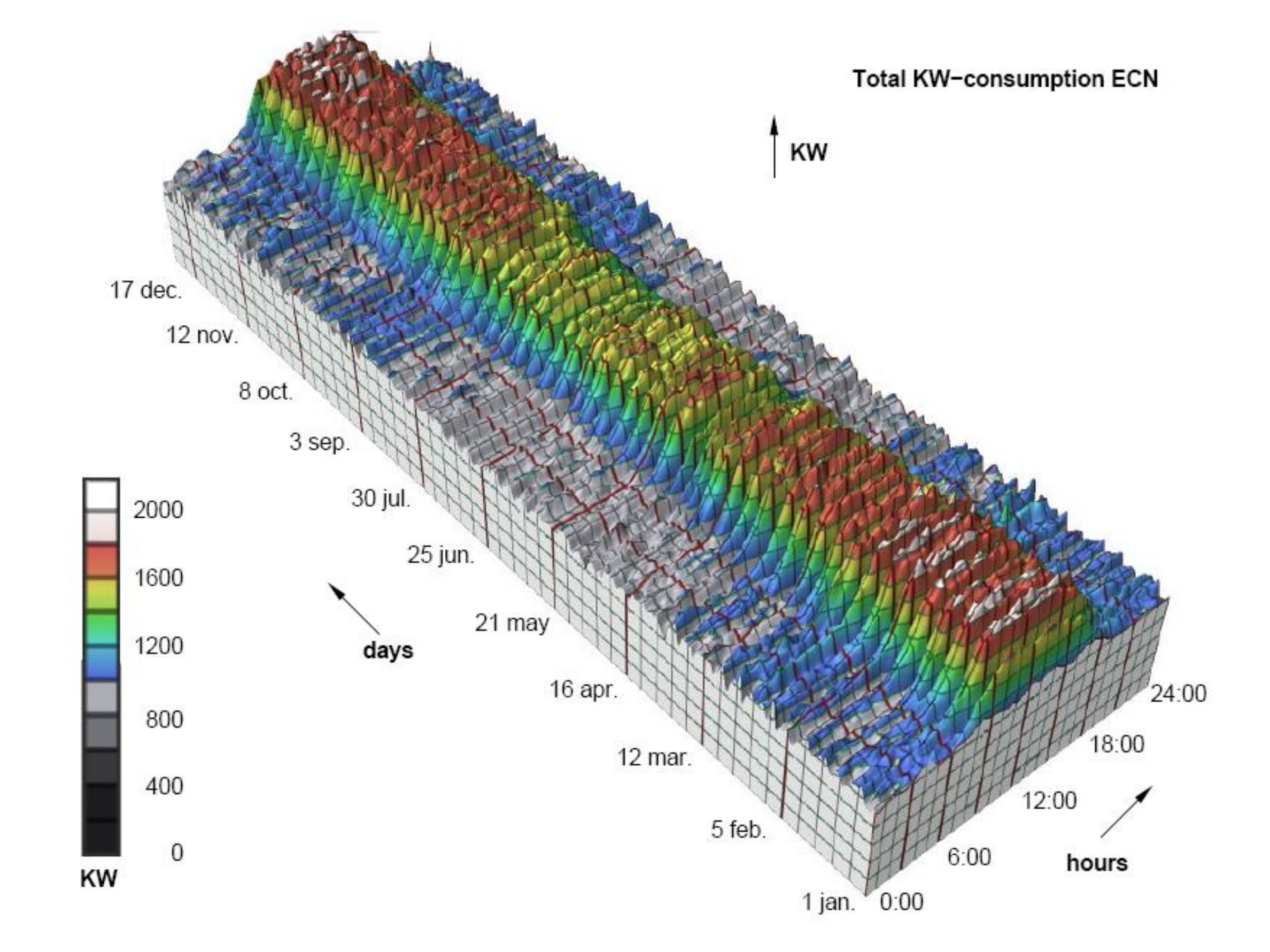
Anscombe's quartet



Francis Anscombe, 1973

Analysis of time-series data

- Given: 10 minute measurements for one year
- 52,560 measurements
- How to visualize these?

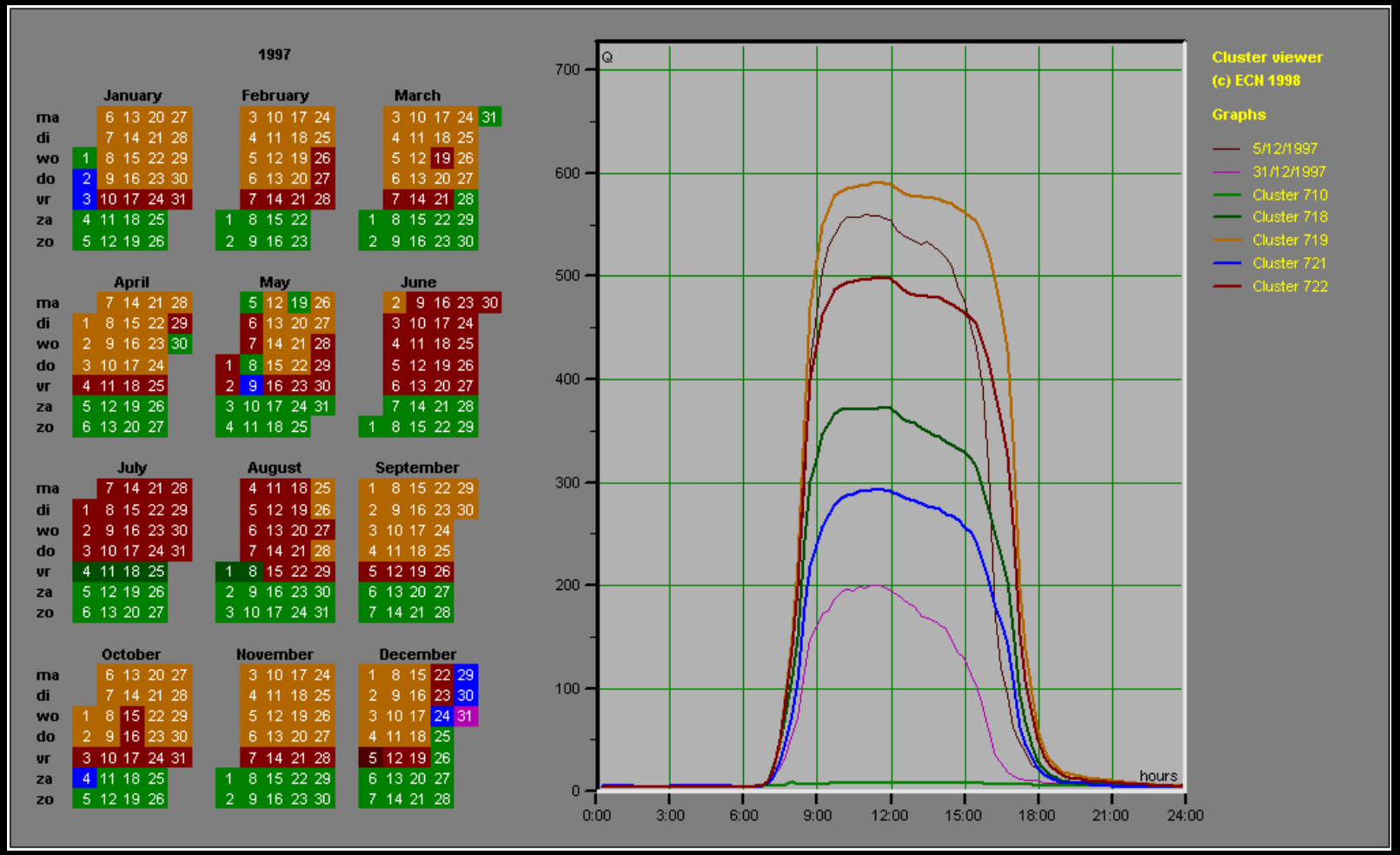

Total KW-consumption ECN
KW
17 dec.
12 nov.
8 oct.
3 sep.
30 jul.
25 jun.
21 may
16 apr.
12 mar.
5 feb.
1 jan.
days
0:00
6:00
12:00
18:00
24:00
hours
2000
1600
1200
800
400
0
KW

Analysis of time-series data

- Given: 10 minute measurements for one year
- 52,560 measurements
- How to visualize these?

- Cluster similar days
- Use standard visualizations

Analysis of time-series data



Cluster & Calendar View, 1999

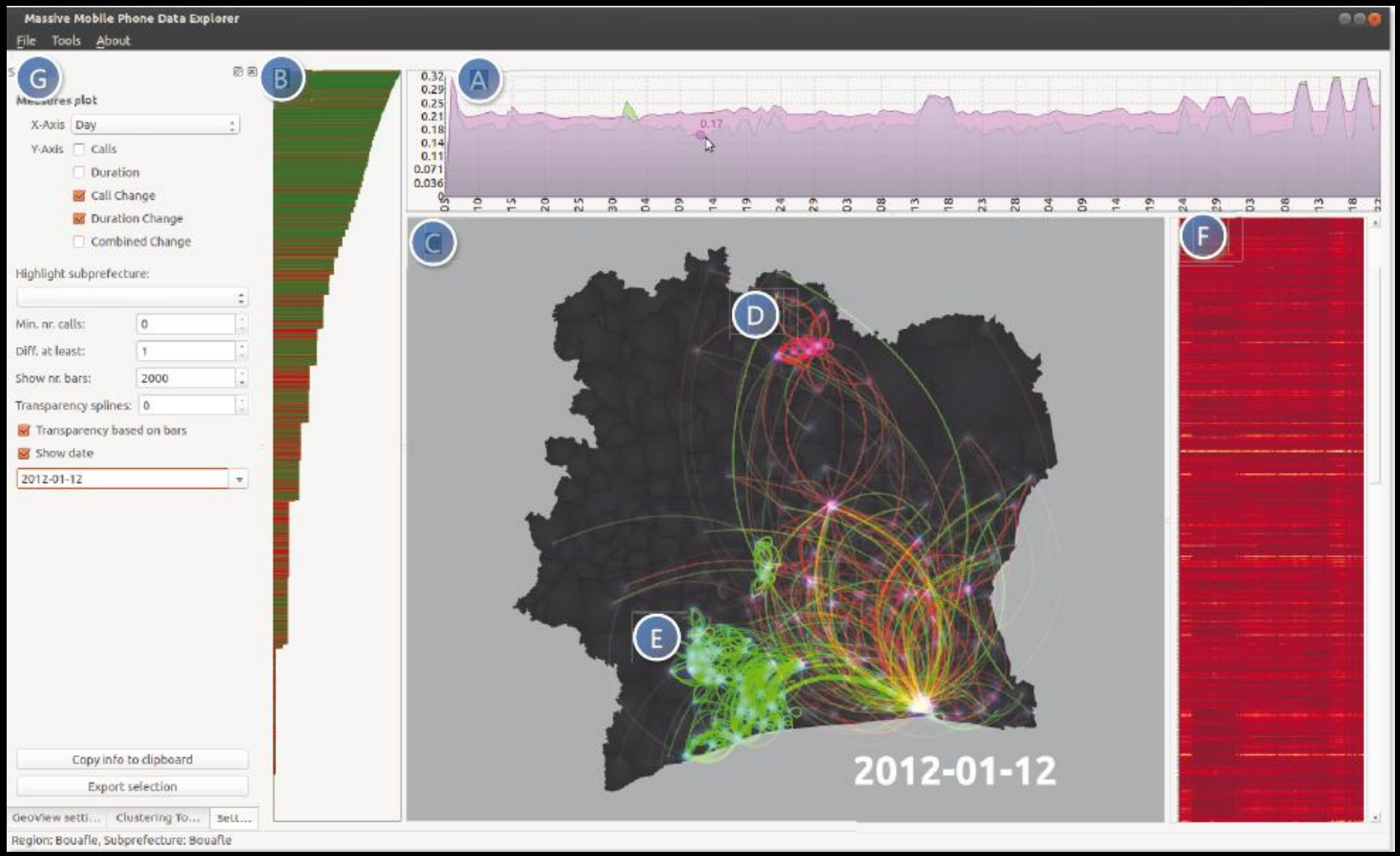
Big Data: D4D challenge

- Data For Development: UN, MIT, Orange

- 5 month telecom data Ivory Coast
- 1000 towers
- Per hour, #calls between towers

- What can we learn from these data?

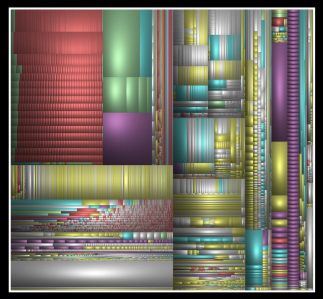
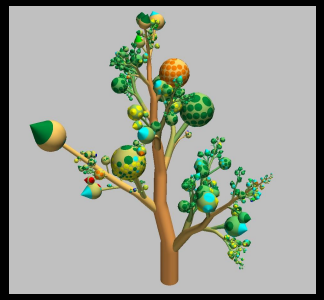
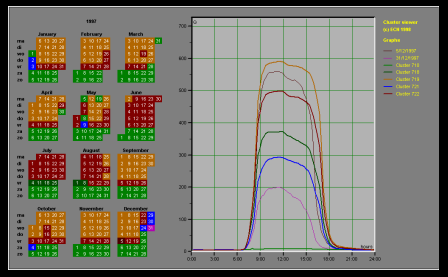
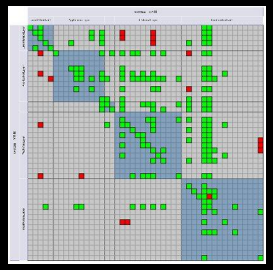
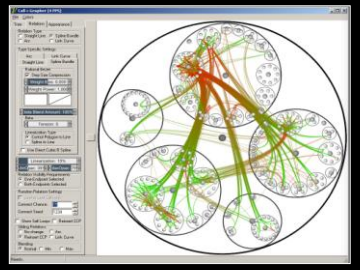
Big Data: D4D challenge



Telecom data visualization, Stef van den Elzen, 2013

Information Visualization

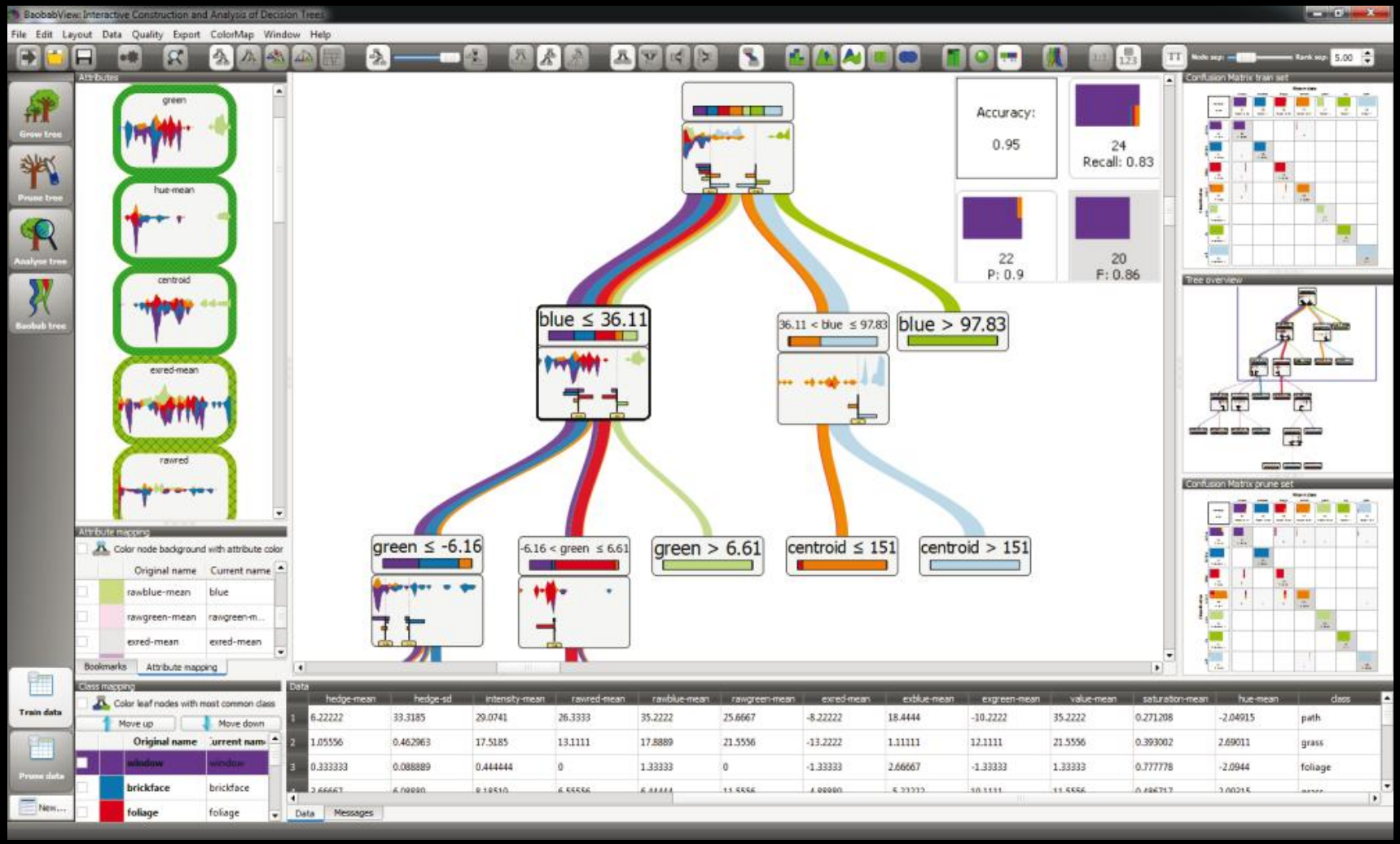
- The use of computer-supported, interactive, visual representations of abstract data to amplify cognition (*Card et al., 1999*)

Thank you!

Questions?

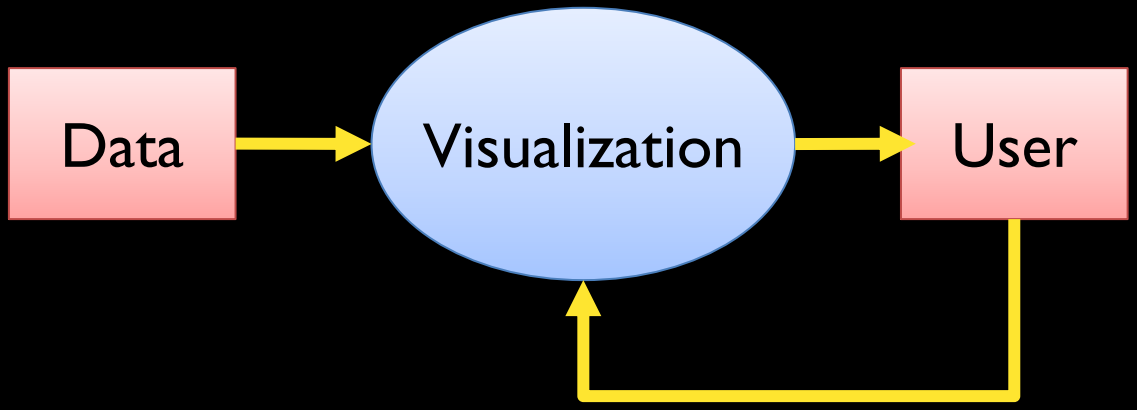
BaobabView



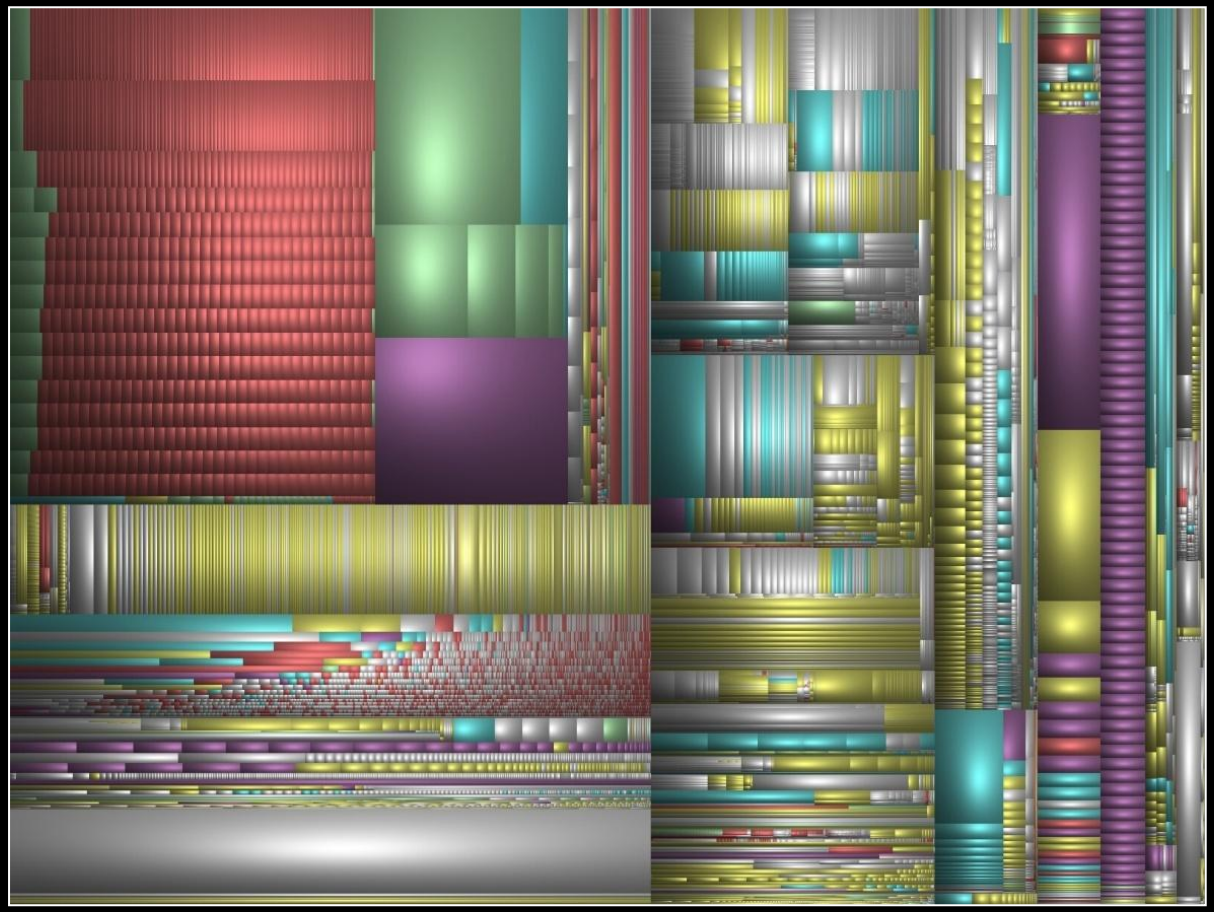
Decision tree visualization, Stef van den Elzen, 2011

Information Visualization

- The use of computer-supported, interactive, visual representations of abstract data to amplify cognition (*Card et al., 1999*)



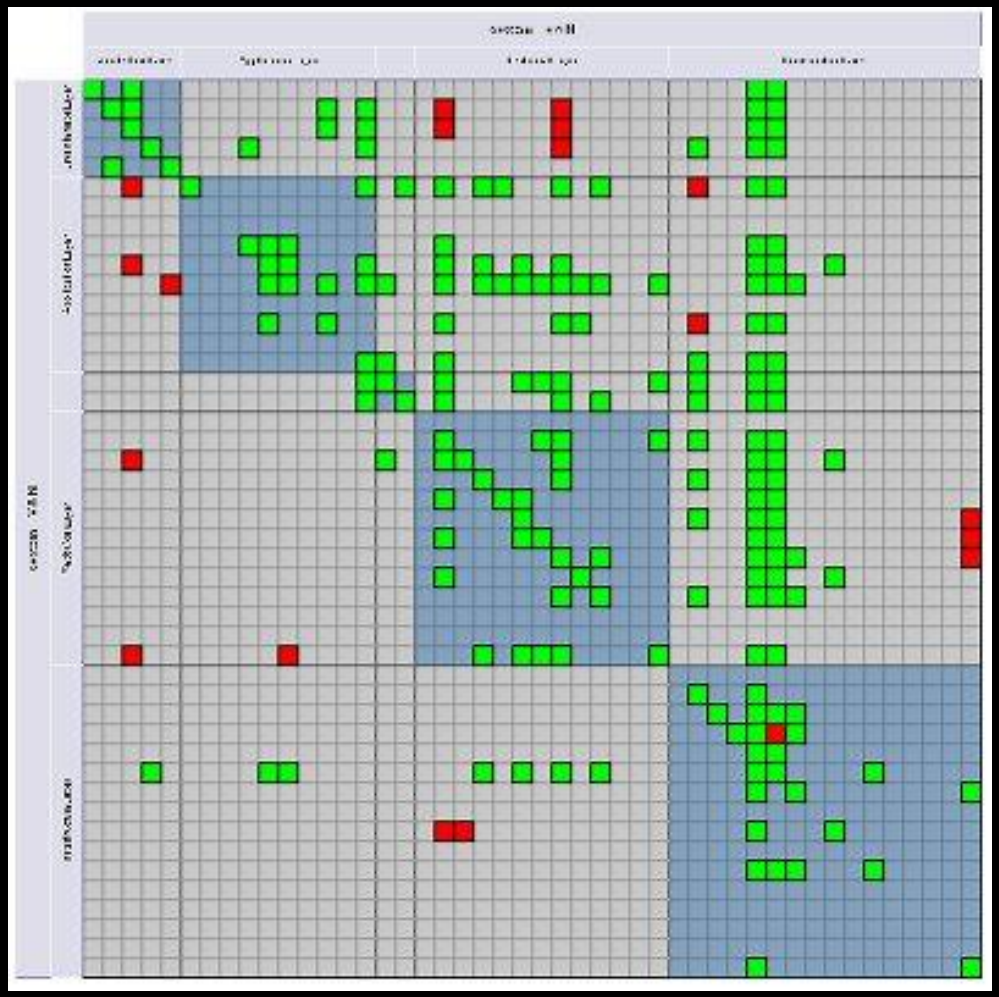
SequoiaView



- www.win.tue.nl/sequoiaview

Van Wijk et al., 1999, Bruls et al. 2000

MatrixView



Van Ham 2003, Van Wijk and Nuy, 2003