

Social Network Analysis: Overview Part 2

EPIC - SNA, Columbia University

Zack W Almquist

June 11th, 2018

University of Minnesota

Network Visualization: Theory and Methods

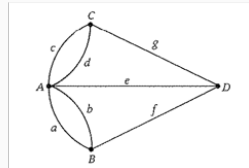
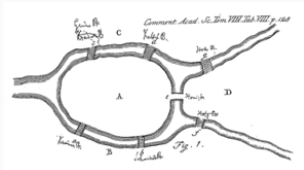
Network Visualization: R

References and Places for More Information

Network Visualization: Theory and Methods

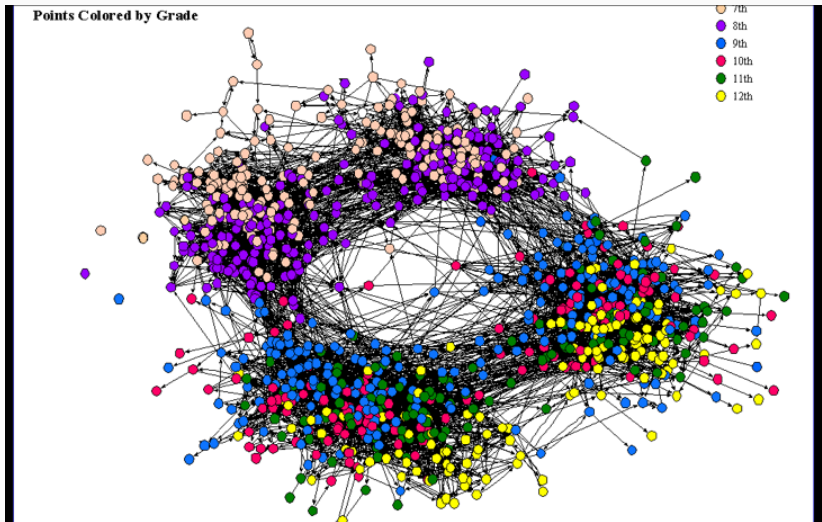
Visualization

- “The success of a visualization is based on deep knowledge and care about the substance, and the quality, relevance and integrity of the content.” (Tufte, 1983)
- Thus a network graph's aim is to clearly communicate something (about patterns of social relationships) that we would have difficulty knowing any other way.



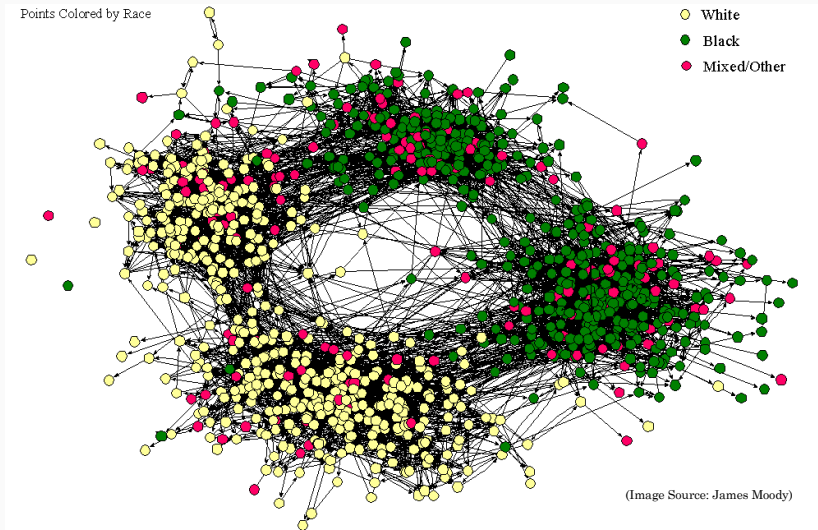
Euler 1741, as reproduced in Freeman LC. Visualizing Social. Journal of Social Structure 2000;1(1).

Visualization: Gaining Some Intuition



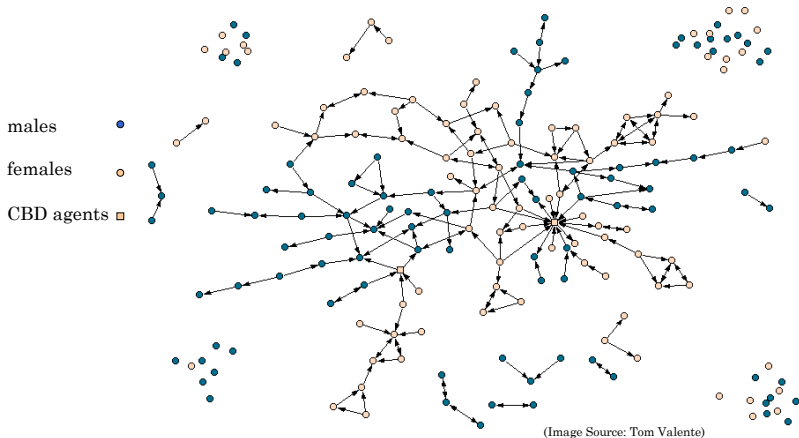
jimi adama. EPIC - SNA 2017. Columbia, University. Origin:

Visualization: Gaining Some Intuition



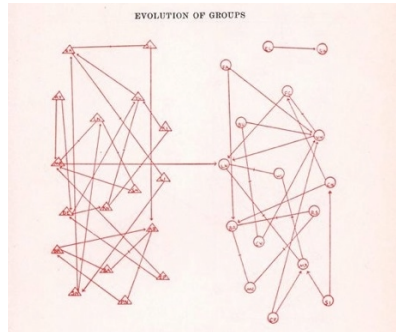
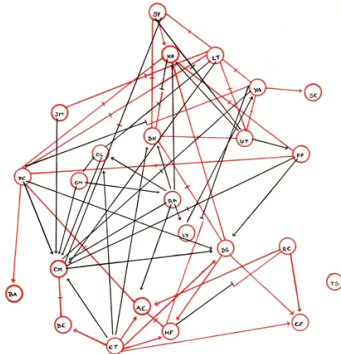
Visualization: Gaining Some Intuition

Figure 1: The general advice network of the village of *Mandrosohasina*, 1999



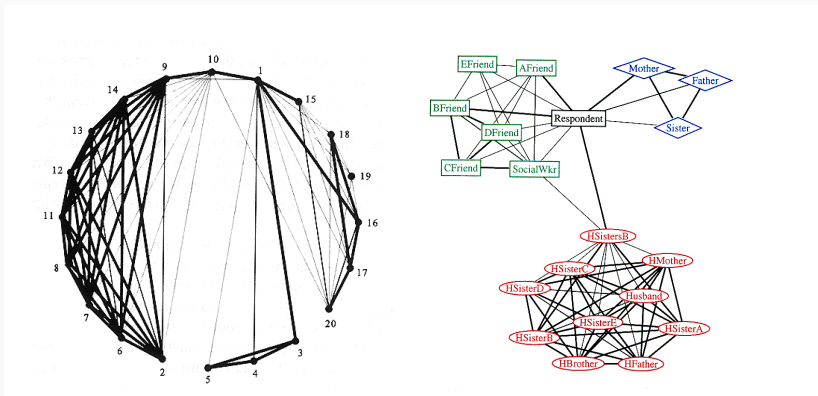
jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin:

Visualization: Gaining Some Intuition



jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin: Moreno 1934, as reproduced in Freeman LC. 2000. Visualizing Social Networks. *Journal of Social Structure* 1(1).

Visualization: Gaining Some Intuition



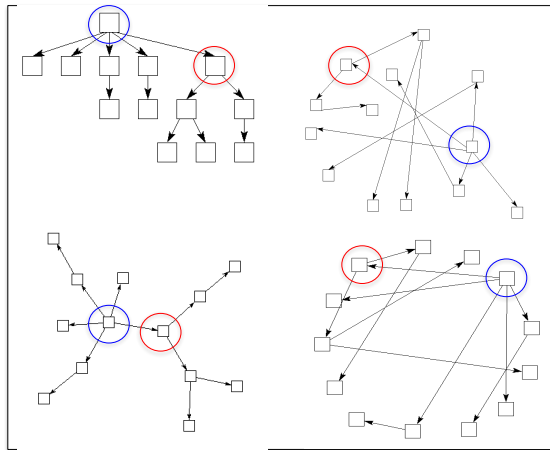
jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin: Mitchell 1994, as reproduced in Freeman LC. 2000. Visualizing Social Networks. Journal of Social Structure 1(1).

Visualization: Gaining Some Intuition

Consider these
4 graphs.

What intuition do
you gain from each?

They're the exact
same network, laid
out differently.



Visualization: Gaining Some Intuition

Information

- Build intuition about the social process generating the network
- Succinctly capture high-dimensional properties of the network
- Maximize Ink to Information ratio
- There is value in beauty (e.g., memory)

Scientifically

- Ability to *replicate* results – same data should produce same picture
- Maximize translation of graph's features to quantifiable measurement of the graph
- Theory-relevant



jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin: Moody J, McFarland DA, Bender-DeMoll S.network visualization. American Journal of Sociology 110(4):1206-1241.

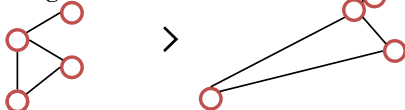
Visualization: Gaining Some Intuition

1 FACTORABLES

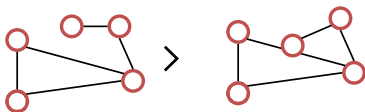
- Minimize edge crossings



- Uniform Edge Lengths



- Nodes don't overlap edges not incident on them

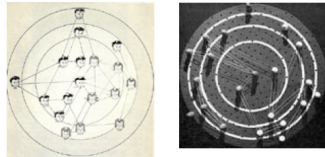


Visualization: Gaining Some Intuition

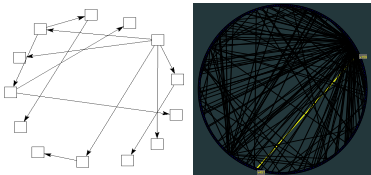
Random



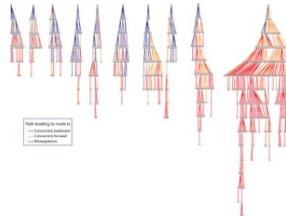
“Spring Embedder”



Circle



Hierarchy



Visualization: Gaining Some Intuition

Spring-Embedder Algorithms

- Connected nodes' springs pull them together
- Disconnected nodes' springs repel one another.
- When balancing these, visualized network's physical space corresponds roughly to social space via network distance/clustering.



Fruchterman-Reingold



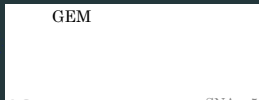
GraphOpt



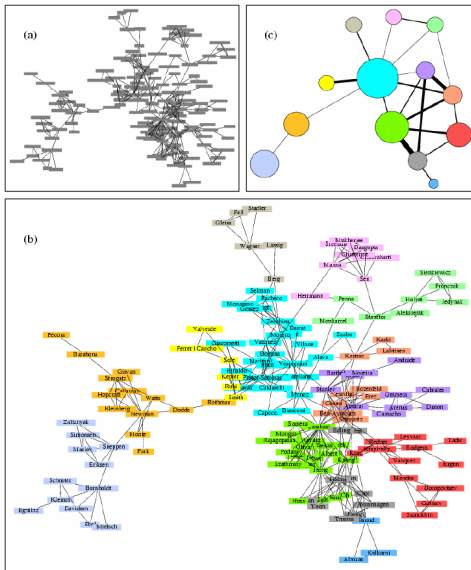
Kamada-Kawai



GEM



Visualization: Gaining Some Intuition

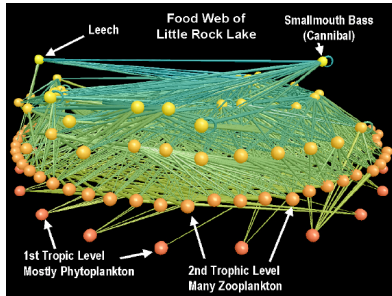


Example of coarsening network structure

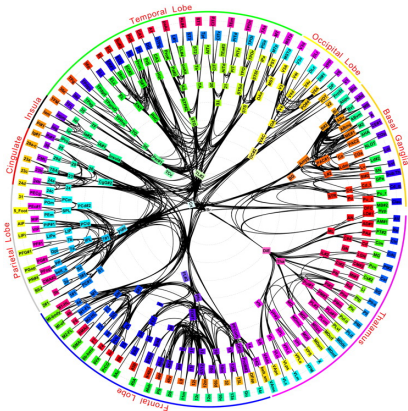
- Newman & Girvan 2004
- co-authorship network of physicists writing papers on networks
- clustering algorithm identifies different subcommunities
- each node is a community – size represents number of authors
- each edge thickness represents the number of co-author pairs between communities

(Image Sources: Lada Adamic)

Visualization: Gaining Some Intuition

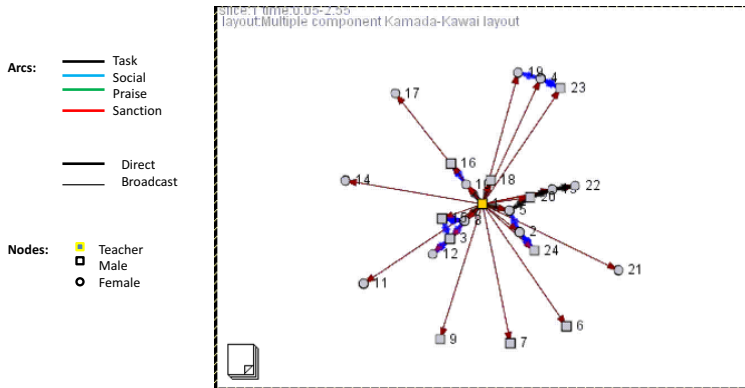


<http://news.bbc.co.uk/2/hi/science/nature/2288621.stm>



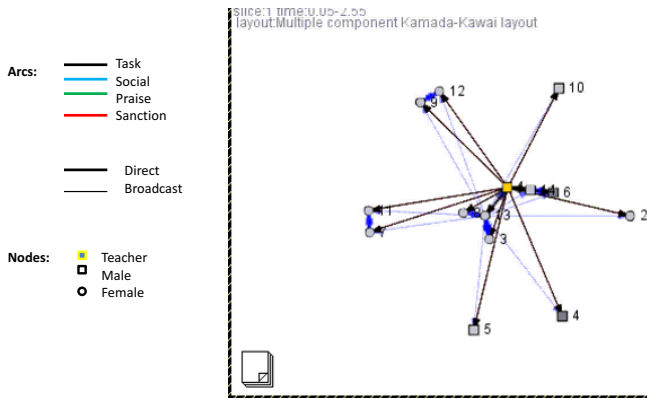
PNAS;107(30):13485-13490.

Visualization: Gaining Some Intuition



jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin: Moody J, McFarland DA, Bender-DeMoll S. 2005. network visualization. American Journal of Sociology 110(4):1206-1241.

Visualization: Gaining Some Intuition



jimi adama. EPIC - SNA 2017. Columbia, Univeristy. Origin: Moody J, McFarland DA, Bender-DeMoll S. 2005. network visualization. American Journal of Sociology 110(4):1206-1241.

Visualization: Gaining Some Intuition

Additional considerations:

- timescale, pace, sampling & representations
 - events vs. relationships
 - discrete vs. continuous time
 - binning (min, max, sum, mean, etc.)
- tie weighting/valuation/direction
- isolates, disconnected components
- initial position
 - random w/ repetition
 - data derived / provided (e.g., chaining)

Network Visualization: R

Why R?

- Open Source
- Large community of developers for SNA
 - STATNET, igraph, ...
- Extensible

References and Places for More Information

References and Places for More Information i

Network Visualization: Theory and Methods

Network Visualization: R

References and Places for More Information