Visual Network Analysis

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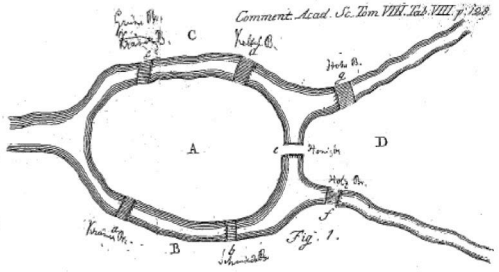
Part 1:
From map to math and back

Venturini, T., Munk, A., & Jacomy, M. (2016). Actor-Network VS Network Analysis VS Digital Networks Are We Talking About the Same Networks? In D. Ribes & J. Vertesi (Eds.), DigitalSTS: A Handbook and Fieldguide (forthcoming).

Venturini, T. (2012). Great expectations: méthodes quali-quantitative et analyse des réseaux sociaux. In J.-P. Fourmentraux (Ed.), *L'Ère Post-Media. Humanités digitales et Cultures numériques* (Vol. 104, pp. 39–51). Paris: Hermann.

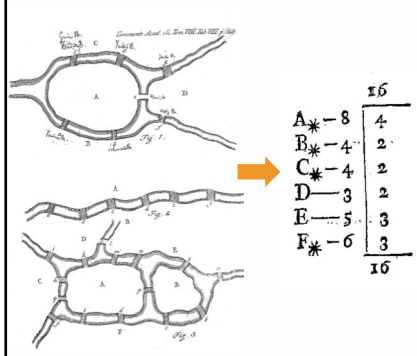
The Seven Bridges of Königsberg

Is it possible to walk through the city walking each bridge once and only once?



The Seven Bridges of Königsberg

Euler, 1736, Solutio problematis ad geometriam situs pertinentis



Hoc porro modo si operatio ad finem perducatur, multa inveniuntur, quae non erant in quaestione; in quo procul dubio tantae difficultatis causa consistit. §3

If, in this way, the work could be brought to a conclusion, many irrelevant factors would arise; therein without doubt lies the reason for the difficulty

(translation in Fleischner, H. 1990. Eulerian Graphs and Related Topics. Amsterdam: Elsevier)

From map to math

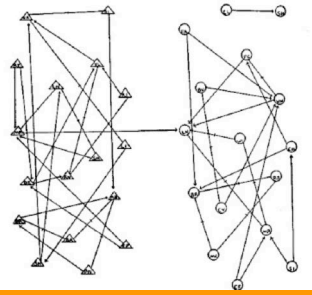
Moreno, J. (1934). Who Shall Survive? Washington, DC: Nervous and Mental Disease Publishing

The forms taken by the interrelation of individuals is a structure and the complete pattern of these structures within a group is its organization. The expression of an individual position can be better visualized through a sociogram than through a sociometric equation (Moreno, 1934, p. 103)

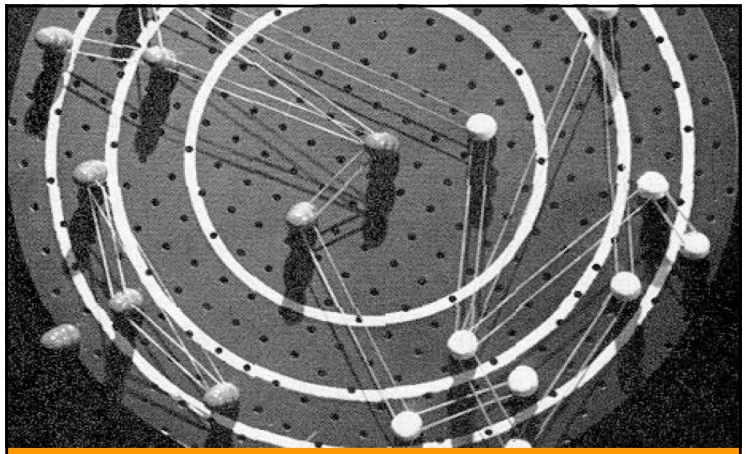
Jacob L. Moreno, April 3, 1933, The New York Times

EMOTIONS MAPPED BY NEW GEOGRAPHY

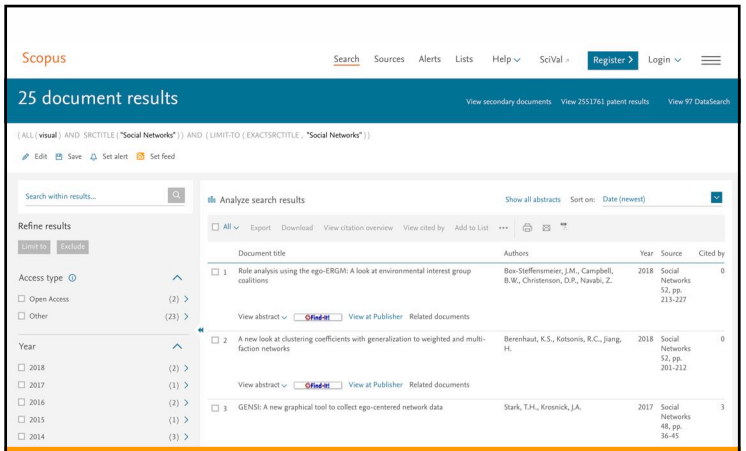
Charts Seek to Portray the Psychological Currents of Human Relationships.



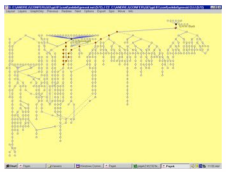
Social networks as maps



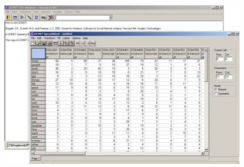
McKenzie's Target Sociogram Board



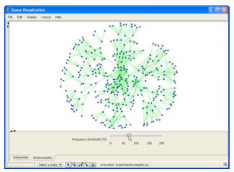
From map to math



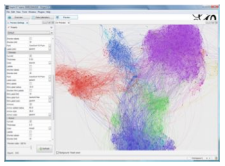
Pajek



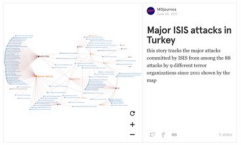
Ucinet



Guess



Gephi



Graph Commons

Sigma/Graphology

And yet...

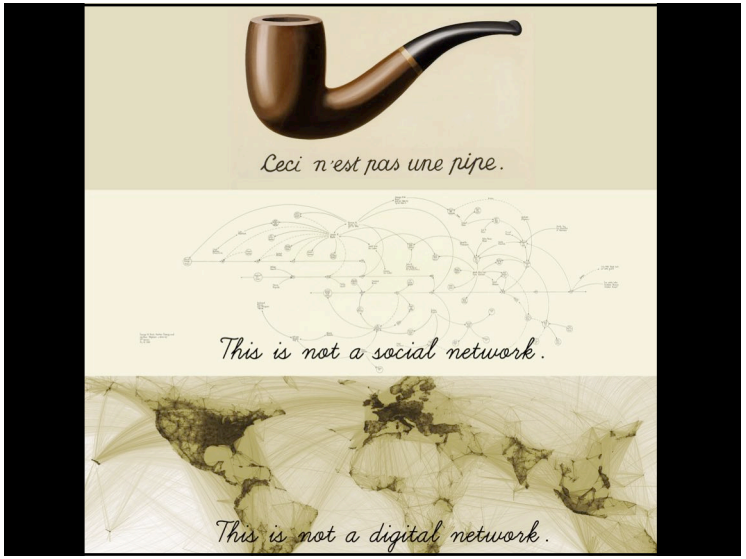
The amazing come back of network images

Part 2:

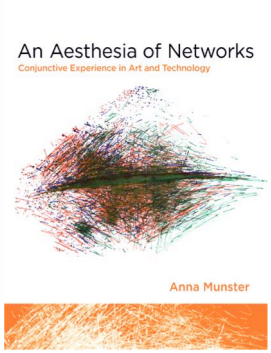
what do we see when we look at networks?

Jacomy, M., Venturini, T., Heymann, S., & Bastian, M. (2014). ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software. PloS One, 9(6), e98679. http://doi.org/10.1371/journal.pone.0098679

Venturini, T., Jacomy, M., & Jensen, P. (work in progress). What do we See, When we Look At Networks. an introduction to visual network analysis and force-directed layouts



Munster, A. (2013). *An Aesthesia of Networks*. Cambridge Mass.: MIT Press



A diagram of a network, then, does not look like a network but maintain the same qualities of relations – proximities, degrees of separation, and so forth – that a network also requires in order to form.

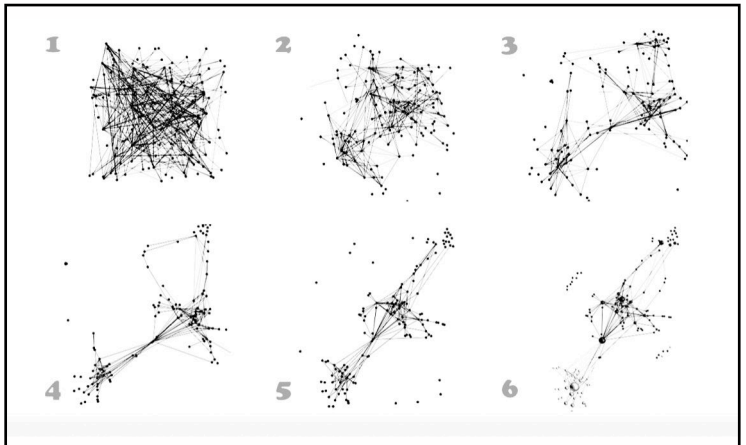
Resemblance should here be considered [as] a resona[nce] (p. 24).

Resonance not resemblance

Geographical chart
(space is a condition of elements' position)

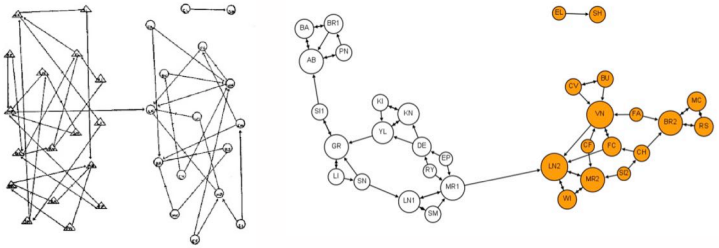
London Underground 1933 Map (Harry Beck)

Network chart
(space is a consequence of elements' position)

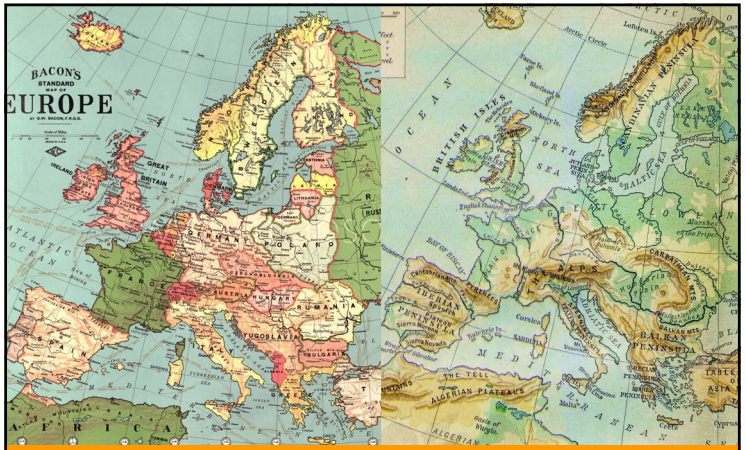


Force-directed spatialisation

Grandjean, Martin (2015).
Social network analysis and visualization: Moreno's Sociograms revisited
www.martingrandjean.ch/social-network-analysis-visualization-morenos-sociograms-revisited/



Reading networks as maps



But which type of maps?

Drucker, J. (2011). Humanities Approaches to Graphical Display.
Digital Humanities Quarterly, 5(1), 1–20.

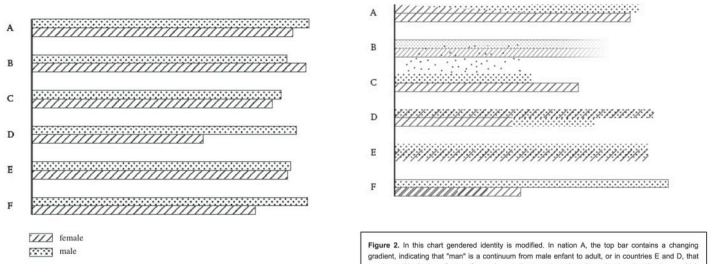


Figure 1. A basic bar chart compares the number of men (top bar) and the number of women (bottom bar) in seven different nations, A through F, at the present time (2010). The assumptions are that quantities (number), entities (nations), identities (gender) and temporality (now) are all self-evident. Graphic credit Xárene Eskandar.

Figure 2. In this chart gendered identity is modified. In nation A, the top bar contains a changing gradient, indicating that "man" is a continuum from male enfant to adult, or in countries E and D, that gender ambiguity is a factor of genetic mutation or adaptation, thus showing that basis on which gendered individuals are identified and counted is complicated by many factors. In country F women only register as individuals after coming of reproductive age, thus showing that quantity is a effect of cultural conditions, not a self-evident fact. The movement of men back and forth across the border of nations B and C makes the "nations" unstable entities. Graphic credit Xárene Eskandar.

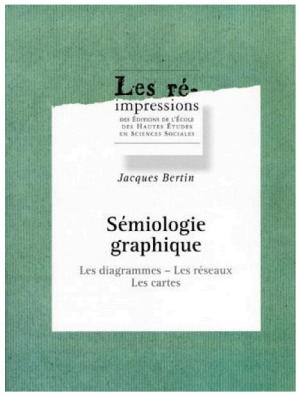
The value of ambiguity

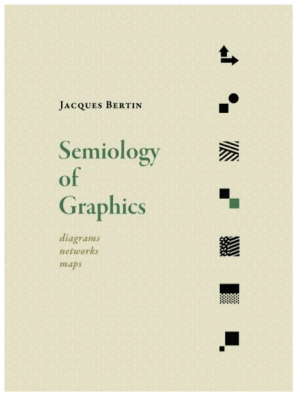
Part 3:

Visual Network Analysis

Venturini, T., Jacomy, M., & Carvalho Pereira, D. (2015).
Visual Network Analysis. Paris. *Sciences Po médialab working paper.*

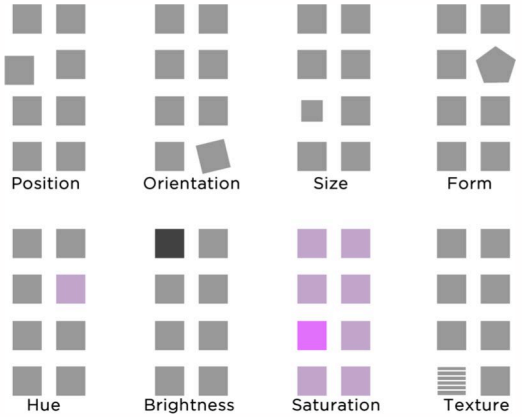
What do we see when we look at networks
an introduction to visual network analysis and force-directed layouts
Tommaso Venturini, Mathieu Jacomy, Pablo Jensen (forthcoming)



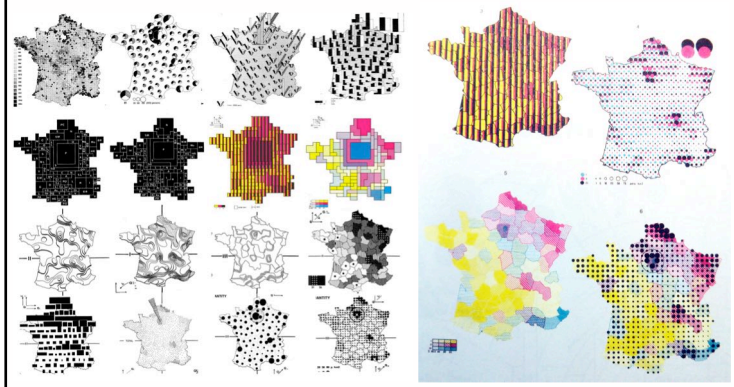


Visual semiotics

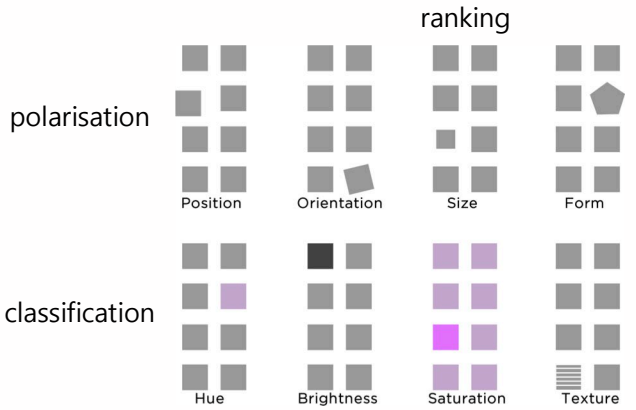
Bertin Jacques, Sémiologie graphique, Paris, Mouton/Gauthier-Villars, 1967



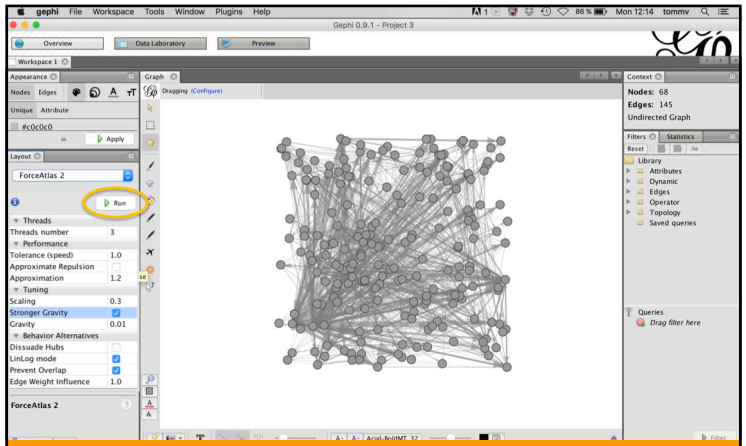
Visual variables



Visual variables in map making

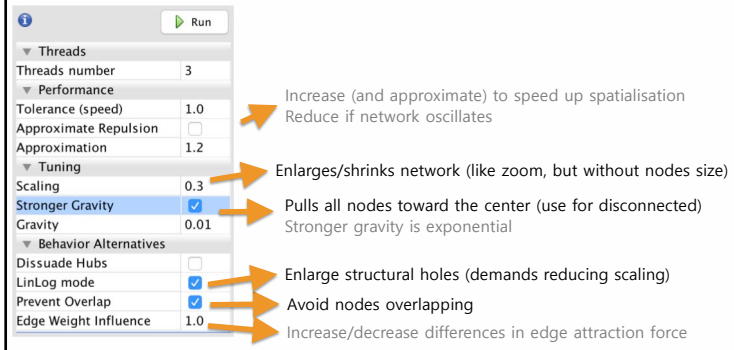


Visual variables



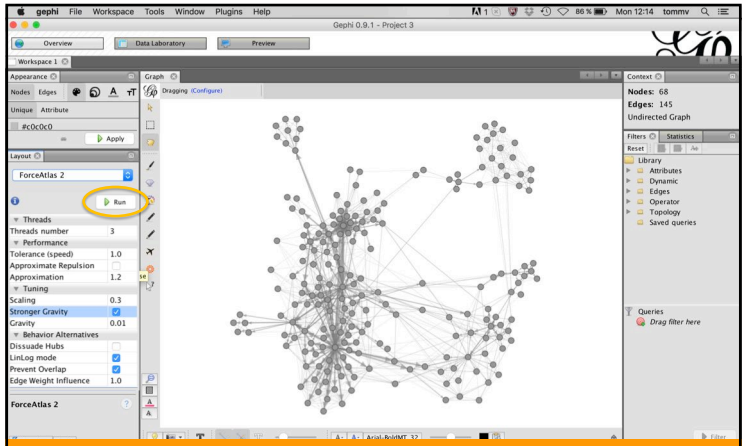
Node position

Spatialize with ForceAtlas 2



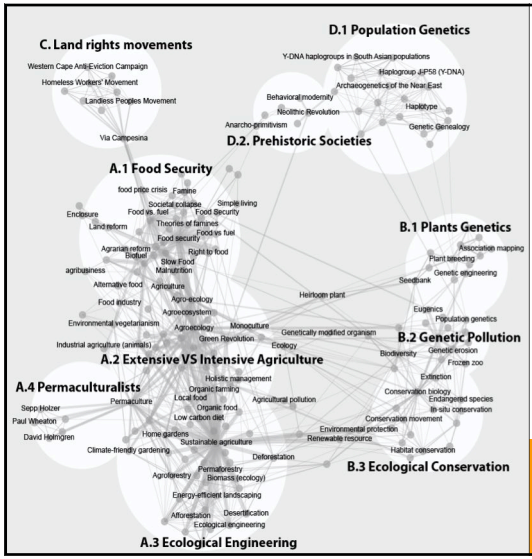
ForceAtlas 2 parameters

(to balance clustering & spacing)

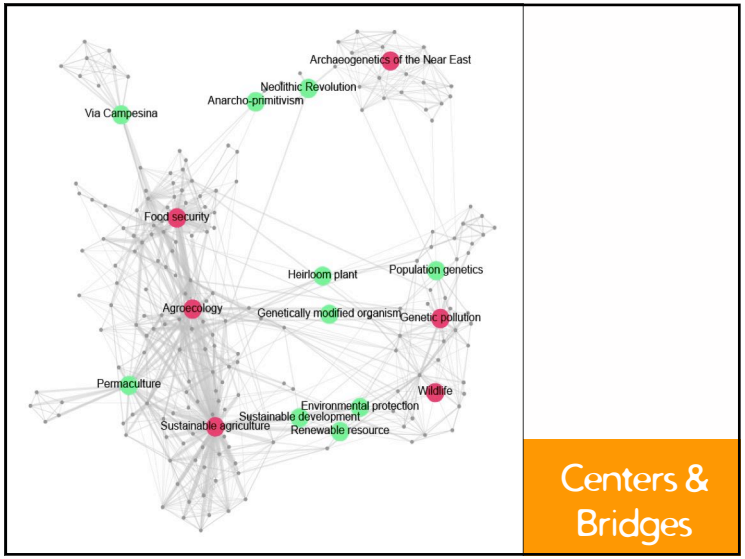


Node position

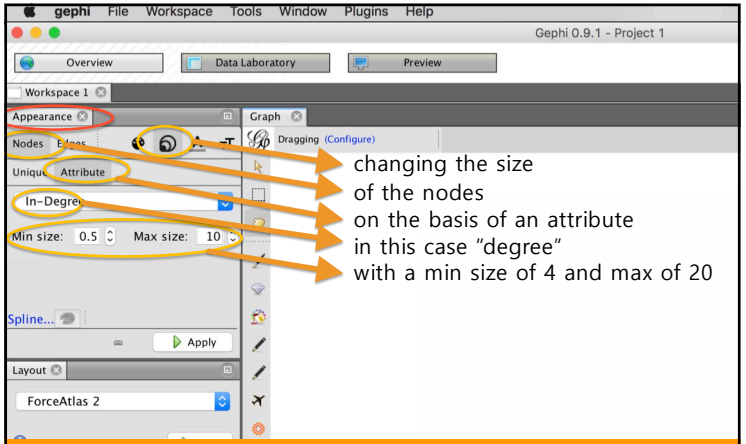
Spatialize with ForceAtlas 2



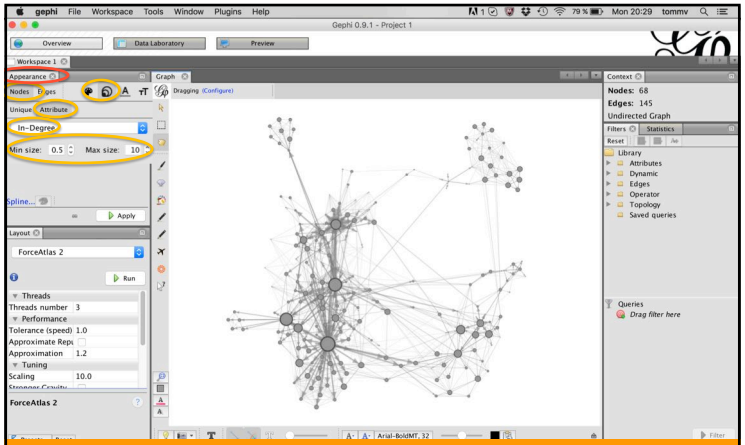
Polarization



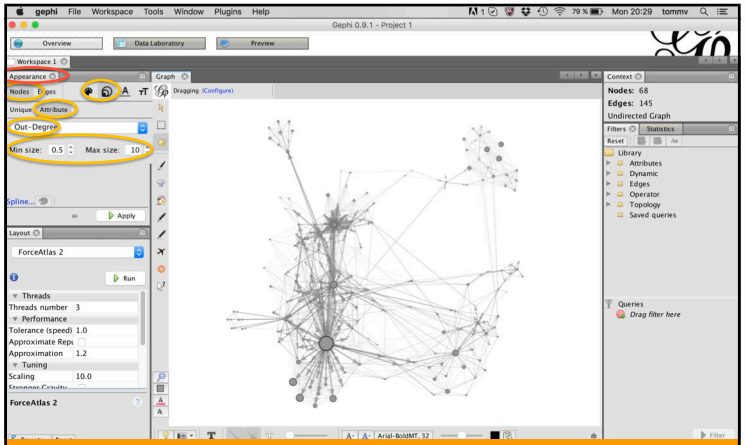
Centers & Bridges



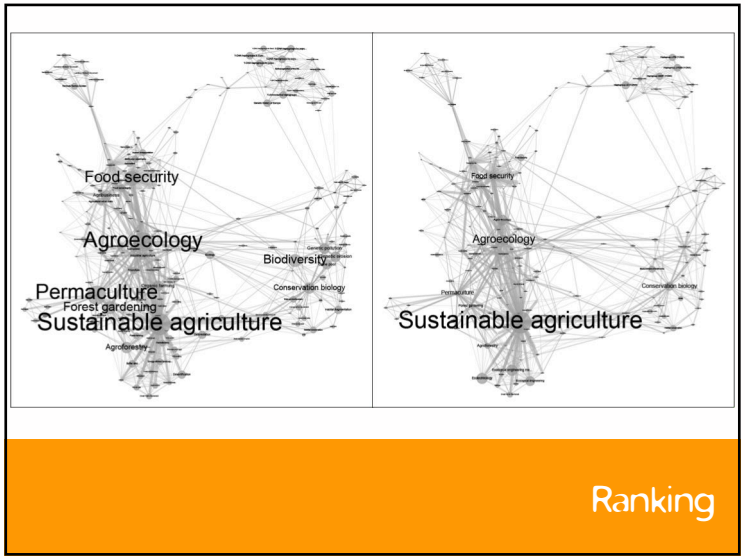
Change node size



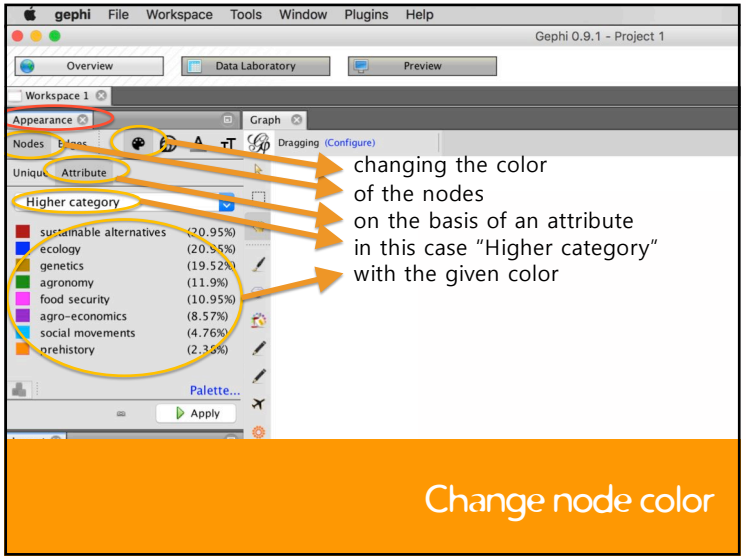
Change node size



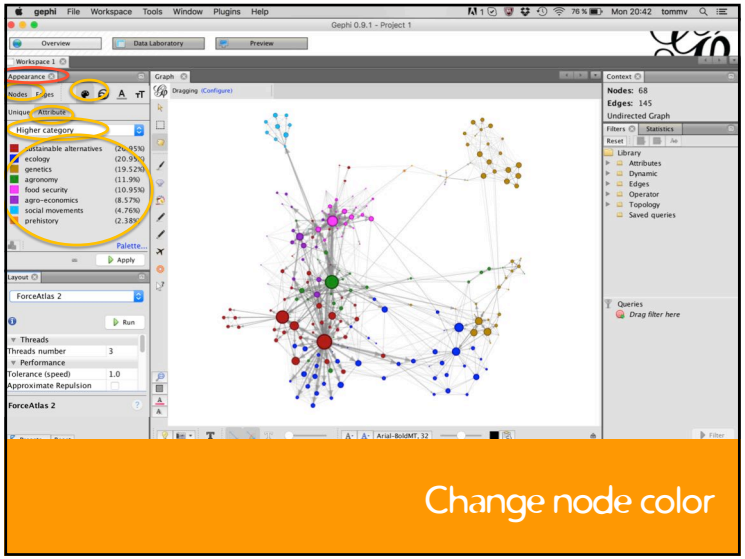
Change node size



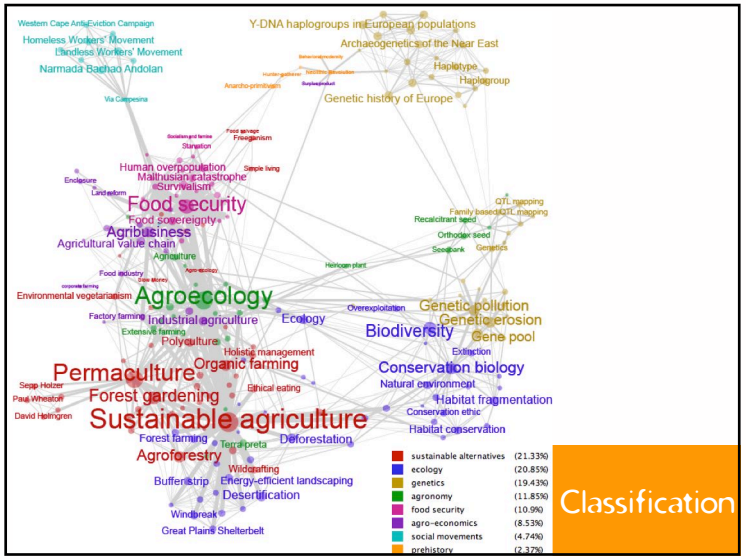
Ranking



Change node color



Change node color

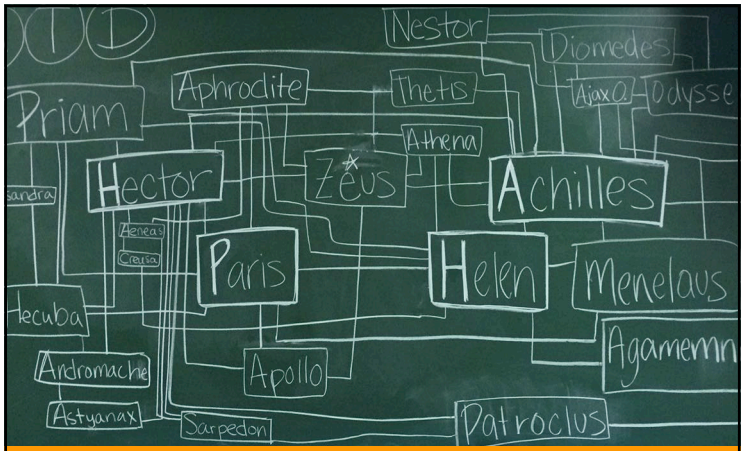


Classification

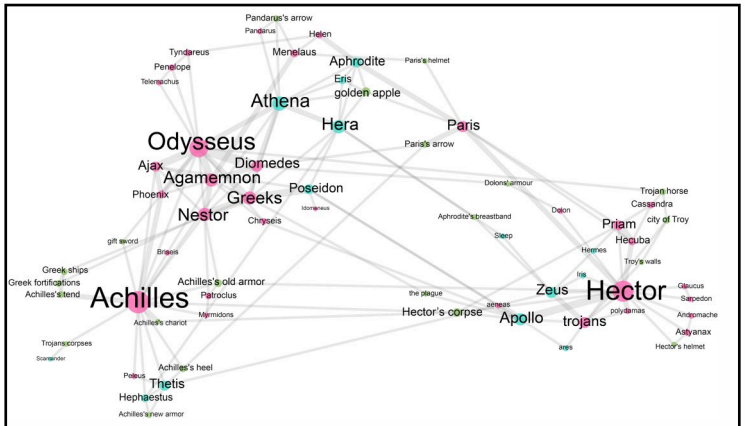
Part 4:
6 network stories

Venturini, T., Jacomy, M., Bounegru, L., & Gray, J. (2018). Visual Network Exploration for Data Journalists. In S. I. Eldridge & B. Franklin (Eds.), The Routledge Handbook to Developments in Digital Journalism Studies (forthcoming). Abingdon: Routledge.

Venturini, T., Bounegru, L., Jacomy, M., & Gray, J. (2016). How to Tell Stories with Networks: Exploring the Narrative Affordances of Graphs with the Iliad. In M. T. Schäfer & K. van Es (eds.), *Datafied Society*. Amsterdam: University Press.



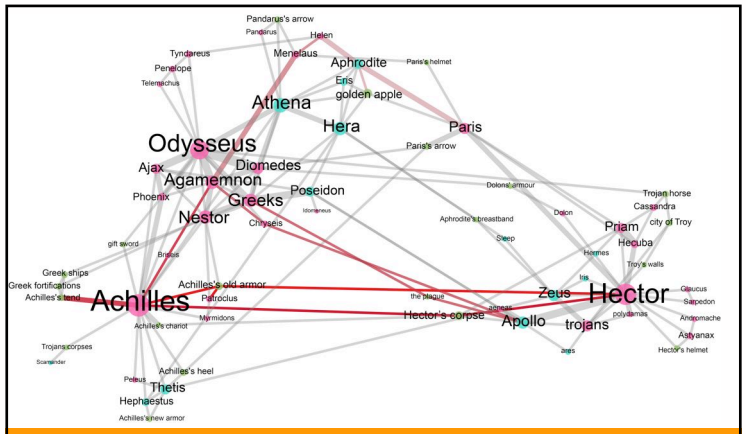
6 network stories



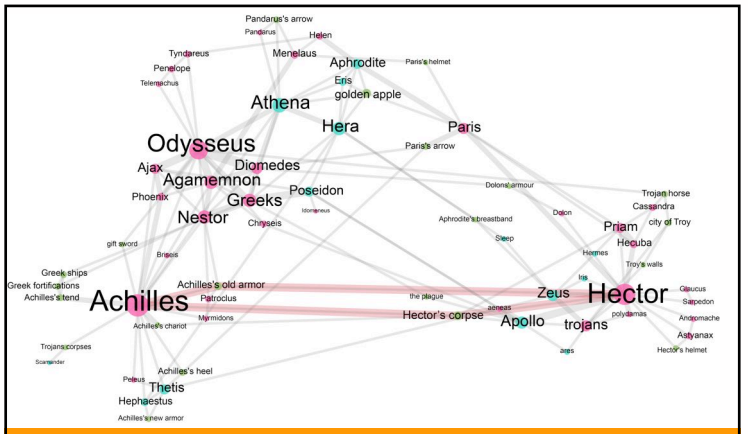
The Iliad

1. The journeys (paths)
   a) The grand tour (diameter / perimeter)
   b) The shortcut (shortest path)
2. The panorama (clusters)
   a) The camps (clusters & holes)
   b) The (un)balance of forces (size & density)
3. The vantage (single nodes)
   a) The crossroad (centrality)
   b) The the bridge (betweeness)

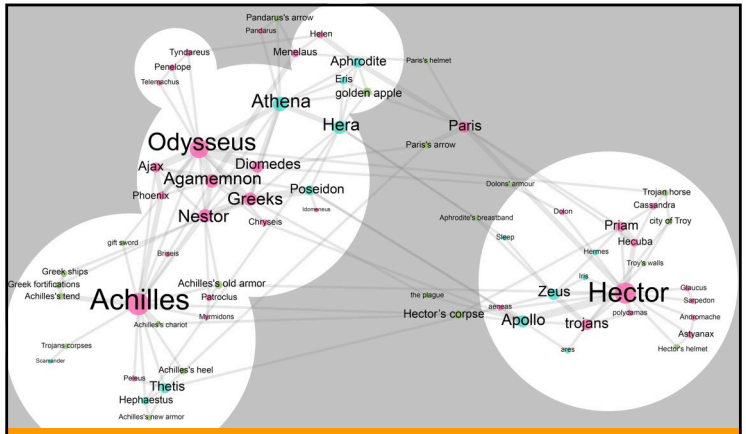
6 network stories



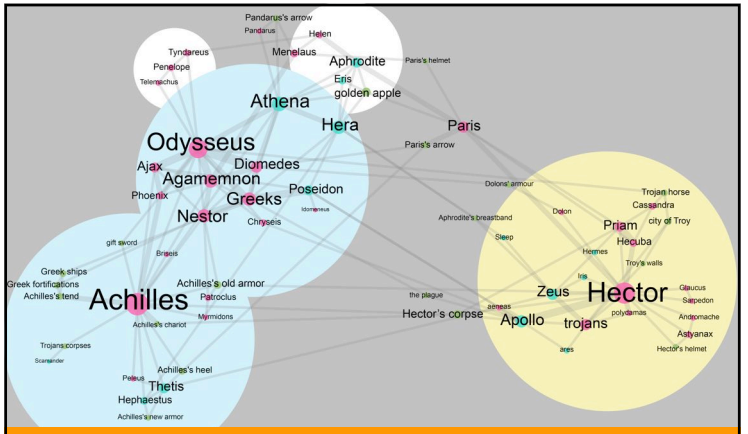
1. journeys > grand tour
(paths) (diameter/perimeter)



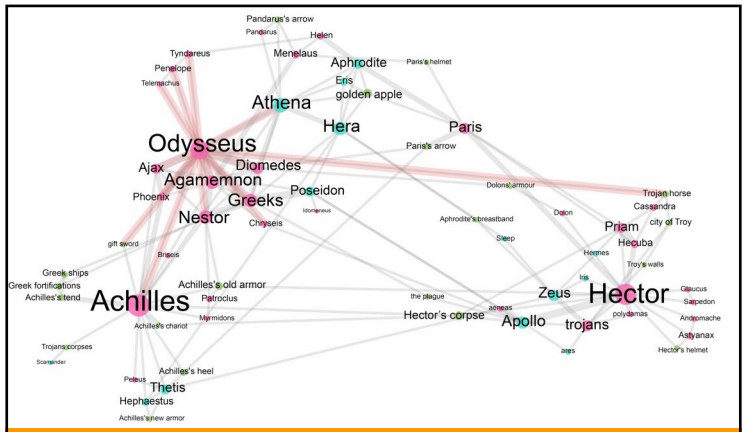
1. journeys > c. shortcuts
(paths) (shortest paths)



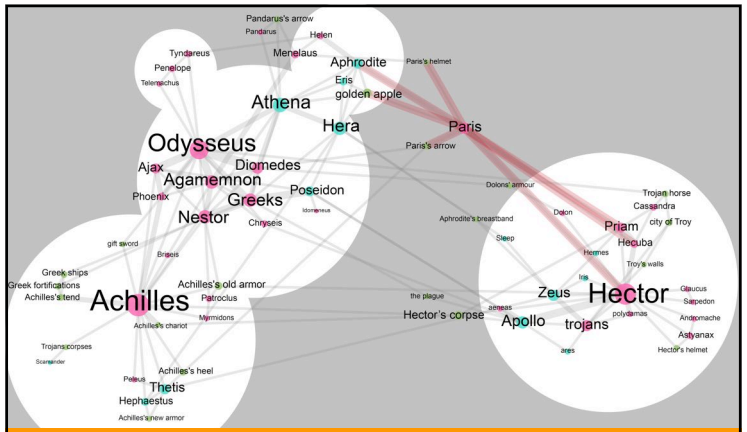
2. panorama > a. camps
(clusters) (cluster & holes)



2. panorama > b. balance of forces
(clusters) (size & density)



3. vantage (single nodes) > a. crossroad (centrality)



3. vantage (single nodes) > b. bridges (betweeness)