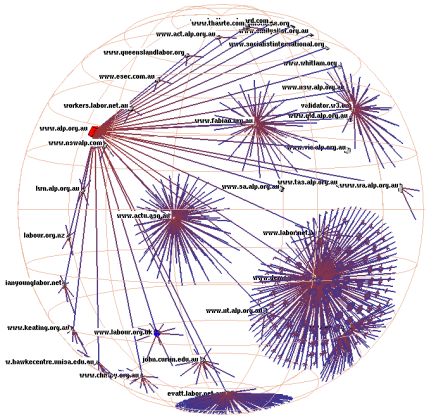
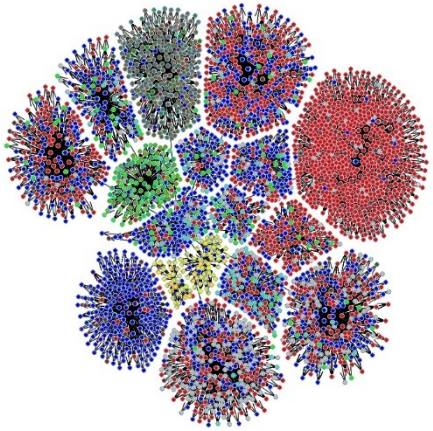
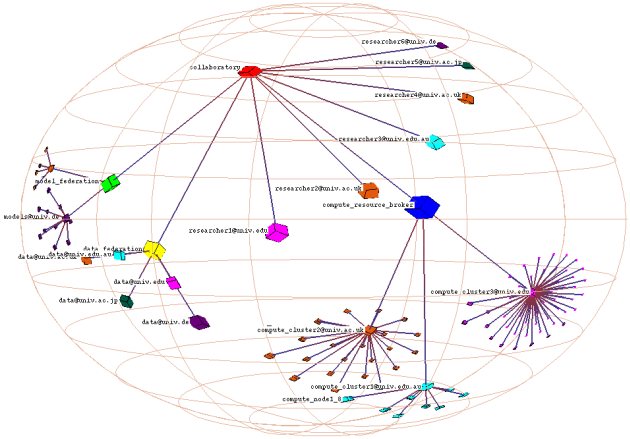
Australian National University

Visualising Online Social Networks







Presentation at Cyberinfrastructre for Network Science Center (CNS) talk series
Indiana University, 2nd May 2016

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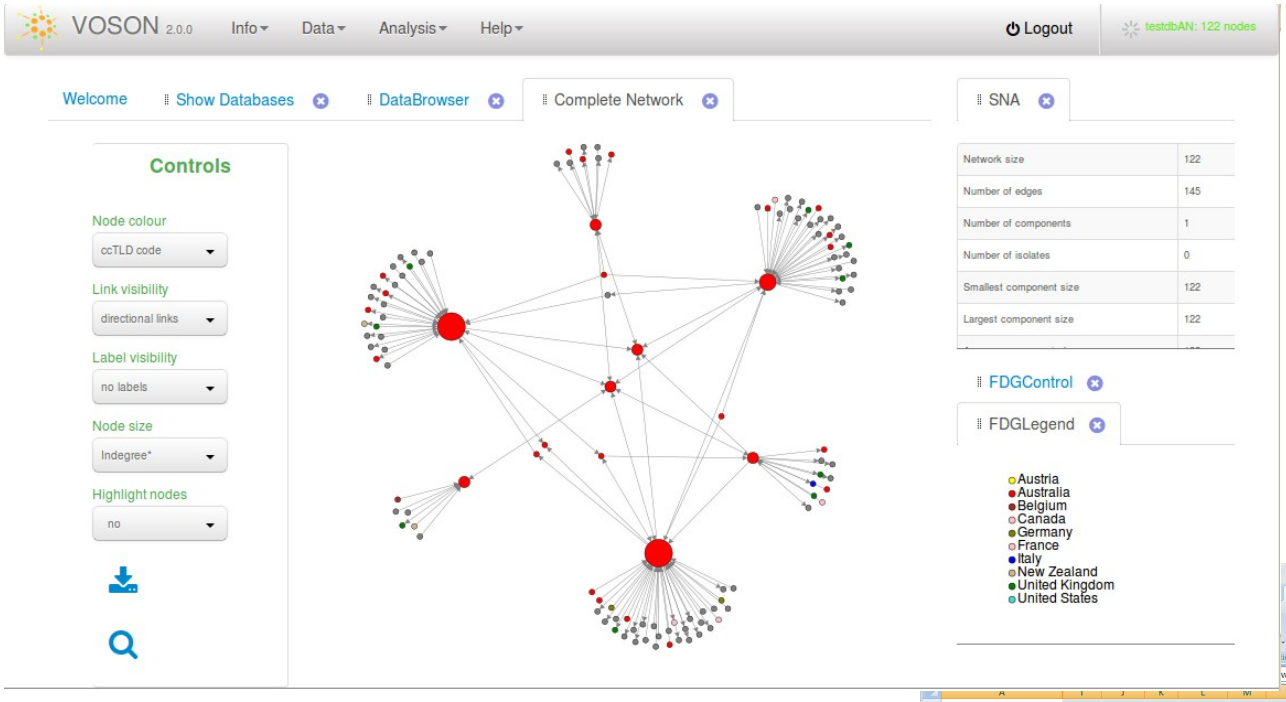
Virtual Observatory for the Study of Online Neworks (VOSON) Lab – introduction

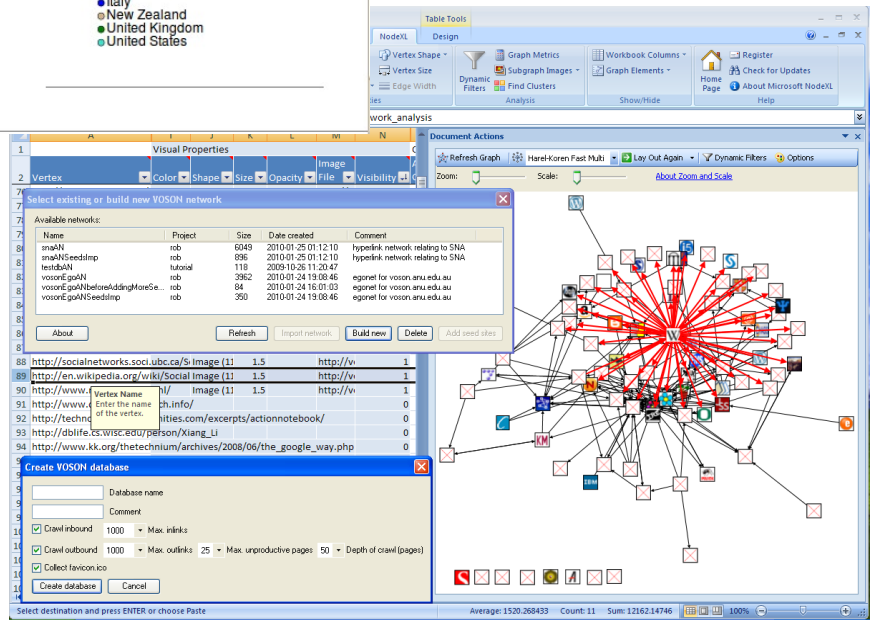
- VOSON Lab at the ANU (http://vosonlab.net): Teaching, research and tool development in areas of web (social) science, network science, computational social science, big data analytics...
  - Formally commenced in 2005
- New research via Australian Research Council grants:
  - DP0452051 "New Methods for Researching the Existence and Impact of Political Networks on the WWW" Ackland and Gibson – 2004-2006
  - SR0567298 "Virtual Observatory for the Study of Online Networks (VOSON)" - Ackland, Gibson, O'Neil, Buchhorn, Bimber, Ward – 2005
  - LP0990974 "The role of online social networks in successful ageing: benefitting from 'who you know' at older ages" - Booth, Ackland, Windsor – 2009-2012
  - DP110100446 "The institutional structure of e-government: a cross-policy, cross-country comparison" – Henman, Ackland, Margetts – 2011-2013
  - DP140103688 “Understanding online attention and user-generated content creation: An information consumption and production perspective” - Ackland – 2014-2016

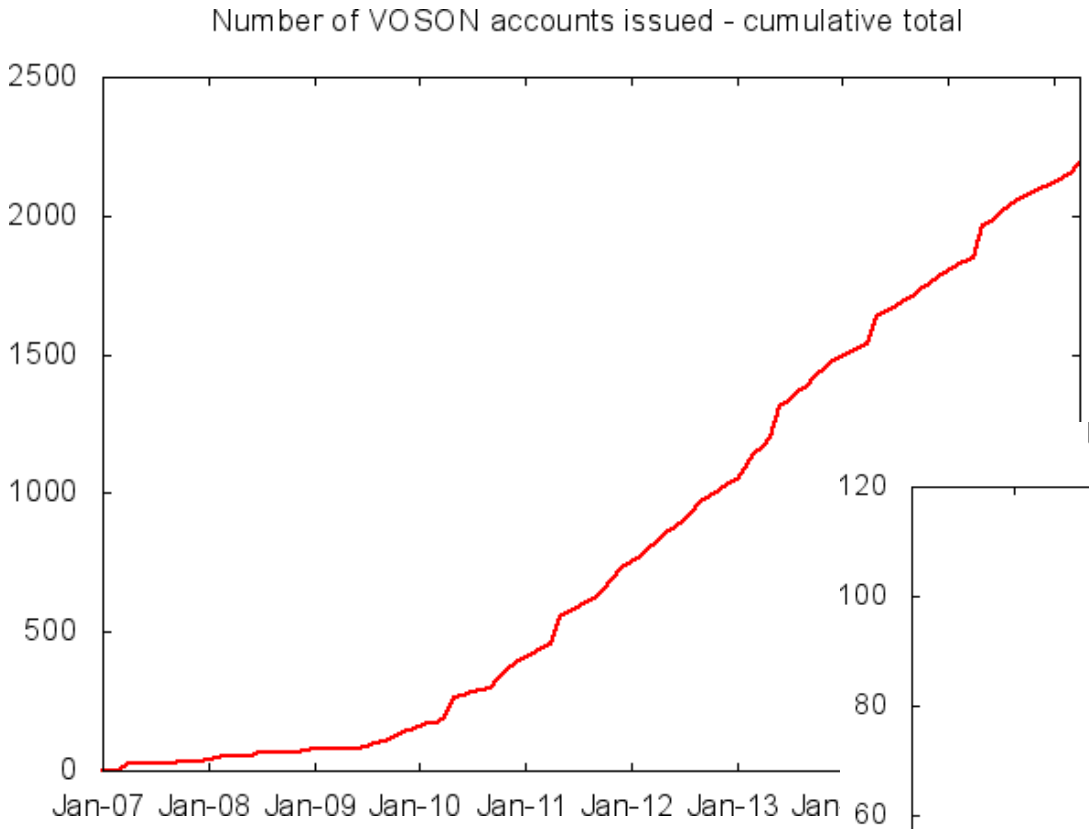
- Research tools
  - **VOSON software** for hyperlink network construction & analysis (publicly available since 2006, over 2000 user accounts issued)
    - Now available commercially via Uberlink (http://www.uberlink.com)
  - R packages:
    - **SocialMediaLab** (with Tim Graham) – released on CRAN Nov 2015
      - collects (via free APIs) data from: Twitter, YouTube, Facebook, Instagram
      - creates various networks (actor networks, semantic networks) and datasets for text analysis
    - **Adaptive Sampling** (with Kyosuke Tanaka)
      - Implements adaptive sampling methodology of [Thompson (2006): Adaptive Web Sampling, Biometrics 62, 1224–1234, December 2006] to enable construction of samples from large-scale networks and unbiased estimates of population parameters.

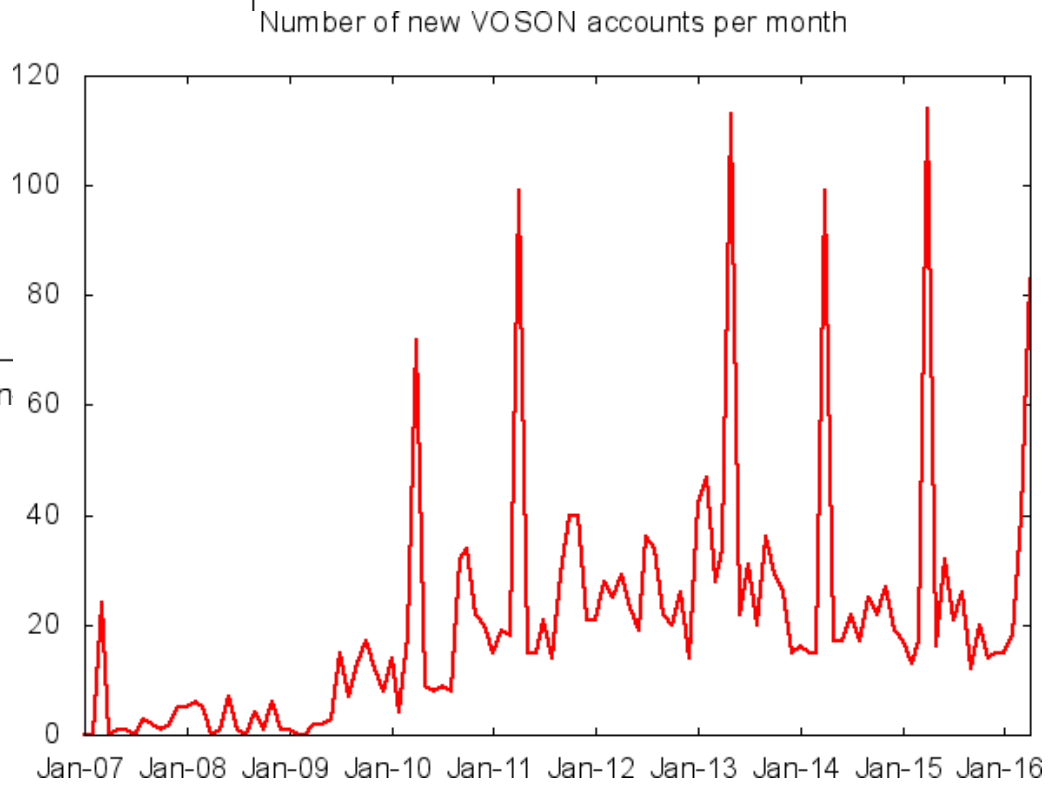


VOSON 2.0 web interface works with Firefox, Chrome, Safari, iPad

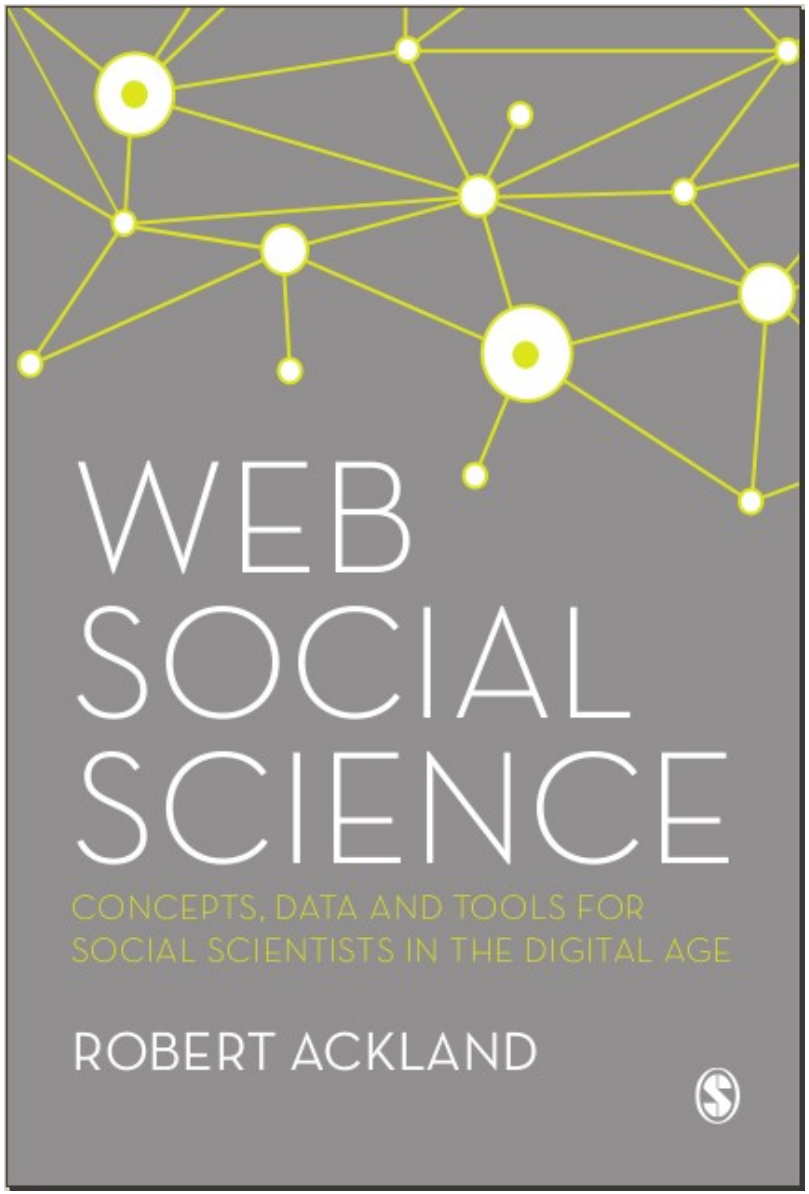
VOSON+NodeXL allows construction and import of hyperlink networks from within NodeXL [*to be decommissioned later this year...*]




Number of VOSON accounts issued - cumulative total
2500
2000
1500
1000
500
0
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan


Number of new VOSON accounts per month
120
100
80
60
40
20
0
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16

- Teaching & training
  - Social Science of the Internet specialisation in ANU's Master of Social Research, established 2008
  - Planned Master of Digital Social Science from 2017
  - PhD supervision
  - ACSPRI courses
    - Big Data Analysis for Social Scientists (R-based course including SocialMediaLab)
    - Social Media Analysis (VOSON, NodeXL, Gephi)

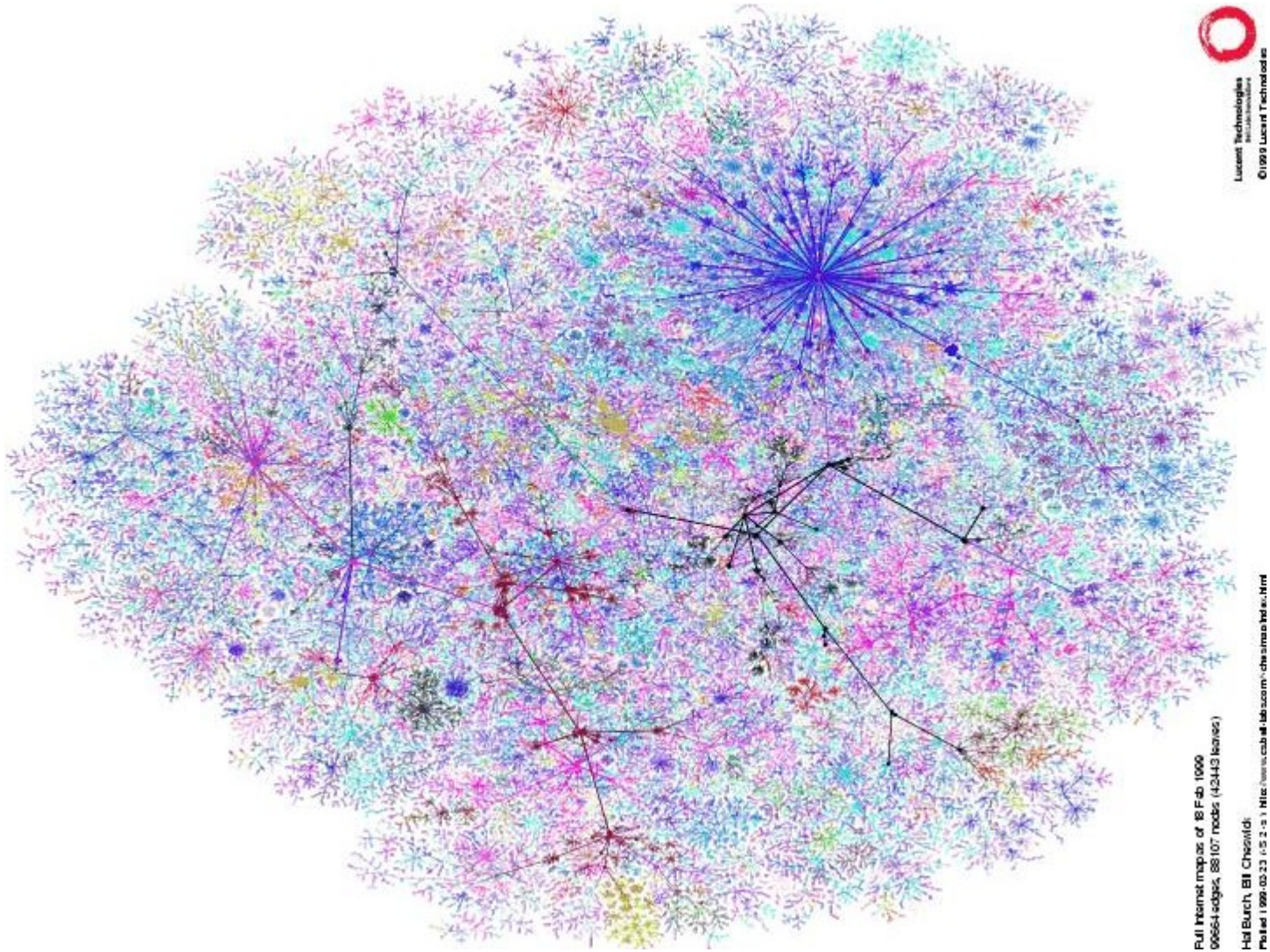


- Part I – Web Social Science Methods
  - Ch 1 – Introduction - Web Primer and Perspectives
  - Ch 2 – Online Research Methods
  - Ch 3 – Social Media Networks
  - Ch 4 – Hyperlink Networks
- Part II – Web Social Science Examples
  - Ch 5 – Friendship Formation and Social Influence
  - Ch 6 – Organisational Collective Behaviour
  - Ch 7 – Politics and Participation
  - Ch 8 – Government and Public Policy
  - Ch 9 – Production and Collaboration
  - Ch 10 – Commerce and Marketing

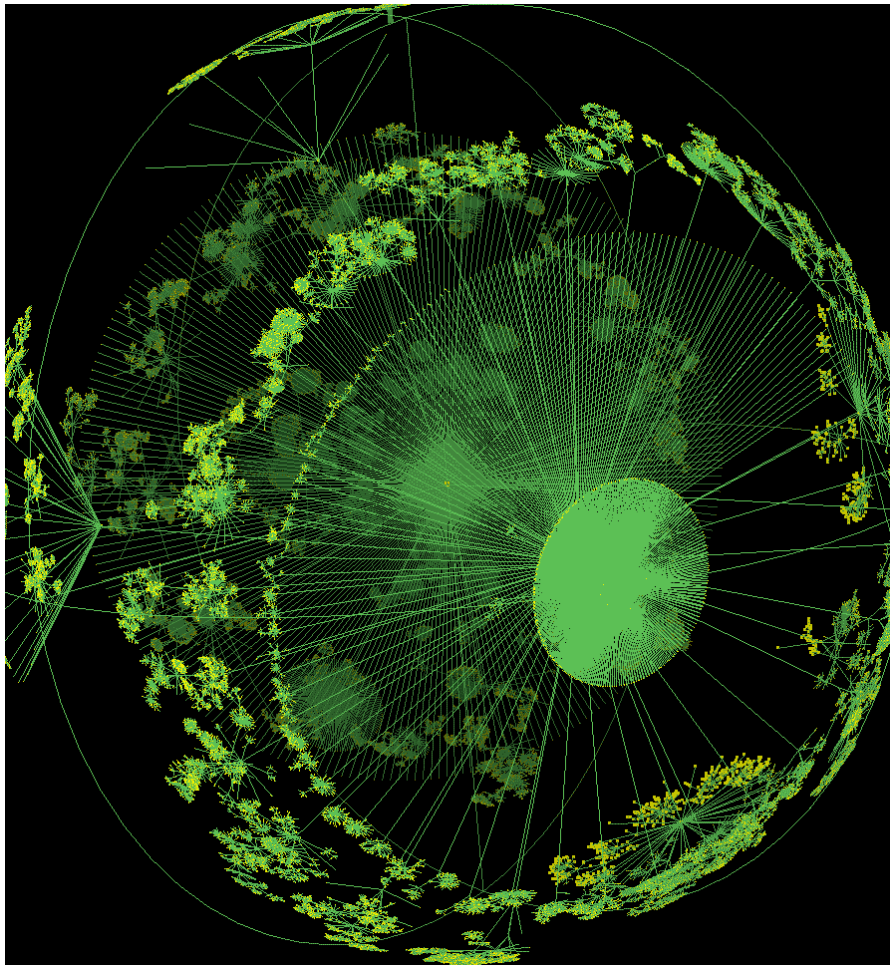
Earlier work (static hyperlink networks)

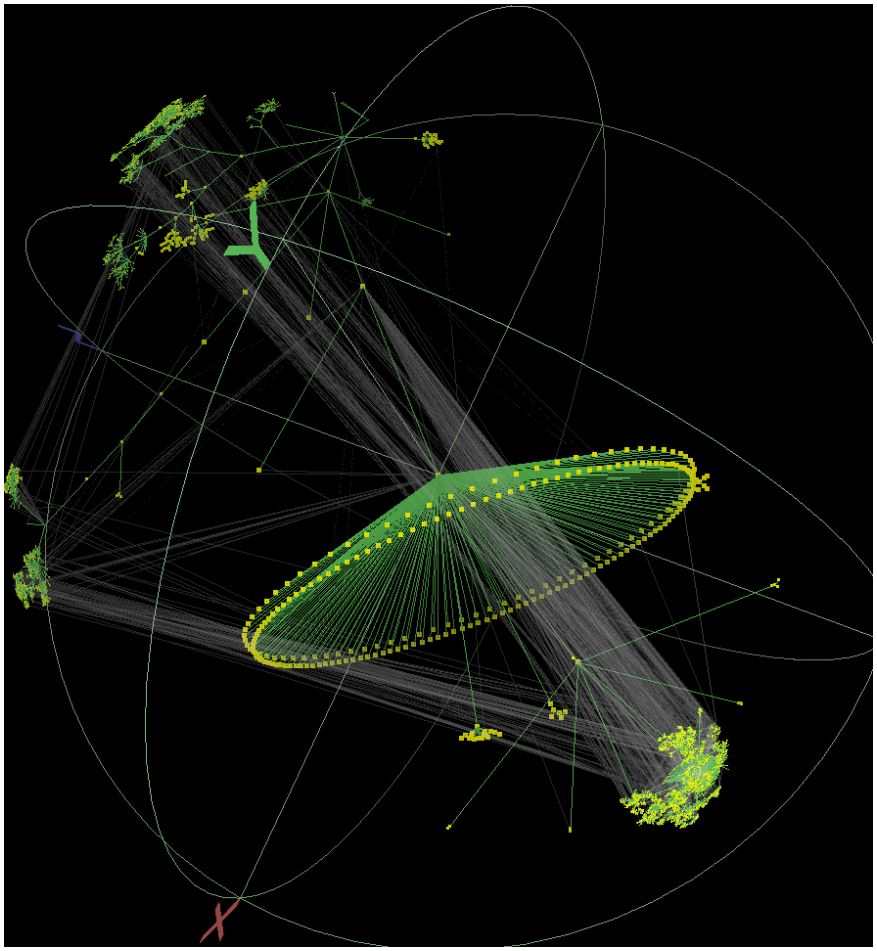
Cyberspace

- “Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding...” William Gibson, *Neuromancer*, 1984
- “It was suggestive of something, but had no real semantic meaning, even for me, as I saw it emerge on the page.” -- Gibson on the origin of the term in the 2000 documentary No Maps for These Territories.

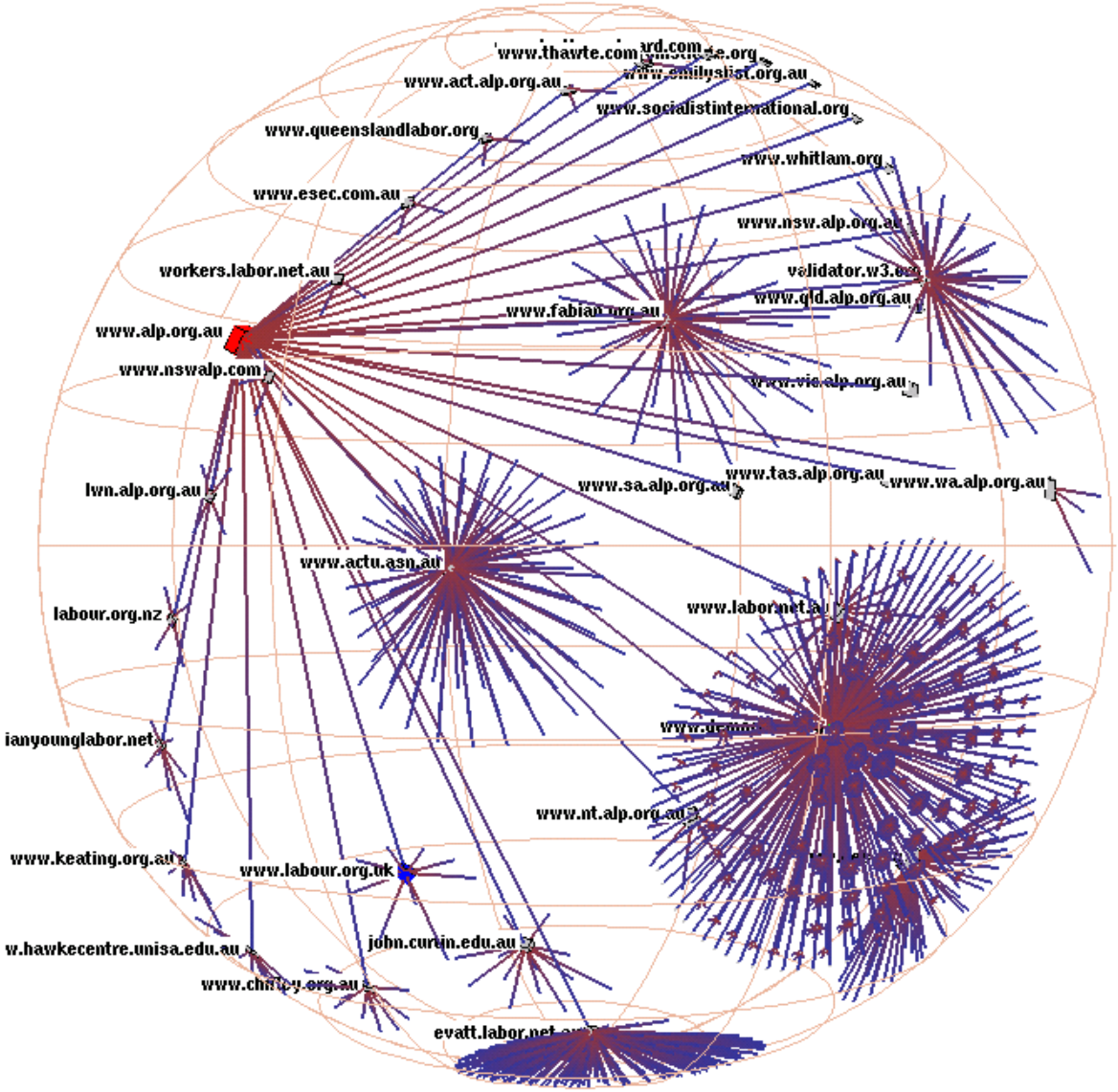


Router-level connectivity of the Internet, 1999 (Internet Mapping Project)





3D hyperbolic graphs of Internet topology created using the Walrus visualisation tool developed at CAIDA

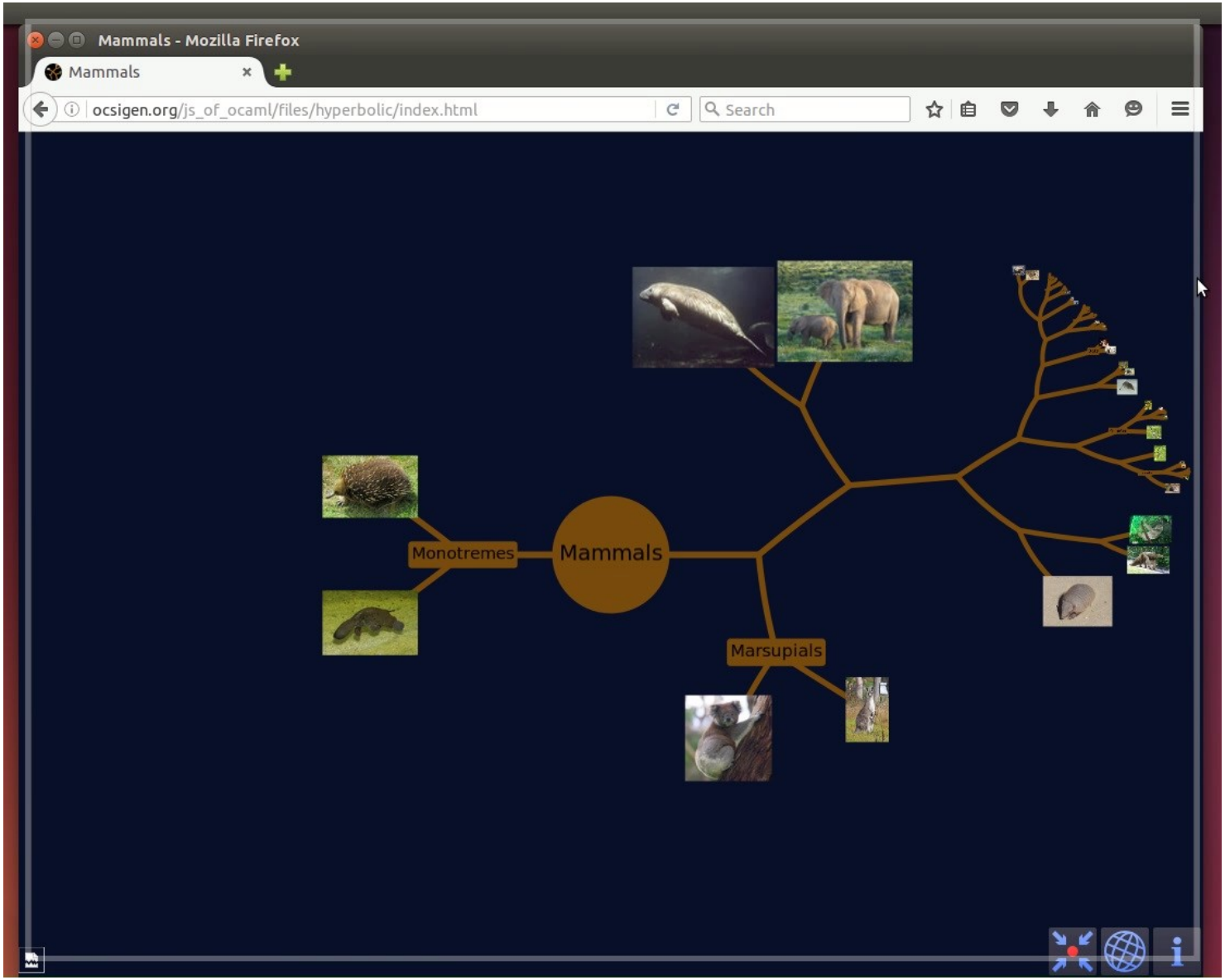


Outbound hyperlinks of the Australian Labor Party

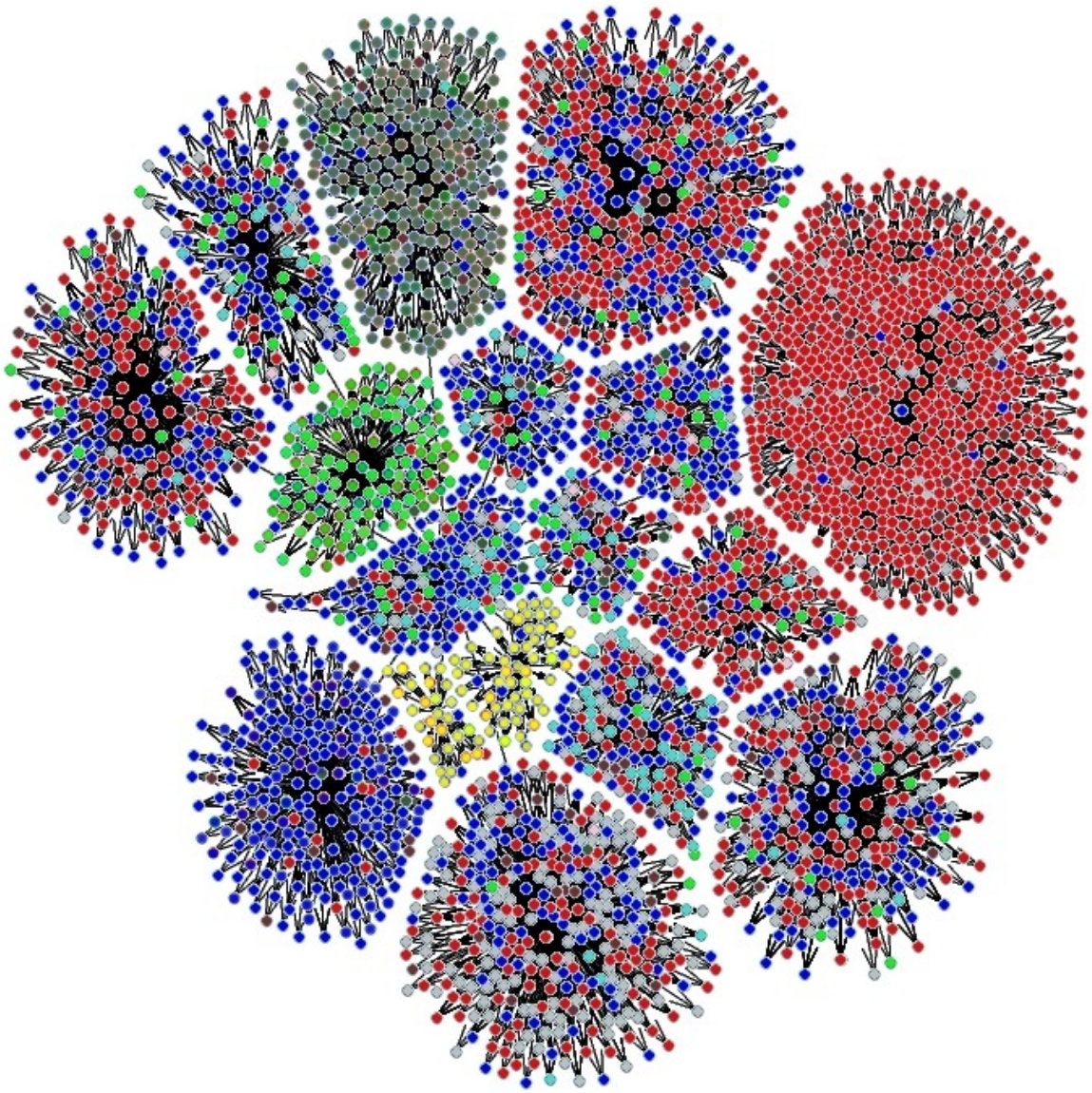
Hyperlink network collected using VOSON

Visualisation using HypViewer tool by Tamara Munzner

Ackland, R. and R. Gibson (2004), "Mapping Political Party Networks on the WWW," refereed paper presented at the Australian Electronic Governance Conference, 14-15 April 2004, University of Melbourne.



Tree of Life hyperbolic visualisation in a web browser, by Jérôme Vouillon (CNRS).



Hyperlink network of an environmental activist organisation (2006)

Hyperlink data collected using VOSON

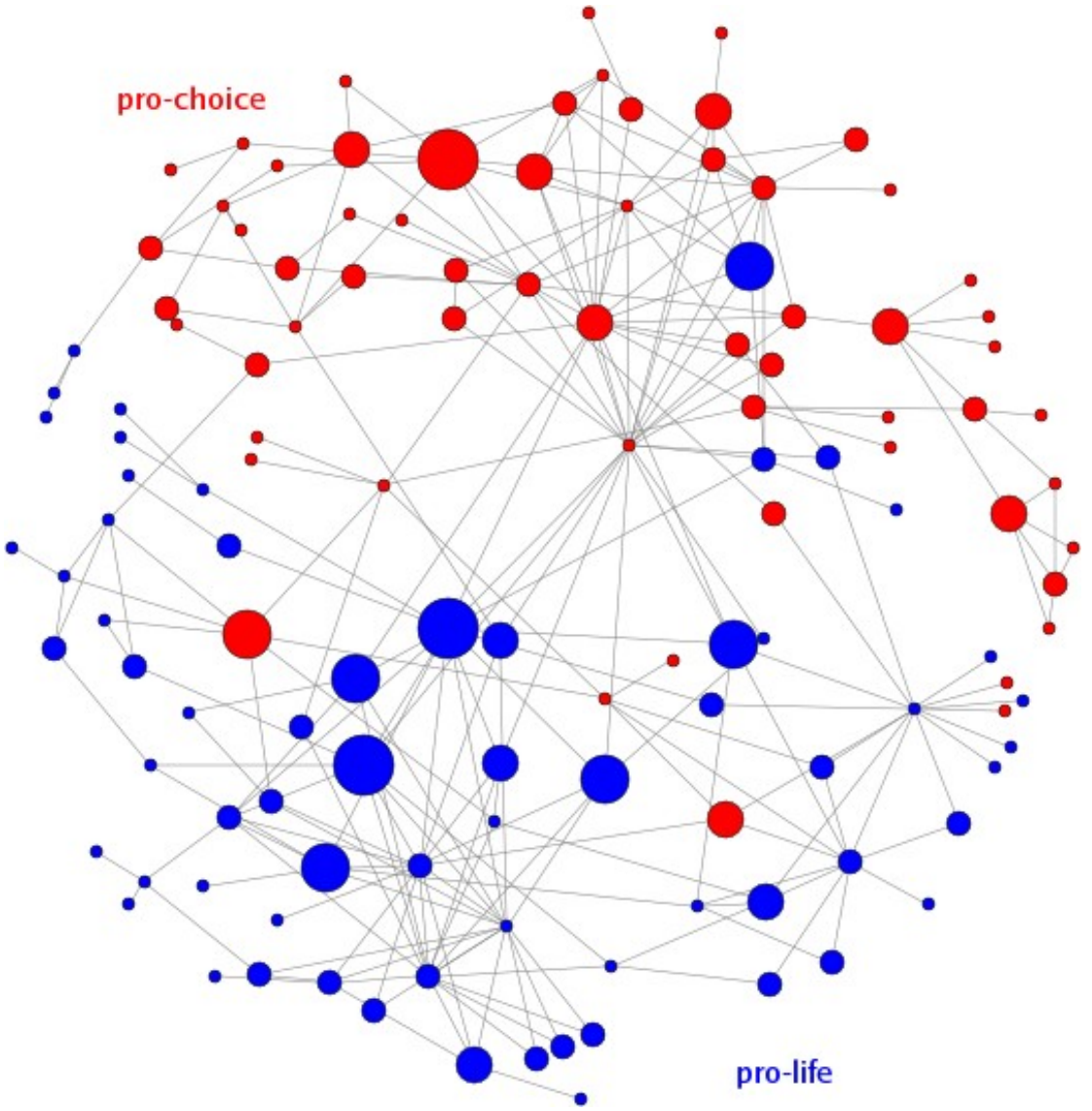
Visualisation using Large Graph Layout (LGL)

Hyperlink network of Australian web sites focused on abortion

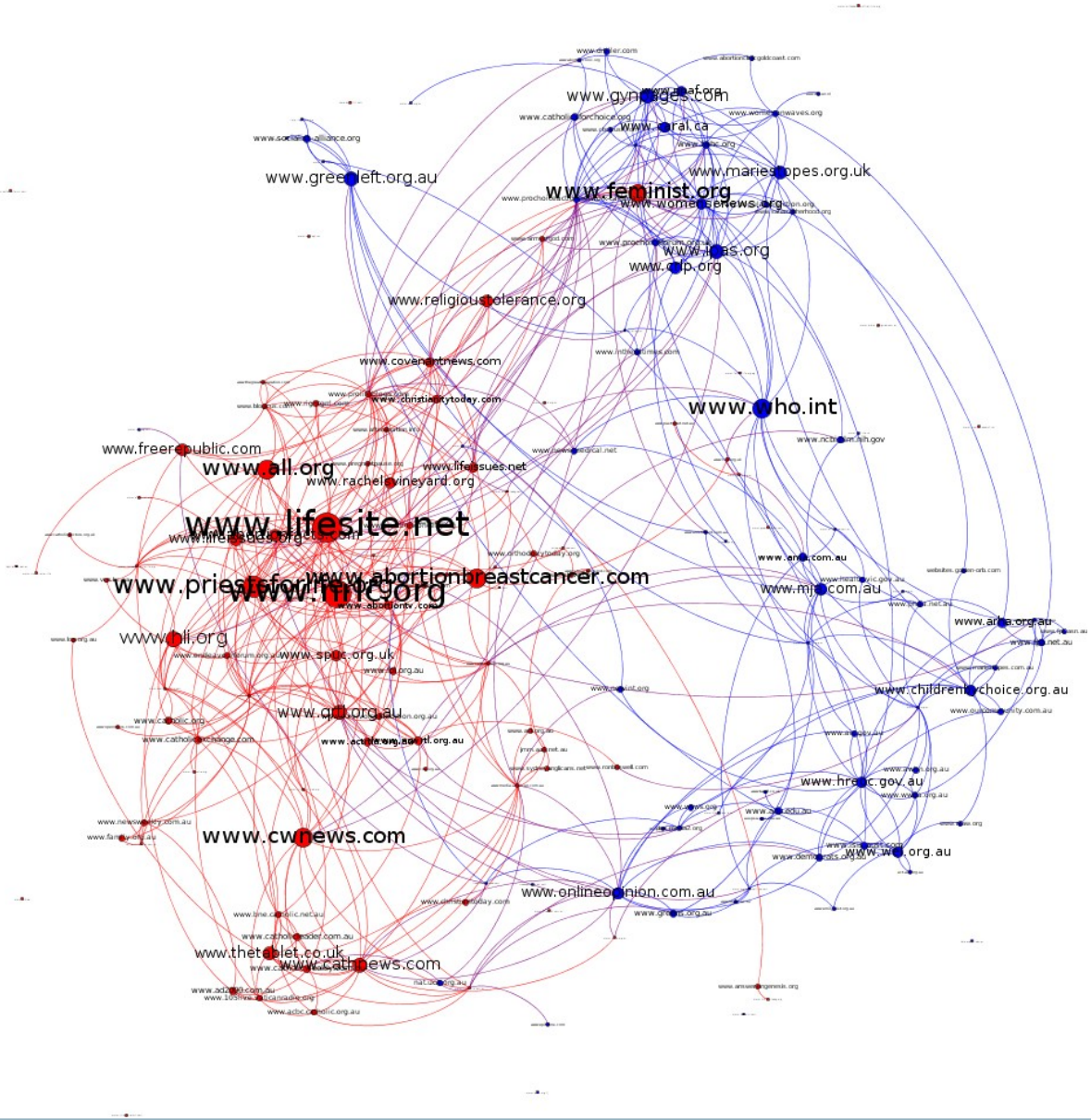
Force-directed graphing algorithm (Fruchterman-Reingold) displays assortative mixing on abortion stance

Note “boundary-spanner” website with high betweeness centrality

Hyperlink network collected and visualised using VOSON

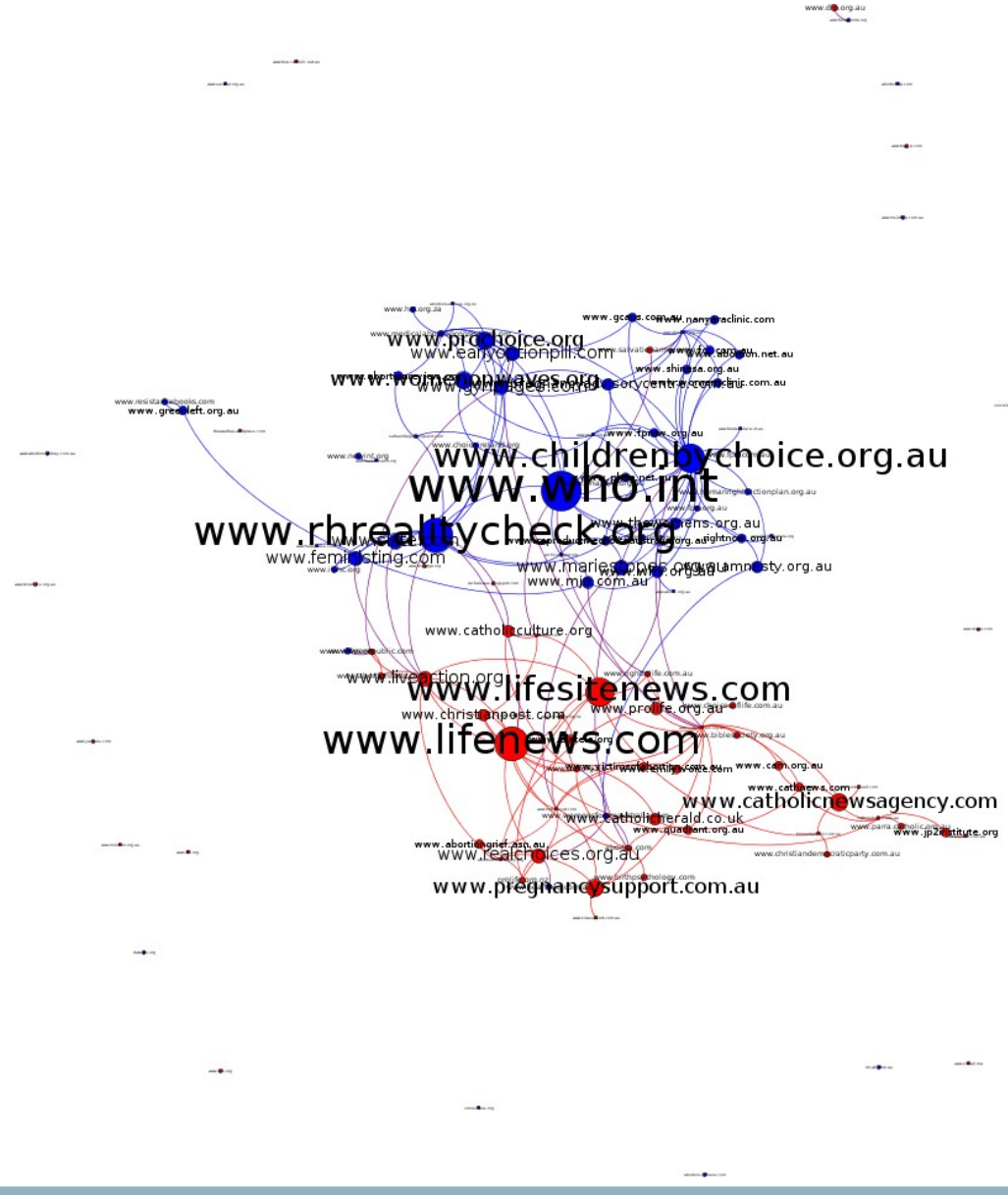


Ackland, R. and A. Evans (2005), "The Visibility of Abortion-Related Information on the World Wide Web," conference presentation at The Australian Sociological Association Annual Conference, 6 December 2005, University of Tasmania.

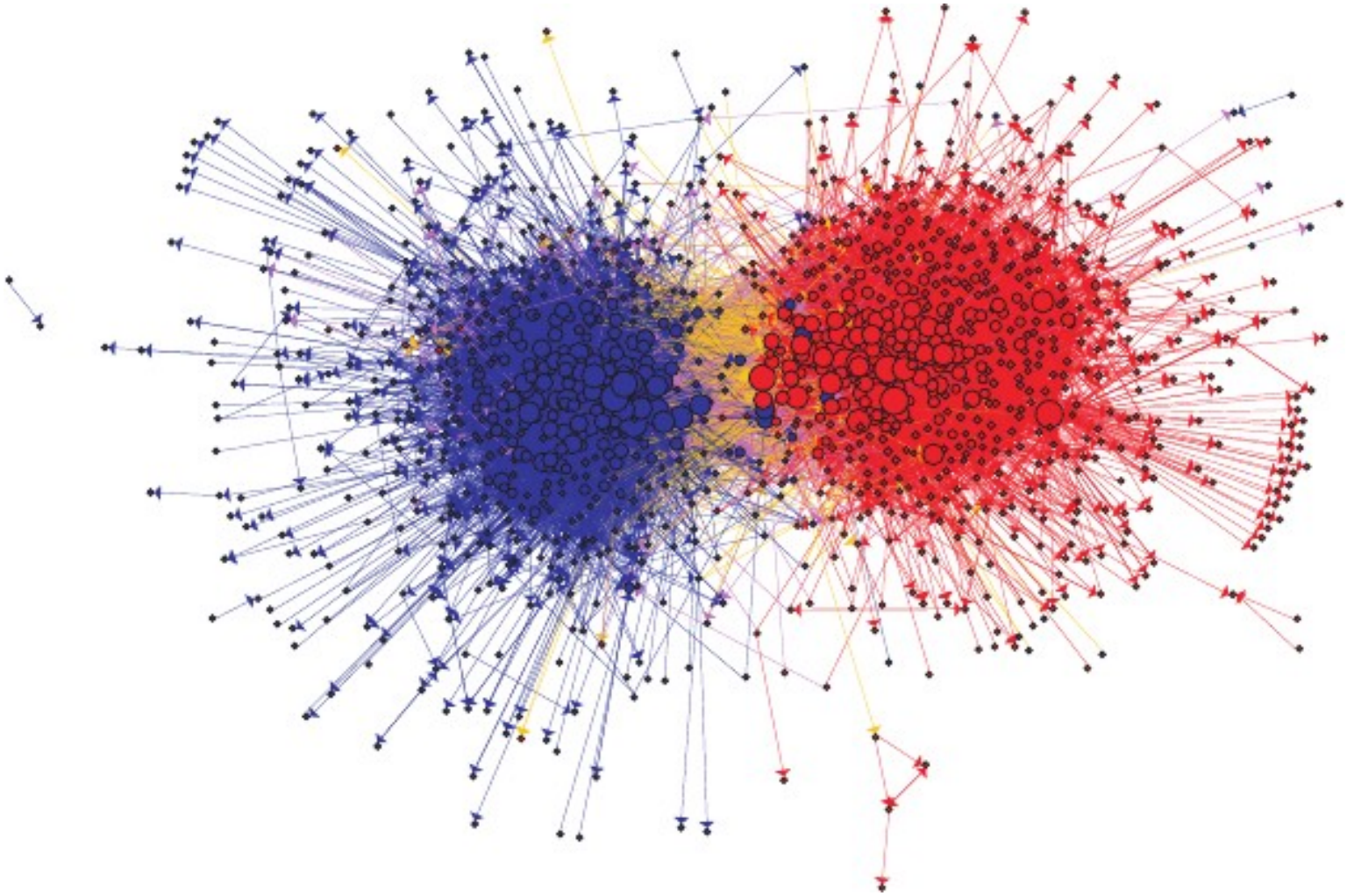


Australian abortion debate participants 2005 (drawn using Gephi)

Ackland, R. and A. Evans (2016), "Using the Web to Examine the Evolution of the Abortion Debate in Australia 2005-2015," forthcoming in N. Brügger and R. Schroeder (eds), *Web as History.* London: UCL Press



Australian abortion debate participants 2015



Adamic, L. and Glance, N. (2005). The political blogosphere and the 2004 U.S. election: Divided they blog. In Proceedings of the 3rd International Workshop on Link Discovery (LINKDD 2005)

More recent work (dynamic social media networks)

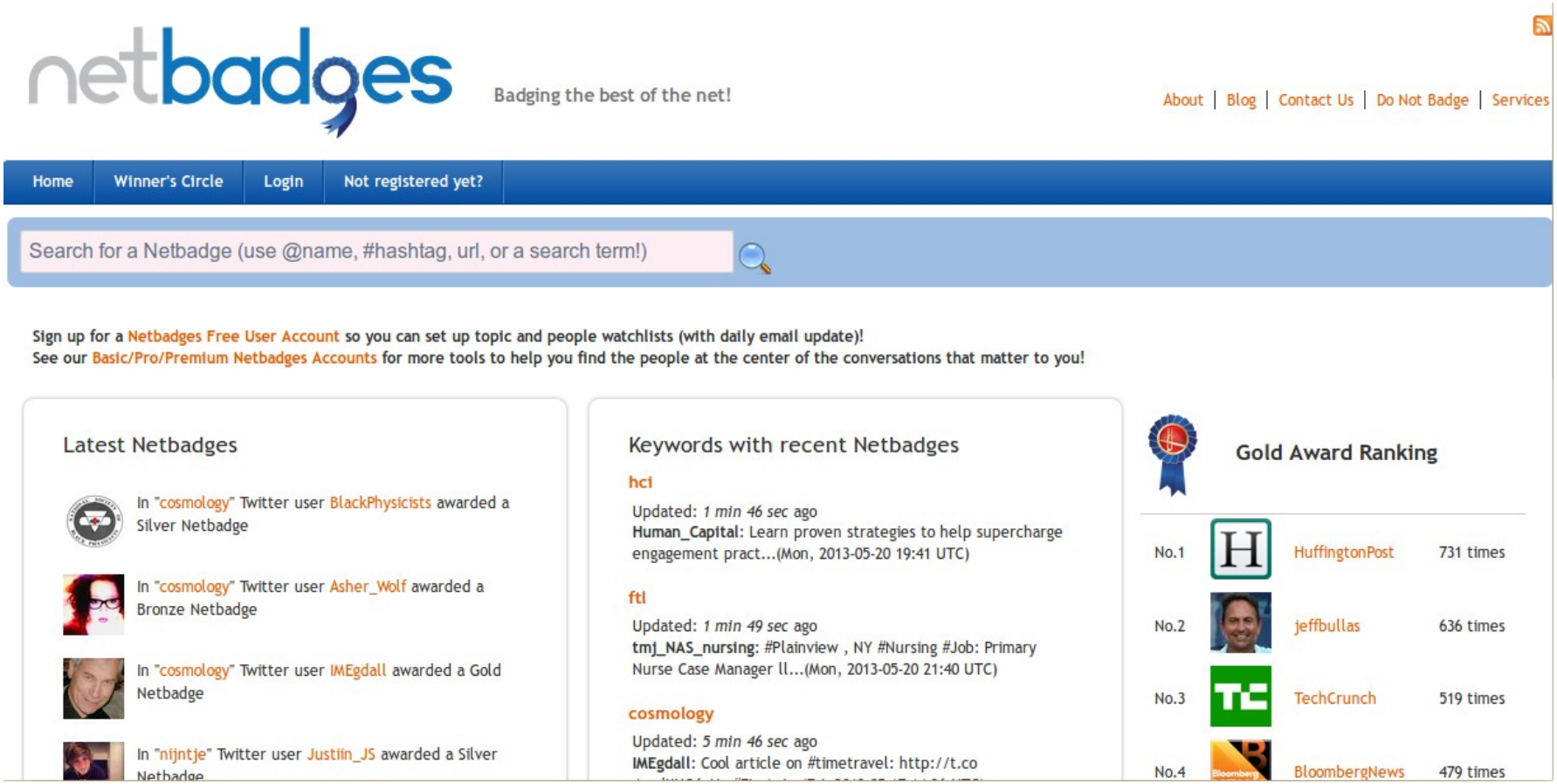
Research project with Mathieu O'Neil (U Canberra)

- *Overarching aim: Investigate whether and how pre-Internet theories of collective action can be combined with network science to provide useful insights into the dynamics of protest in the social media era*
- RQ1: Can some Twitter hashtags be used to demarcate the boundaries to **fields** [“field hashtags”]?
  - Examined using dynamic visualisation of Twitter networks
- RQ2: Can some Twitter hashtags meaningfully be considered as **collective action frames** [“frame hashtags”]?
  - Examined using statistical analysis of response of actors to emergent hashtags

- Relevant papers:
  - Ackland & O'Neil (2011): "Online collective identity: The case of the environmental movement," *Social Networks*, 33, 177-190.
  - O'Neil & Ackland (2015): “Competition in an Online Social Movement Field,” revise & resubmit.
  - O'Neil and Ackland (2016), "Towards a Theory of Online Field/Forces," in M. Allen, J. Hunsinger & L. Klastrup (eds), International Handbook of Internet Studies Vol.2. Amsterdam: Springer. (Accepted 8/2/2016). http://papers.ssrn.com/abstract=2769684
  - Ackland, O'Neil & Perez (2015): “Tweeting the Frame: Frames and Fields in the Age of the Networked Individual," in preparation.

Data

- Data are from Netbadges.com
- Between Oct 2011 and Jun 2013 Netbadges collected (every several days) for particular hashtags:
  - Tweets containing these hashtags
  - Twitter profile data for these users
  - Social graph (follower network) of these users
- This presentation focuses on two sets of hashtags:
  - OWS: #ows, #occupywallstreet
  - #fablab
- Dynamic directed network: edge between i and j indicates either a retweet, @mention or @reply


netbadges
Badging the best of the net!
About | Blog | Contact Us | Do Not Badge | Services
Home
Winner's Circle
Login
Not registered yet?
Search for a Netbadge (use @name, #hashtag, url, or a search term!)
Sign up for a Netbadges Free User Account so you can set up topic and people watchlists (with daily email update)!
See our Basic/Pro/Premium Netbadges Accounts for more tools to help you find the people at the center of the conversations that matter to you!
Latest Netbadges
In "cosmology" Twitter user BlackPhysicists awarded a Silver Netbadge
In "cosmology" Twitter user Asher_Wolf awarded a Bronze Netbadge
In "cosmology" Twitter user IMEgdall awarded a Gold Netbadge
In "nijntje" Twitter user Justiin_JS awarded a Silver Netbadge
Keywords with recent Netbadges
hci
Updated: 1 min 46 sec ago
Human_Capital: Learn proven strategies to help supercharge engagement pract...(Mon, 2013-05-20 19:41 UTC)
ftl
Updated: 1 min 49 sec ago
tmj_NAS_nursing: #Plainview , NY #Nursing #Job: Primary Nurse Case Manager ll...(Mon, 2013-05-20 21:40 UTC)
cosmology
Updated: 5 min 46 sec ago
IMEgdall: Cool article on #timetravel: http://t.co
Gold Award Ranking
No.1 HuffingtonPost 731 times
No.2 jeffbullas 636 times
No.3 TechCrunch 519 times
No.4 BloombergNews 479 times

RQ1: Dynamic visualisation of Twitter networks

- At this stage, very descriptive and exploratory
- Using **ndtv R** package
- Do Twitter networks demarcated by field hashtags “look” and “operate” like fields? Can we infer something useful about:
  - Growth of the field
  - Response to exogenous shocks
  - Growth or reduction of number of clusters over time

- Some videos of network evolution...
  - #fablab hashtag
  - Collected from 4 Feb 2012 to 26 Apr 2013
  - Parameters for visualisation [these are fairly arbitrary...will different parameters give qualitatively different results?]
    - 7 day interval, link decays after 45 day [arbitrary]
    - Kamada-Kawai layout (implemented in ndtv)
    - Subsets of nodes with degree (over entire period) of: 2, 10, 20
  - Would data from Twitter firehose give qualitatively different results?

Final thoughts - Actor-Network Theory versus Social Network Analysis

- A **lot** has been written about Actor-Network Theory (ANT). Some useful recent references:
  - Bruno Latour, Pablo Jensen, Tommaso Venturini, Sébastian Grauwin and Dominique Boullier (2012), "'The whole is always smaller than its parts' – a digital test of Gabriel Tardes' monads," *The British Journal of Sociology*, 63(4), 590-615.
  - Tommaso Venturini, Anders Munk, Mathieu Jacomy (2016). "Actor-Network VS Network Analysis VS Digital Networks: Are We Talking About the Same Networks?," Chapter in *DigitalSTS: A Handbook and Fieldguide* (forthcoming) (David Ribes, Janet Vertesi, eds.) 2016.

- While SNA has provided the foundation for most of my research on online networks, with Tim Graham (Uni Queensland) I'm now exploring ANT for researching social media networks:
  - It is hard to think of a Twitter user as having an “essence” when (in big data research) we typically don't know anything more about the user than the text/hashtags he/she/it has used...perhaps we can learn more (or at least something different) via the network of connections between users and hashtags i.e. the actor-network
  - It can be compelling to interpret emergent clusters in dynamics networks as groups or fields but macro structures emerging from micro interactions is only one way of looking at the world as Latour and co. suggest, perhaps the *whole is indeed smaller than its parts*...

"In textual analysis, a bipartite graph of documents and named-entities constitutes the closest approximation to an actor-network." [Tommaso Venturini and Daniele Guido (2012): "Once Upon a Text : an ANT Tale in Text Analysis," Sociologica, 3.]

Fig 6. This network shows all the eight Grimm stories analyzed and their most relevant expressions. The size of the nodes entities is proportional to the number of documents in which the expression appears.

Thank you