

Social network and network science co-citations across disciplines in 1996-2013

Raffaele Vacca

Bureau of Economic and Business Research
Clinical and Translational Science Institute
University of Florida, Gainesville

r.vacca@ufl.edu

May 30, 2014

This visualization uses co-citation networks to map the research field of social networks and network science across different disciplines, namely the social sciences, physics, and computer science. Each node is a *cited* author and each tie is a co-citation between two authors. Node size represents degree centrality, and edge width and color intensity represent the number of co-citations between two authors. The *citing* papers are all the publications in the [Thomson Reuters Web of Science](#) (WOS) that mention “social networks” or “network science” in their topic. Using [WOS categories](#), citing papers have been divided into two broad disciplines: the social sciences versus physics and computer science. Node color represents the discipline in which an author is cited: (1) Blue authors are cited by papers in the social sciences; (2) Grey authors are cited by papers in physics or computer science; (3) Red authors are cited by papers in both the disciplinary classes. Citing papers have been downloaded for the period from 1996 to 2013, and divided into six 3-years time spans according to their publication date. This has resulted into a time series of six co-citation networks. A network animation has been created to show the evolution of the co-citation network over these six time periods.

The visualization files can be downloaded [at this link](#):

- [Figure1.png](#) shows the most recent static co-citation network (2011-2013).

- [Figure2.png](#) shows the same network with author names (you need to zoom in to be able to read the names).
- [Video.mov](#) is the network animation. This can also be viewed online at <https://vimeo.com/96745135>. If you view it online, make sure to click the *HD* button in the bottom right to visualize the video in full resolution.

The visualization reveals a number of interesting patterns:

- The core-periphery structure of the social network/network science co-citation network in the social sciences, with a core in sociology and organizational studies.
- The emergence of a separate minor core over the last 10 years. This is formed by a few physicists and computer scientists who have served as bridges for social network research into their own disciplines.
- The steady expansion of social network research in physics and computer science in the last 15 years.
- The typical cumulative advantage dynamic of scientific networks, as realized in a highly cross-disciplinary research field. In both the social sciences and physics/computer science, the growth pattern of the co-citation network is one in which a periphery keeps expanding around a stable core formed by essentially the same authors over the years. At the same time, these core authors in either discipline are also those who tend to be cited by *both* disciplines (red nodes). In other words, “star” authors are both the core of their own discipline, and bridges to different disciplines. This shows the typical cumulative-advantage, rich-get-richer dynamic of scientific networks, as developing in a uniquely cross-disciplinary field like social networks and network science.

The project is written in R and is completely reproducible using the original WOS data and the R scripts available at <https://github.com/raffaelevacca/EUSN-co-citation-networks>.