

Concepts and Methods of Social Network Analysis

Course at Berlin-Brandenburgische Akademie der Wissenschaft

Instructor Prof. Dr. Johannes Weyer (TU Dortmund)

Time Montag, 9th till Wednesday, 11th 2017

Social network analysis (SNA) aims at understanding the processes of interaction and coordination within social systems, be it small friendship networks, large communities (e.g. within the academia) or strategic alliances of different partners (e.g. in research and development). The qualitative approach distinguishes the network mode of coordination from markets and hierarchies, while the quantitative approach develops measures that help to identify positions of individuals within networks and to analyse the structure of the whole network.

The workshop will give an overview of different SNA approaches – both qualitative and quantitative – and will also present different methods of SNA, ranging from static measures to dynamic models, which allow for investigating the dynamics of networks, too.

1 Monday

1.1 Introduction (10:15 – 11:45)

- Outlook of social network analysis
- Overview over the subjects of the course

1.2 Networks, Markets, Hierarchies (13:15 – 14:45)

- Typologies of social coordination
 - Basic reading (Powell 1990)
 - Further references (Powell/Grodal 2005, Weyer 2014c)

1.3 Empirical studies (15:15 – 16:45)

- Innovation networks
 - (Weyer 2014b)
 - (Powell/Grodal 2005, Pyka/Scharnhorst 2009, Cantner/Graf 2006)
- Other empirical evidences
 - (Dikova 2015, Fritsch/Kauffeld-Monz 2010)

- (Swift/Hwang 2013, Hua/Wang 2015)

2 Tuesday

2.1 Governance (10:15 – 11:45)

- Social mechanisms of control and coordination
- New approaches to multi-level-governance
 - (Weyer et al. 2015)
 - (Hedström/Swedberg 1996, Mayntz 2003, Torfing et al. 2012, Ostrom 2010, Duit/Galaz 2008)

2.2 Methods of SNA (13:15 – 14:45)

- Quantitative measures and indices
 - (Jansen/Diaz-Bone 2011)
 - (Jansen 2006, Faust 1997, Stegbauer/Häußling 2011)

2.3 Software for SNA (15:15 – 16:45)

- SIENA (www.stats.ox.ac.uk/~snijders/siena)
- UCINET (www.analytictech.com/ucinet UCINET)
- PAJEK (<http://vlado.fmf.uni-lj.si/pub/networks/pajek>)
- Gephi (www.gephi.org)
 - *Please download Gephi to your computer and check system requirements, especially concerning Java (Windows and Linux only).*
- NetLogo (<http://ccl.northwestern.edu/netlogo>)
 - Network Extension (<http://ccl.northwestern.edu/netlogo/docs/nw.html>)
- (Weyer et al. 2014, Hanneman/Riddle 2005, Borgatti et al. 2002)

3 Wednesday

3.1 Experimentation with Gephi (10:15 – 11:45)

- Creation of table with nodes and edges in Excel
- Matrix multiplication
- Import of data into Gephi
- Visualization

3.2 Data Networks in the Age of the Internet (13:15 – 14:45)

- Reality mining (Eagle/Pentland 2006, Eagle/Greene 2014, Russell 2013)
- Predictive analysis (Larose/Larose 2015, McCue 2014)
- Governance by/of algorithms (Saurwein et al. 2015, Just/Latzer 2016)
- Trapped in the net – Networks in the data society (Weyer 2014a, Kurz/Rieger 2009, Rochlin 1997)

3.3 Final discussion (15:15 – 16:00)

- Summary
- Feedback

4 References

- Borgatti, S.P./M.G. Everett/L.C. Freeman, 2002: Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.
- Cantner, Uwe/Holger Graf, 2006: The network of innovators in Jena: An application of social network analysis. In: Research Policy 35: 463-480.
- Dikova, Desislava, 2015: Improving Innovation: Are Internal And External Sources Of Knowledge Complements Or Substitutes? In: Schmalenbach Business Review: ZFBF 67: 349-367.
- Duit, Andreas/Victor Galaz, 2008: Governance and complexity—emerging issues for governance theory. In: Governance 21 (3): 311-335.
- Eagle, Nathan/Kate Greene, 2014: Reality mining: Using big data to engineer a better world. MIT Press.
- Eagle, Nathan/Alex Pentland, 2006: Reality mining: sensing complex social systems. In: Personal and ubiquitous computing 10: 255-268.
- Faust, Katherine, 1997: Centrality in affiliation networks. In: Social networks 19 (2): 157-191,
http://www.socsci.uci.edu/~kfaust/faust/research/articles/faust_centrality_sn_1997.pdf.
- Fritsch, Michael/Martina Kauffeld-Monz, 2010: The impact of network structure on knowledge transfer: an application of social network analysis in the context of regional innovation networks. In: The Annals of Regional Science 44: 21-38.
- Hanneman, Robert A./Mark Riddle, 2005: Introduction to social network methods. <http://www.faculty.ucr.edu/~hanneman/nettext/>.
- Hedström, Peter/Richard Swedberg, 1996: Social Mechanisms. In: Acta Sociologica 39: 281-308.
- Hua, Lei/Wenping Wang, 2015: The impact of network structure on innovation efficiency: An agent - based study in the context of innovation networks. In: Complexity 21: 111-122.
- Jansen, Dorothea, 2006: Einführung in die Netzwerkanalyse (3. Aufl.). Opladen: UTB (Leske + Budrich).
- Jansen, Dorothea/Rainer Diaz-Bone, 2011: Netzwerkstrukturen als soziales Kapital. Konzepte und Methoden zur Analyse struktureller Einbettung. In: Johannes Weyer (Hg.), Soziale Netzwerke. Konzepte und Methoden

- der sozialwissenschaftlichen Netzwerkforschung (2. Aufl.). München: Oldenbourg, 73-108.
- Just, Natascha/Michael Latzer, 2016: Governance by algorithms: reality construction by algorithmic selection on the Internet. In: *Media, Culture & Society* 39: xx-xx, <http://journals.sagepub.com/doi/pdf/10.1177/0163443716643157>.
- Kurz, Constanze/Frank Rieger, 2009: Stellungnahme des Chaos Computer Clubs zur Vorratsdatenspeicherung (1 BvR 256/08, 1 BvR 263/08, 1 BvR 586/08). <http://www.ccc.de/vds/VDSfinal18.pdf>.
- Larose, Daniel T./Chantal D. Larose, 2015: *Data mining and predictive analytics*. John Wiley & Sons.
- Mayntz, Renate, 2003: New challenges to governance theory. In: Henrik Paul Bang (Hg.), *Governance as social and political communication*. Manchester: Manchester University Press, 27-40.
- McCue, Colleen, 2014: *Data mining and predictive analysis: Intelligence gathering and crime analysis*. Butterworth-Heinemann.
- Ostrom, Elinor, 2010: Beyond markets and states: polycentric governance of complex economic systems. In: *The American economic review* 100: 641-672.
- Powell, Walter W., 1990: Neither Market nor Hierarchy: Network Forms of Organization. In: *Research in Organizational Behavior* 12: 295-336.
- Powell, Walter W./Stine Grodal, 2005: Networks of innovators. In: Jan Fagerberg/David Mowery/Richard R. Nelson (Hg.), *The Oxford Handbook of Innovation*. Oxford: Oxford University Press, 56-85.
- Pyka, Andreas/Andrea Scharnhorst (Hg.), 2009: *Innovation Networks – New Approaches in Modelling and Analyzing*. Berlin: Springer.
- Rochlin, Gene I., 1997: *Trapped in the net. The unanticipated consequences of computerization*. Princeton: Princeton UP.
- Russell, Matthew A., 2013: *Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More (2nd Edition)*. O'Reilly Media, Inc.
- Saurwein, Florian/Natascha Just/Michael Latzer, 2015: Governance of algorithms: options and limitations. In: *info* 17 (6): 35-49, <http://dx.doi.org/10.1108/info-05-2015-0025>.
- Stegbauer, Christian/Roger Häußling (Hg.), 2011: *Handbuch Netzwerkforschung*. Wiesbaden: VS Verlag.
- Swift, Peter E/Alvin Hwang, 2013: The impact of affective and cognitive trust on knowledge sharing and organizational learning. In: *The Learning Organization* 20: 20-37, <http://dx.doi.org/10.1108/09696471311288500mcc>.
- Torring, Jacob/B. Guy Peters/Jon Pierre/Eva Sørensen, 2012: *Interactive governance. Advancing the paradigm*. Oxford: Oxford University Press.
- Weyer, Johannes, 2014a: Einleitung: Netzwerke in der mobilen Echtzeitgesellschaft. In: ders. (Hg.), *Soziale Netzwerke. Konzepte und Methoden der sozialwissenschaftlichen Netzwerkforschung (3. Aufl.)*. München: Oldenbourg, 3-37.
- , 2014b: Innovations-Netzwerke. In: ders. (Hg.), *Soziale Netzwerke. Konzepte und Methoden der sozialwissenschaftlichen Netzwerkforschung (3. Aufl.)*. München: Oldenbourg, 211-236.
- (Hg.), 2014c: *Soziale Netzwerke. Konzepte und Methoden der sozialwissenschaftlichen Netzwerkforschung (3. überarbeitete Auflage)*. München: Oldenbourg.
- Weyer, Johannes/Fabian Adelt/Sebastian Hoffmann, 2015: *Governance of complex systems. A multi-level model (Soziologisches Arbeitspapier*

42/2015). Dortmund: TU Dortmund,
<http://hdl.handle.net/2003/34132>.

Weyer, Johannes/Robin D. Fink/Tobias Liboschik, 2014: Softwarebasierte Methoden der Netzwerk-Analyse. In: Johannes Weyer (Hg.), Soziale Netzwerke. Konzepte und Methoden der sozialwissenschaftlichen Netzwerkforschung (3. Aufl.). München: Oldenbourg, 105-127.