

Introduction to Social Network Analysis

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Dates and schedule:

Tuesday	06 May @ Badia Fiesolana, Seminar Room 2
Wednesday	07 May @ Badia Fiesolana, Seminar Room 2
Thursday	08 May @ Badia Fiesolana, Seminar Room 2
Friday	09 May @ Badia Fiesolana, Seminar Room 2

Credits: 20

Course overview

Social networks are an integral part of our lives. We are embedded in networks of social relationships at work, in school, in our family, and in our leisure activities. The social sciences have long established that these networks directly and indirectly determine people's attitudes and behaviors. Many of the phenomena we are interested in, be it polarization, prejudice, social norms, education or employment outcomes, political attitudes, identities, bullying, and even depression or obesity, are affected by the social networks in which individuals are embedded. Furthermore, the structure of these networks – how we are connected to others and how our contacts are connected – is shaped by individuals' attitudes and behaviors. Social network analysis (SNA) provides tools to detect these processes and unravel the often bidirectional relation between networks and attitudes/behavior.

This workshop provides a general introduction to social network analysis, covering topics from network visualization and description to advanced statistical methods for analyzing cross-sectional and longitudinal network data. In the first part, participants will learn key theoretical concepts for describing networks and network positions. In hands-on lab sessions, participants will calculate network statistics and learn how to visualize the often complex data in R. In this part, we mainly consider networks as independent variables that can be used to predict attitudes and behavior. We also introduce different types of network data (e.g., ego-centric and complete networks), and we will practice with tools developed to collect qualitative and quantitative social network data. The second part of the workshop focuses on widely used statistical methods for analyzing social networks as dependent variables: stochastic actor-oriented models for longitudinal analyses and exponential random graph models for cross-sectional analyses. Participants will perform these analyses on their own computer using R, and learn how to interpret the coefficients and evaluate the quality of their results.

Programme

Date & time	Topic	Materials
Tuesday 6 May (10:00-12:30)	1. Introduction to SNA (<i>Dieuwke</i>) - Main debates and research questions - Basic terminology - Different types of networks - Core concepts, mechanisms, and measures	<i>Required readings:</i> - Prell & Schaefer (2024) (12 pp) - Scott (2017), Ch. 6 (pp. 96-106) & Ch. 7 (30 pp) <i>Additional readings:</i> - Scott (2017), Ch. 2 (26 pp; accessible overview of the history of SNA)
Tuesday 6 May (13:30-15:30)	2. Visualizing & describing networks in R (<i>Dieuwke</i>) - The structure of network data - Visualizing (complete) networks with igraph - Describing networks: network-level measures (e.g., reciprocity, transitivity) and individual positions/nodal attributes (e.g., centrality, degree) - Subgroups and community detection	<i>Additional readings (applications):</i> - Bruggeman et al. (2012) (13 pp; communities in complete networks) - Lubbers et al. (2019) (14 pp; extended networks) - Smith et al. (2019) (25 pp; core networks)
Wednesday 7 May (10:00-12:30)	3. Networks as independent variables (<i>Dieuwke</i>) - Continuation of 2 - Describing ego-centric networks - Analyzing networks as independent variables	<i>Required readings:</i> - Perry, Roth & Small (2024) (15 pp) <i>Additional readings:</i> - Chetty et al. (2022) (13 pp)
Wednesday 7 May (13:30-15:30)	3. Collecting network data (Tobias) - Challenges and best practices - Tools for qualitative and quantitative social network data (Network Canvas, Qualtrics, GENSI, SICCEN)	<i>Required readings:</i> - Stark (2018) (13 pp) - Birkett et al. (2021) (10 pp) <i>Additional readings:</i> - Stark & Krosnick (2017) (10 pp) - Baez Camargo et al. (2025) (16 pp)
Thursday 8 May (10:00-12:30)	4. Networks as dependent variables: Principles and applications of longitudinal social network analysis (<i>Tobias</i>) - Research questions - Principles of analyzing networks as dependent variables - Applications	<i>Required readings:</i> - Snijders et al. (2010) (17 pp) <i>Additional readings:</i> - Stark et al. (2020) (32 pp)
Thursday 8 May (13:30-15:30)	5a. Modeling longitudinal networks: SOAM workshop (<i>Tobias</i>) - Data requirement - Types of covariates + Seminar Tobias (1.5 hours)	<i>Required readings:</i> - Stark et al. (2017) (24 pp) <i>Additional readings:</i> - Bracegirdle et al. (2022) (15 pp)
Friday 9 May (10:00-12:30)	5b. Modeling longitudinal networks: SOAM workshop (<i>Tobias</i>)	<i>Required readings:</i>

	<ul style="list-style-type: none"> - Parameter interpretation - Modelling social influence - Multilevel/meta analysis 	<ul style="list-style-type: none"> - Kretschmer & Leszczensky (2022) (26 pp) <p><i>Additional readings:</i></p> <ul style="list-style-type: none"> - Fujimoto et al. (2018) (26 pp)
Friday 9 May (13:30-15:30)	<p>6. Modeling cross-sectional networks: ERGMs (Dieuwke)</p> <ul style="list-style-type: none"> - Research questions - Challenges and best practices - Goodness of Fit - Basic application in R 	<p><i>Required readings:</i></p> <ul style="list-style-type: none"> - Lusher, Koskinen & Robins (2013), Ch. 2, 4 & 5 (24 pp) <p><i>Additional readings:</i></p> <ul style="list-style-type: none"> - Zwier & Geven (2023) (12 pp)

Software

We will use the programming language R, which is widely used for visualizing and analyzing networks and is open source and free of charge. Prior knowledge of R is not required. The workshop organizers will provide sample scripts.

Preparations

1. Please ensure that R and RStudio are installed on your laptop before the start of the workshop (follow the instructions [here](#)).
2. To prepare for some of the hands-on exercises, please install the following R-packages on your local machine: sna, network, igraph, xtable, RSiena, ergm, intergraph.
For Mac users (optional): if you may also want to see RSiena behave like it does on a Windows computer (which is not necessary), you need to also install the tcltk package.

Background readings on coding in R

- Wickham, H., Çetinkaya-Rundel, M. & Grolemund, G. (2017). [R for Data Science \(2e\)](#).
- Thulin, M. (2024). [Modern Statistics with R \(2e\)](#).

Bibliography

Required readings

- Birkett M., Melville J., Janulis P., Phillips G. 2nd, Contractor N., & Hogan B. (2021). Network Canvas Key decisions in the design of an interviewer-assisted network data collection software suite. *Social Networks*, 66, 114-124. <https://doi.org/10.1016/j.socnet.2021.02.003>
- Bruggeman, J., Traag, V. A., & Uitermark, J. (2012). Detecting communities through network data. *American Sociological Review*, 77(6), 1050–1063. <https://doi.org/10.1177/0003122412463574>
- Chetty, R., Jackson, M.O., Kuchler, T. et al. (2022). Social capital I: measurement and associations with economic mobility. *Nature* (608), 108–121. <https://doi.org/10.1038/s41586-022-04996-4>
- Kretschmer, D., & Leszczensky, L. (2022). In-group bias or out-group reluctance? The interplay of gender and religion in creating religious friendship segregation among Muslim youth. *Social Forces*, 100(3), 1307-1332. <https://dx.doi.org/10.1093/sf/soab029>
- Lubbers, M. J., Molina, J. L., & Valenzuela-García, H. (2019). When networks speak volumes: Variation in the size of broader acquaintanceship networks. *Social Networks*, 56, 55–69. <https://doi.org/10.1016/j.socnet.2018.08.004>
- Lusher, D., Koskinen, J., & Robins, G. (Eds.). (2013). *Exponential random graph models for social networks: Theory, methods, and applications*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511894701>

- Perry, B., Roth, A., & Small, M. (2024). 31. Personal networks and egocentric analysis (pp. 439-454). In J. McLevey, J. Scott, P. J. Carrington (Eds.) *Introducing social network analysis* (2 ed.). Sage Publications Ltd, <https://doi.org/10.4135/9781529682618.n2> (free online access via EUI library)
- Prell, C., & Schaefer, D. (2024). 1. Introducing social network analysis (pp. 19-31). In J. McLevey, J. Scott, P. J. Carrington (Eds.) *Introducing social network analysis* (2 ed.). Sage Publications Ltd, <https://doi.org/10.4135/9781529682618.n31> (free online access via EUI library)
- Scott, J. (2017). *Social network analysis* (4th edition). Sage Publications Ltd. <https://doi.org/10.4135/9781529716597>
- Smith, J. A., McPherson, M., & Smith-Lovin, L. (2014). Social distance in the united states: Sex, race, religion, age, and education homophily among confidants, 1985 to 2004. *American Sociological Review*, 79(3), 432–456. <https://doi.org/10.1177/0003122414531776>
- Snijders, T. A., Van de Bunt, G. G., & Steglich, C. E. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks*, 32(1), 44-60. <https://doi.org/10.1016/j.socnet.2009.02.004>
- Stark, T. H., Leszczensky, L., & Pink, S. (2017). Are there differences in ethnic majority and minority adolescents' friendship preferences and social influence with regard to their academic achievement?. *Zeitschrift für Erziehungswissenschaft: ZfE*, 20(3), 475-498. <https://link.springer.com/article/10.1007/s11618-017-0766-y>
- Stark, T. H. (2018). Collecting Social Network Data (pp. 241-254). in: Vannette D., Krosnick J. (eds) *The Palgrave Handbook of Survey Research*. Cham, Switzerland: Palgrave Macmillan. <https://link.springer.com/book/10.1007/978-3-319-54395-6>

Additional readings

- Baez Camargo, C.; Gadenne, V.; Mkoji, V.; Perera, D.; Persian, R.; Sambaiga R. & Stark, T. H. (2025). Addressing Bribery and Associated Social Norms in Healthcare: Results of a Behaviour Change Intervention in Tanzania. *European Journal of Social Psychology*, in press. <https://doi.org/10.1002/ejsp.3140>
- Bracegirdle, C., Reimer, N. K., van Zalk, M., Hewstone, M., & Wölfer, R. (2022). Disentangling contact and socialization effects on outgroup attitudes in diverse friendship networks. *Journal of Personality and Social Psychology*, 122(1), 1. <https://dx.doi.org/10.1037/pspa0000240>
- Fujimoto, K., Snijders, T. A., & Valente, T. W. (2018). Multivariate dynamics of one-mode and two-mode networks: Explaining similarity in sports participation among friends. *Network Science*, 6(3), 370-395. <https://dx.doi.org/10.1017/nws.2018.11>
- Stark, T. H. & Krosnick, J. A. (2017). GENSI: A New Graphical Tool to Collect Ego-Centered Network Data. *Social Networks*, 48, 36-45. <https://doi.org/10.1016/j.socnet.2016.07.007>
- Stark, T. H., Rambaran, J. A. & McFarland, D. A. (2020). The meeting of minds: Forging social and intellectual networks within universities. *Sociological Science*, 7, 433-464. <https://doi.org/10.15195/v7.a18>
- Zwier, D., & Geven, S. (2023). Knowing me, knowing you: Socio-economic status and (segregation in) peer and parental networks in primary school. *Social Networks*, 74, 127–138. DOI: <https://doi.org/10.1016/j.socnet.2023.03.003>

Further reading for after the workshop

The books below are all freely accessible online (note: some require an institutional login). Some are more practical discussions of the application of SNA methods (Kolaczyk & Csárdi, 2014; Robins, 2015), others comprehensive reference books with introductory chapters and more advanced discussions of specific applications and methods (McLevey et al., 2024; Wasserman & Faust, 1994).

- Kolaczyk, E. D., & Csárdi, G. (2014). *Statistical analysis of network data with R* (Vol. 65). Springer New York. <https://doi.org/10.1007/978-1-4939-0983-4>
- McLevey, J., Scott, J., & Carrington, P. J. (Eds.). (2024). *The Sage Handbook of Social Network Analysis* (2nd ed.). Sage Publications Ltd. <https://doi.org/10.4135/9781529682618>
- Robins, G. (2015). *Doing social network research: Network-based research design for social scientists*. Sage Publications Ltd. <https://doi.org/10.4135/9781473916753>
- Scott, J. (2017). *Social network analysis* (4th edition). Sage Publications Ltd. <https://doi.org/10.4135/9781529716597>
- Wasserman, S., & Faust, K. (Eds.). (1994). *Social network analysis: Methods and applications*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511815478>