

INTRODUCTION: WHAT ARE SOCIAL NETWORKS?

We are increasingly aware of the interdependencies of social life: the twenty-first century is characterized by communication and transportation technologies that shrink the world, make it smaller, and thus help bring individuals geographically far from one another into close social contact. We live in a world that is paradoxically small and wide: each of us is embedded in local communities, yet at the same time more and more of us hold contacts that span the globe, and further, each of us is arguably only a few 'links' away from anyone else in the world (Milgram, 1967; Watts, 1999).

These interdependencies have both positive and negative consequences. Our knowledge that the world is both large and small makes us more sensitive to the idea that our actions affect those around the world, and whom we know in our local social circles could very well connect us with someone in a distant land. However, these same interdependencies have shown us some dark sides: asocial and terrorist groups can be both local and global, using their local links to spread global messages of hate and intolerance.

Thus, the social relations that knit together our modern world can have multiple effects, and a local occurrence in one area of the world can affect the rest. Yet there is a big gap between this intuitive understanding of how our social world works and a more precise understanding of how these interactions and relationships form. Filling this gap is important if we want to understand what kind of interventions (if any) we can make to improve a variety of social conditions, and in addition, understanding of these kinds of interactions and relationships can also help our understanding of the world.

This book attempts to fill this gap by providing an overview of an increasingly popular approach for studying social relations and their structuring: social network analysis (SNA). This approach involves theoretical concepts, methods and analytical techniques to uncover the social relations that the individuals and groups together, the structure of those relations, and how relations and their structures influence (or are influenced by) social behaviour, attitudes, beliefs and knowledge.

The growing popularity of this approach coincides with the growing awareness in our society of the interdependencies and complexities of social systems in particular, but also ecological ones as well; social policy makers, for example, are increasingly turning their attention to the role of networks for understanding a range of problems on the local, regional, societal and even global level. With regards to the environment, a number of scholars and policy makers are also starting to see the importance of understanding social networks for providing insights into the ways humans understand, value and manage the natural world.

The literature on social networks is vast: there are three journals that focus entirely on social networks – *Connections*, *Journal of Social Structure* and *Social Networks* – and there are a number of books that focus on the techniques, concepts, theories and mathematics that form the field.

This book differs from others in its emphasis and scope. Whereas many introductory books on SNA are more suitable for learners with a background in statistics or sociology, or both, this book is aimed primarily for an audience of newcomers to the field, who might not have much confidence in their knowledge of sociology, statistics or mathematics. A second audience is for those already familiar with SNA, but have yet to tackle some of the newer trends in methods and techniques, such as Exponential Random Graph Models (ERGMs) or actor-based models, such as those found in the software application SIENA. Finally, a third audience consists of those looking to teach SNA, and are in need of some examples of how to get students started with software applications, and friendly introductions to some of the mathematics involved. This book is designed to serve all of these three audiences. It is a book for the social network novice on learning how to study, think about and analyse social networks; the intermediate user, who has not yet come across some of the newer developments or trends in the field; and the teacher, who is looking for a range of exercises, as well as an up-to-date historical account of the field.

The book aims to offer a full overview of this field – historical origins; common theoretical perspectives and frameworks used in the field; traditional and more recent analytical procedures; and fundamental mathematical equations necessary for gaining a foothold in the field. After reading this book and following the exercises within, you should have a good basic understanding of social networks and social network analysis, literally from metaphor to models.

A word on organization: I have chosen to organize the book in three Parts. [Part I](#) offers a lot of background and fundamental concepts for later parts of the book. Thus, [Part I](#) includes a chapter on basic terminology ([Chapter 1](#)); an up-to-date historical account of social network analysis ([Chapter 2](#)); and a chapter on how to think about and design a research study involving social network data gathering and analysis ([Chapter 3](#)). This last chapter also includes within it a summary of the most common theoretical frameworks used in social network analysis, these being (i) social capital, (ii) social exchange, (iii) social influence network theory, (iv) social selection network theory, and (v) biased net theory.

[Part II](#) introduces readers to most of the fundamental, analytical concepts used in social network analysis, and organizes these concepts in terms of 'levels'. By this I mean that I break down the notion of a 'social network' as being composed of a

series of levels such as actors (e.g. individuals); relations connecting actors together (e.g. friendship); dyads (i.e. pairs of actors); triads (i.e. structures composed of three actors); subgroups; and entire networks. Each level is given its own chapter, where relevant concepts, theories, analytical techniques and examples are given.

In presenting these concepts as levels, this book is keeping pace with the SNA field: increasingly, SNA researchers are conceptualizing and researching social networks from a multilevel approach (Blau, 1993; Coromina and Coenders, 2006; DiPrete and Forristal, 1994; Klein Ikkink and van Tilburg, 1999; Lubbers, 2003; Lubbers et al., in press; van Duijn et al., 1999; Van Emmerik, 2006; Van Emmerik, in press;). In doing so, this enables researchers to not only see the relative contribution of each network level to the processes or phenomena under investigation, but also to study how these levels interact with each other. Further, in adopting a levels-oriented approach, and starting with the individual actor level, this book begins at a point that most readers are familiar with, i.e. the individual as an actor within a particular environment. Studying the social world from the viewpoint of individuals is reflective of the more traditional approach to social sciences, but it is also more intuitive and familiar to the average reader. Thus, beginning the study of networks with individuals, and then building up to higher and higher levels of structure, makes sense from a pedagogical angle.

The concepts presented in [Part II](#) lay a foundation for [Part III](#), which introduces the idea of statistical significance in relation to social network data, and some of the most common statistical models and techniques to date. The tie-based and actor-based models introduced in this chapter are considered to be among the more recent methodological developments in the SNA field, and their power lies within their ability to provide distribution models suitable for the interdependent nature of network data. As such, these models provide a good means for statistical testing, as well as explaining network structure.

[Part III](#) is followed by the Appendices, designed to offer some in-depth examples of how to use two popular software applications within SNA. The first, UCINET, is referred to throughout many chapters of the book, yet an in-depth introduction to the software is provided in [Appendix 1](#). The second software application is Siena, which is used for the more advanced statistical models such as ERGMs and actor-based models. I chose these two applications over others (e.g. Pajek, R or Pnet) for a number of reasons. With regards to UCINET, the menu for this software is organized in a way which is more consistent with the way social scientists think about social networks, and thus, the way in which networks are presented in this book. In addition, UCINET has grown within the social networks field, versus its near rival, Pajek, which was developed by graph theorists, and was intended more for use with very large networks. With regards to my choice for using Siena, this application can handle both ERGMs and actor-based models, thus you can use it for both cross-sectional and longitudinal statistical modelling of networks. Siena has, in the time period of this book being written, also been re-designed to work within the R software environment; this is an environment especially well-suited for statisticians and analysts of large-scale networks. If readers are interested in learning RSiena, I encourage them to visit the website: http://stat.gamma.rug.nl/siena_r.htm.

Beyond these introductory remarks on social networks and the organization of this book, I would like to conclude this chapter with some acknowledgements. In the initial proposal stage of this book, I was influenced by a number of colleagues, namely, Caroline Haythornthwaite, Chris Rojek, Steve Borgatti and Fil Agneessens. These discussions greatly inspired me as I set about trying to outline this book and make decisions on what topics to include. Along the way, at various other stages, the following people have been instrumental to helping me complete this book: in alphabetical order, this list includes Fil Agneessens; Jackie Beckhelling; Professor Klaus Hubacek; Professor David Krackhardt; Dr Mark Reed; Professor Michael Savage; Professor John Scott; and Professor John Skvoretz. I would like to offer a special thanks to Professor Martin Everett, from University of Manchester and Professor Tom Snijders, from Oxford University.

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REFERENCES

- Blau, P. M. (1993) 'Multilevel structural analysis', *Social Networks*, 15: 201–15.
- Coromina, L. and Coenders, G. (2006) 'Reliability and validity of egocentered network data collected via web: A meta-analysis of multilevel multitrait multimethod studies', *Social Networks*, 28: 209–31.
- DiPrete, T. A. and Forristal, J. D. (1994) 'Multilevel models: Methods and substance', *Annual Review of Sociology*, 20: 331–57.
- Klein Ikkink, K. and Van Tilburg, T. (1999) 'Broken ties: reciprocity and other factors affecting the termination of older adults' relationships', *Social Networks*, 21: 131–46.
- Lubbers, M. J. (2003) 'Group composition and network structure in school classes: a multilevel application of the p* model', *Social Networks*, 25: 309–32.
- Lubbers, M. J., Molina, J. L., Lerner, J., Brandes, U., Ávila, J. and McCarty, C. (in press) 'Longitudinal analysis of personal networks. The case of Argentinean migrants in Spain', *Social Networks*.
- Milgram, S. (1967) 'The small world problem', *Psychology Today*, 1(1): 60–7.
- Van Duijn, M. A. J., Van Busschbach, J. T. and Snijders, T. A. B. (1999) 'Multilevel analysis of personal networks as dependent variables', *Social Networks*, 21: 187–210.
- Van Emmerik, I. J. H. (2006) 'Gender differences in the creation of different types of social capital: A multilevel study', *Social Networks*, 28: 24–37.
- Van Emmerik, I. H. (in press) 'Gender differences in the creation of different types of social capital: A multilevel study', *Social Networks*.
- Watts, D. J. (1999) 'Networks, dynamics and the small world phenomenon', *American Journal of Sociology*, 105: 493–527.