SOCIAL NETWORK ANALYSIS for EGO-NETS

Nick Crossley • Elisa Bellotti • Gemma Edwards
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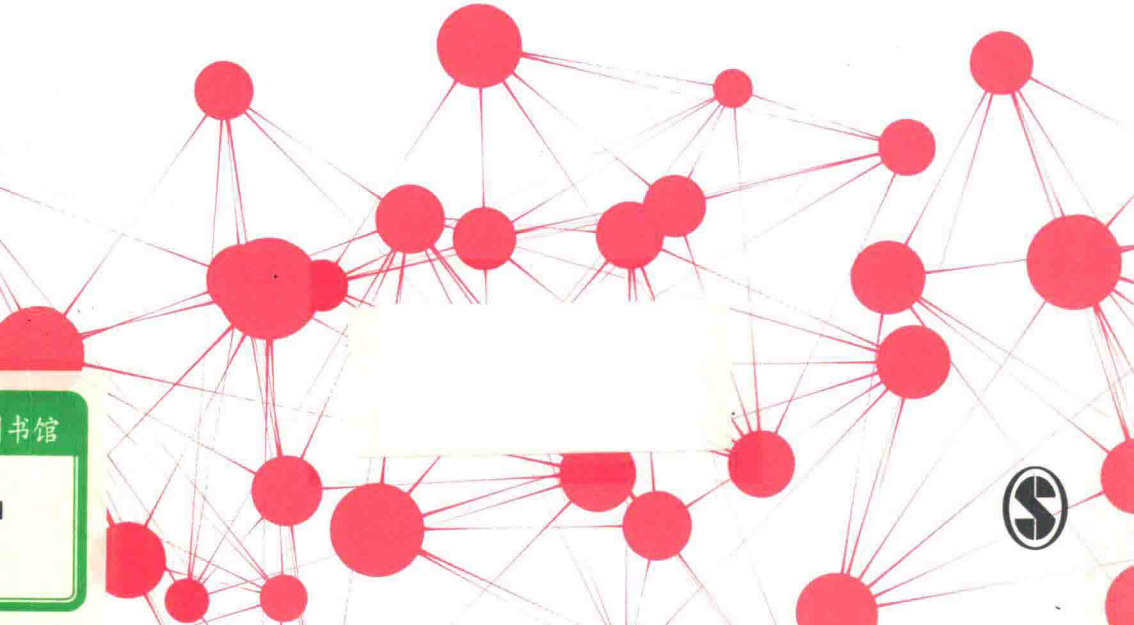

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2455 Teller Road
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B 1/I 1 Mohan Cooperative Industrial Area
Mathura Road
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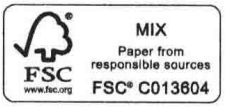
SAGE Publications Asia-Pacific Pte Ltd
3 Church Street
#10-04 Samsung Hub
Singapore 049483

First published 2015

Editor: Chris Rojek
Assistant editor: Gemma Shields
Production editor: Katherine Haw
Copyeditor: Kate Campbell
Marketing manager: Michael Ainsley
Cover design: Lisa Harper-Wells
Typeset by: C&M Digitals (P) Ltd, Chennai, India
Printed and bound by CPI Group (UK) Ltd, Croydon, CR0 4YY



Library of Congress Control Number: 2015935668

British Library Cataloguing in Publication data

A catalogue record for this book is available from the British Library

ISBN 978-1-4462-6776-9
ISBN 978-1-4462-6777-6 (pbk)

SOCIAL NETWORK ANALYSIS for EGO-NETS

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ACKNOWLEDGEMENTS

The authors would like to thank Steve Borgatti and Analytic Technologies for permission to use screenshots from UCINET; Bernie Hogan for permission to use screenshots from NameGenWeb; and Marc Smith for permission to use screenshots from NodeXL. They would also like to thank Routledge for permission to reproduce Figures 4.2 (p. 87), 4.3 (p. 88) and 4.7 (p. 91) from Elisa Bellotti's (2014) *Qualitative Networks: Mixed Methods in Sociological Research* (London, Routledge).

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INTRODUCTION

Learning Outcomes

By the end of this chapter you will:

1. Know how 'network' is defined in social network analysis.
2. Be familiar with three different approaches to social network analysis: ego-net analysis, whole network analysis and two-mode analysis.
3. Know what is distinctive about ego-net analysis.
4. Understand the pros and cons of ego-net analysis, relative to whole network analysis, and where it is most appropriate to use each approach.
5. Understand some of the ways in which network data are stored and represented for purposes of network analysis, and also certain fundamental concepts and measures used by network analysts.
6. Be familiar with the basic plan for the book as a whole.

Introduction

In this book we offer a comprehensive introduction to one of the most widely used forms of social network analysis (SNA): actor-centred or 'ego-net' analysis. An ego-net is the network which forms around a particular social actor, be that a human actor or a corporate actor, such as an economic firm or national government. In theory it involves all other actors (alters) with whom an ego enjoys a specific type or types of tie (e.g. emotional closeness, information sharing, economic exchange, etc.) and all relations

(of the same type or types) between those alters. Useful and important work can be conducted without information on ties between alters, however, and this aspect of the definition of an ego-net is therefore sometimes relaxed: an ego-net is then simply a list of alters with whom a target individual (ego) enjoys a particular type of relation.

Thus defined, ego-nets can be visualised, as in Figure 1.1, using coloured shapes ('vertices') to represent an ego and her alters (the nodes of the network) and connecting lines ('edges' or 'arcs') to represent ties between them. The 'ego' is coloured black in Figure 1.1 to distinguish her from her (grey) alters.

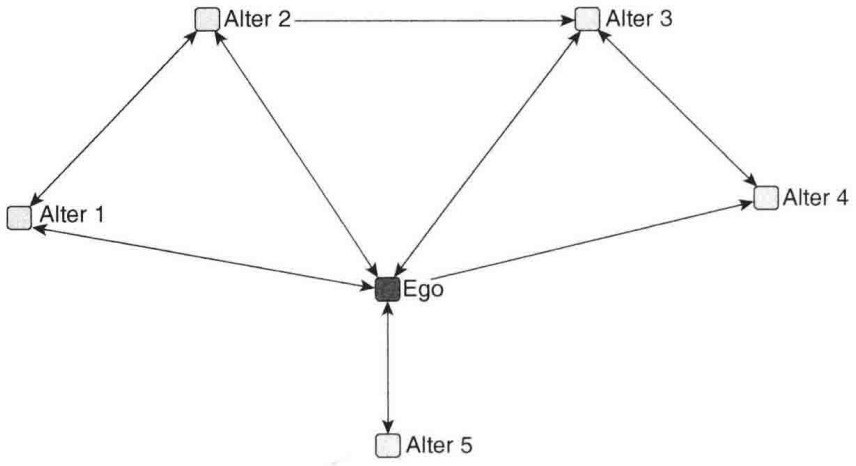

Figure 1.1 Visualising an ego-net

Ego-net analysis is one of several approaches to SNA. Like each of the others and like any other research method, it has strengths and weaknesses and is more appropriate in some circumstances than others. Our decision to focus the book exclusively upon ego-net analysis is not an expression of preference on our part or an argument in favour of it over other forms. We have all used a variety of forms of SNA in the course of our work. Our decision to focus upon ego-net analysis here is based upon the observation that it tends to receive less coverage than other approaches in general texts on SNA, when we, as teachers of the range of SNA methods, find that many newcomers to the approach either wish to use an ego-net approach or probably should use it, given the nature of their research problem, and when a large number of papers published on networks, including many influential papers, use this approach. In short, we have written this book because there is no other book-length introduction to ego-net analysis and there should be.

Ego-net analysis is best understood in the context of a wider appreciation of SNA and of the concept and importance of social networks more

generally. We therefore begin this chapter with a brief review of the field and of the two key alternatives to ego-net analysis within SNA: whole network analysis and two-mode analysis. This will allow us to draw out the distinctiveness of ego-net analysis and its strengths and weaknesses, relative to the other approaches. Furthermore, it will allow us to explain when and where ego-net analysis is more (and less) appropriate as an approach compared to the other approaches. The chapter ends with a brief discussion of the plan for the rest of the book.

Networks and Network Analysis

Connection is a constitutive fact of social life. A social world comprises not only a plurality of social actors, both human and corporate (e.g. firms or governments), but also interaction and enduring ties between those actors. Actors influence one another and exchange resources, becoming interdependent. They cooperate, compete, conflict, support and seduce one another. And these interactions and ties make a difference. For example, where ties cluster, generating a dense nexus of mutual influence, we often find greater homogeneity in attitudes, preferences and practices (Coleman 1988). To give another example, pathways of ties through networks provide channels for the diffusion of culture, resources, information and often viruses too. Finally, where specific patterns of ties give rise to trust and norms of cooperation ('social capital') this can facilitate forms of action, both individual and collective, that would not be possible in the absence of that particular configuration of ties – although this is usually at the cost of certain constraints (Coleman 1990). Networks are social structures which, as Durkheim (1964) said of social structures more generally, afford both opportunities and constraints for those entangled within them.

Some of the effects just mentioned can be generalised across a network. Everybody within the network is affected to a similar degree. Some apply to certain sub-groups within a network more than others, however, and some may apply specifically to particular actors, on account of the position they occupy within the network. This might be a matter of who they know, to invoke everyday wisdom, or, more generally, of the types of people they know. However, it may be a matter of network structure; where they fit within a pattern of relations: for example, which parts of a network they uniquely bridge (Burt 1992, 2005) or the pattern of connection in their immediate network neighbourhood.

These observations raise important methodological questions. How do we capture and analyse relational phenomena? With a certain amount of tweaking, which we discuss in Chapter Three, many of the standard methods of data gathering within social science can be used to generate relational,

network data. Nodes and their ties must be systematically surveyed but we can do that with a questionnaire, a structured or semi-structured interview, through direct observation (participant or non-participant), by trawling archives and texts, and perhaps by other means too. Furthermore, in the 'information age' and more especially the age of Web 2.0, a great deal of relational data is routinely generated in the course of everyday life, prompting some to ask if social scientists should not be taking more advantage of these sources too (Savage and Burrows 2007). Of course many social scientists are now taking advantage of them.

What we do with relational data when we have them, how we store and analyse them, poses more problems for conventional social scientific approaches, however. Relational data differ from the data usually analysed in social science and require dedicated techniques for their storage, representation and analysis. This is where SNA comes in. SNA is the collective label for a set of interconnected concepts, theories and techniques, developed for the most part within a relatively cohesive, interdisciplinary research 'network', devoted to the gathering and analysis of relational data (for a comprehensive introduction see Borgatti et al. 2013, Scott 2000 or Wasserman and Faust 1994).

SNA has a long history, stretching back to the 1930s (see Freeman 2006, Scott 2000) and its development has involved seminal contributions from sociologists, anthropologists, social psychologists, business analysts and increasingly also political scientists and economists. The distinctiveness of the approach owes at least as much to a wider interdisciplinary reach, into a branch of mathematics known as graph theory, however, and to collaboration between social scientists, mathematicians and increasingly also statisticians. It is not an exclusively quantitative approach and in this book we will stress the gains to be made from adopting a mixed method, qualitative and quantitative, approach to it (see also Bellotti 2014, Crossley 2010, Edwards 2010, Edwards and Crossley 2009). However, it is the interplay between social science and graph theory, in large part, which facilitates relational analysis and marks SNA out as a distinct research methodology.

What Are Networks?

All networks comprise two essential elements:

- A set of nodes.
- A set or sets of ties.

Optionally, they may also include:

- A set of node attributes.

Nodes

What counts as a node will vary between research projects and is at the discretion of the researcher. Anything might be defined as a node for purposes of SNA if it is meaningful to define it thus in the context of a particular study; that is, if a researcher has good reasons to want to regard it as a node, and if it is capable of the type of tie of interest to the researcher. Nodes might be: human individuals, chimpanzees, organisations, cities, nation-states, etc. Network analysis is a formal analytic approach, focused upon patterns of connection. It can be applied to any type of connection between any type of object. However, most analytic routines and algorithms assume that all nodes are, in principle, equally capable of engaging in the type of connection under consideration and this is therefore a constraint upon node choice. Each of the nodes in a friendship network must be capable of forming a friendship with any and every other, for example, at least in principle.

This doesn't mean that every node will be a friend with every other. That wouldn't be a very interesting network to analyse! Nor does it preclude the possibility that certain conditions might make friendship between some nodes more likely than others. Indeed, one of the questions we might be interested in is whether certain properties, either of the network or the nodes (e.g. beliefs or identities), affect the likelihood of connection between them. Such patterns and properties are only of interest, however, where we believe that, in principle, any node could form a tie (e.g. a friendship) with any other. It may be interesting if we find that members of one ethnic group less often form business ties with members of another ethnic group, for example, or if one ethnic group is found to be marginal in the network of a particular business community but only because we believe that, in principle, any member of the node set could form a tie with any of the others.

The relative absence of constraints upon node choice imposed by the theories and procedures of SNA does not mean that anything goes with regard to node selection. To reiterate our above point, nodes and node sets must be defined and selected carefully, with reference to the ideas and theories driving a particular research project. As in statistics, a network analysis is only as good as the data upon which it is based and it is the responsibility of the researcher to ensure that their data are meaningful and of a high quality. SNA packages will generate impressive visualisations and numerical arrays out of any old rubbish but it will still be rubbish. 'Garbage in' leads to 'garbage out' (the GIGO principle) and we must be careful to ensure that the nodes/node set that we select for analysis will allow us to answer the scientific questions that we have set for ourselves.

The question of which nodes to focus upon for a social network analysis is often a matter of where to draw the boundaries around a node set. Some networks are already bounded for us. If we are interested in friendship