Special issue on ‘Network Analysis’ Preface by the Guest Editors

Anuška Ferligoj · Vladimir Batagelj

Published online: 9 April 2011
© Springer-Verlag 2011

Network analysis has attracted considerable interest from the social, behavioral and other science communities in recent decades. This interest can be attributed to the importance and need to analyze (e.g., social) *relationships* among units, to detect any underlying structural patterns, and to infer implications of these relationships. Wasserman and Faust (1994) pointed out that the network perspective allows new leverage for answering standard social and behavioral science research questions by giving precise formal definitions to aspects of the political, economic, or social environment. In the context of social network analysis, ‘environment’ is expressed by patterns or regularities in relationships among interacting units.

While the origins of social network analysis can be found in sociometry (Moreno 1934), the social psychology of groups, and various sociological and social anthropological studies of factories and communities, in the last decade the development of network analysis was also influenced by statistical approaches from physics (e.g., scale-free networks and the power law as well as mean field theory) and by applications in the context of the internet, e-commerce, and Web 2.0. Already in 1978 the *International Network for Social Network Analysis* (INSNA) was formed in order to foster exchange of information and mutual intellectual support. It publishes the newsletter *Connections* and organizes the International Sunbelt Conference each year.

In this context a *Workshop on Social Network Analysis: Models and Methods for Relational Data* (ARS’09) was held at the University of Salerno (Italy) on 13–14 July 2009 and presented scientific results and recent developments in various areas

A. Ferligoj (✉)

Faculty of Social Sciences, University of Ljubljana, Kardeljeva pl.5, 1000 Ljubljana, Slovenia
e-mail: anuska.ferligoj@fdv.uni-lj.si

V. Batagelj

Department of Mathematics, University of Ljubljana, FMF, Jadranska 19, 1000 Ljubljana, Slovenia
e-mail: vladimir.batagelj@fmf.uni-lj.si

of network analysis: visualization of networks, dynamic networks, large networks, blockmodeling, collaboration networks, networks in politics and organization, new methodologies for relational data, statistics in network analysis, as well as networks in business and economics. Given the obvious relevance of network analysis methods, the conference organizers planned, jointly with the Editors of the journal *Advances in Data Analysis and Classification* (ADAC), a Special Issue of ADAC on topics related to network analysis. A call for papers was circulated among the members of various data analysis societies and of the workshop that included, in particular, the following topics:

- Methodological innovations in the fields of network analysis (e.g., blockmodeling, dynamic networks, large networks).
- The development of computational and visualization tools that efficiently implement methods and models for network analysis.
- Innovative applications of network analysis in specific domains such as sociology, communication sciences, political science, psychology, bioinformatics, business, finance, signal processing, data mining, etc.

All submitted papers had to undergo the usual peer-review process with at least two reviews for each manuscript. Finally five of them were accepted and are published in the present Special Issue.

The paper on 'Network ensemble clustering using latent roles', written by *Ulrik Brandes, Jürgen Lerner, and Uwe Nagel*, presents a method for graph classification based on the assumption that members of the same cluster have a similar role structure. Given a network ensemble (a collection of attributed graphs with some substantive commonality), vertices are first classified based on attribute similarity. Projection of each graph onto the resulting vertex partition yields feature vectors of equal dimension, irrespective of the original graph sizes. These were clustered using an appropriate clustering method.

In their paper 'On the use of auxiliary information in social network analysis' *Giuseppe Giordano and Maria P. Vitale* consider the problem of exploring the effect of external information on the formation of ties in a network of interrelated actors. They propose a strategy that decomposes the original two-mode affiliation matrix of the network by linear combinations of data vectors that represent the external information by a suitable matrix of coefficients. This permits to obtain specific relational data matrices that include effects of external information. The derived adjacency matrices can then be analyzed from a network analysis perspective. In particular, the authors look for clusters of structurally equivalent actors obtained by clustering methods.

The first part of the paper 'Web page importance ranking' by *Wolfgang Gaul* discusses the currently known techniques for page importance ranking in web analysis. In the second part he proposes an approach that uses a set of interesting Web pages and their m-clicks-ahead neighborhoods to provide recommendations for additional important Web information within a specific situation. Applications of the new algorithm show that approaches that use the underlying Web link structure could be enriched by considerations according to how the analysis of additional data and the use of suited support tools can be incorporated.

The next paper, written by *Vladimir Batagelj* and *Matjaž Zaveršnik* and with the title 'Fast algorithms for determining (generalized) core groups in social networks' proposes first an efficient algorithm for determining the classical cores decomposition of a given network. The second part of the paper considers the question whether the approach used for the core decomposition can be extended to other, generalized core concepts that are implied by suitable vertex property functions. It is shown that for local monotone vertex property functions the corresponding generalized cores can be efficiently determined along the same lines as in the classical case. The proposed algorithms are illustrated by the analysis of a collaboration network in the field of computational geometry.

The final paper is written by *Joshua A. Lospinoso*, *Michael Schweinberger*, *Tom A.B. Snijders*, and *Ruth M. Ripley* and deals with 'Assessing and accounting for time heterogeneity in stochastic actor oriented models'. The authors explore time heterogeneity in stochastic actor oriented models (SAOMs) and insofar study the evolution of networks. SAOMs provide a flexible framework for network dynamics which allow researchers to test selection, influence, behavioral, and structural properties in network data over time. The authors show how the forward-selecting, score type tests can be employed in order to quickly assess heterogeneity at almost no additional computational cost, thereby using one step estimates to assess the magnitude of the heterogeneity. Simulation studies are conducted to support the validity of this approach.

We are grateful to the Editors of ADAC, and in particular to Professor Hans-Hermann Bock, for giving us the opportunity to produce this Special Issue. Professor Bock's encouragement and help have been of great importance. We would like to thank also many distinguished scholars who reviewed papers submitted for this Special Issue.

Special thanks goes to the organizers of the very successful workshop ARS'09 at the University of Salerno, especially to Professor Maria Rosaria d'Esposito and Dr. Maria Prosperina Vitale. We look forward to meeting researchers in social network analysis at the next ARS'11 in Naples.

References

- Moreno JL (1934) Who Shall Survive. Nervous and Mental Disease Publishing, Washington
Wasserman S, Faust K (1994) Social network analysis: methods and applications. Cambridge University Press, Cambridge