Review of 'Social and Economic Networks'

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This is a review of the following book:

Social and Economic Networks
Matthew O. Jackson
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1. INTRODUCTION

Social and economics networks have not only attracted substantial research but have also been the subject of popular books [Gladwell 2002; Barabasi 2003]. Networks are ubiquitous with the presence of different kinds of social, economic and information networks around us. The internet, a major source of source of commerce and information is one of the most prominent examples of a complex network. Complex networks have been examined by physicists, sociologists, economists, mathematicians and computer scientists with different perspectives. Social networks (which were initially researched by sociologists) have been given great importance in economics [Goyal 2007; Slikker and van den Nouweland 2001; Demange and Wooders 2005]. Moreover, network analysis [Wasserman et al. 1994] is attracting foundational research by computer scientists [Brandes and Erlebach 2005; Kleinberg 1999]. Diffusion of information, social influence, trust, communication and cooperation between agents are heavily researched topics in e-commerce and multiagent systems. All these topics are well covered in *Social and Economic Networks*. Jackson has already written some useful surveys on social and economic networks (see for instance [Jackson 2003; 2005]). This book is an ambitious effort to combine various perspectives in a single book.

2. CONTENTS

The book is composed of four main parts and a total of thirteen chapters. Part I contains chapters 1, 2 and 3 which cover the fundamentals of network analysis. Chapter 1 provides examples of social networks to motivate the study of social networks. Chapter 2 is a basic introduction to graph theory and linear algebra

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concepts used in the book. Chapter 3 covers various aspects of network structures such as diameter, small worlds, clustering, degree distributions, correlations, homophily (tendency to form links with similar people), strength of weak ties (the idea that acquaintances enable reaching populations that are not accessible through close friends), structural holes (disconnect between two people with complementary resources), social capital and diffusion.

Part II surveys random graph models (Chapter 4), growing random networks (Chapter 5) and strategic network formation (Chapter 6). It elaborates on different models of networks. Chapter 4 is a primer on standard random graph models of networks. Compared to Chapter 4, which covers static random networks, Chapter 5 considers growing random networks. Chapter 6 takes into account strategic network formation and concerns stability and efficiency in network formation.

Part III covers implications of network structure on diffusion (Chapter 7), learning (Chapter 8), behavior in games on networks (Chapter 9) and markets (Chapter 10). Chapter 7 considers diffusion in networks which is the basis of modeling epidemics, word of mouth marketing and other phenomena. The use of percolation theory to model diffusion is well explained. In Chapter 8, models for learning, social influence, opinion leaders and consensus are considered. Chapter 9 highlights the use of non-cooperative game theory to model behavior on networks. It focuses on different variations of graphical and network games. The chapter is self contained with an appendix which is an overview of non-cooperative game theory. Chapter 10 explores the role of networks in markets. Different models of networked markets are outlined.

The final part IV is on the methods, tools and empirical analyses of networks. It includes game theoretic models in network formation (Chapter 11), allocations on networks (Chapter 12) and observing and measuring social interaction (Chapter 13). Chapter 11 elaborates on the use of stability and equilibrium to model network formation. The chapter also considers stochastic strategic models of network formation. Chapter 12 examines the use of cooperative game theory in resource allocation and communication in networks. Chapter 13 highlights important factors to take into account during empirical analysis of social networks.

3. OPINION

The author states in the preface that the 'book provides an overview and synthesis of models and techniques for analyzing social and economic networks'. The author has been successful in this aim of providing a comprehensive overview of a vast subject. Considering that the book covers material from so many fields, it is surprisingly self-contained. For example, required concepts from basic graph theory, random graph theory, non-cooperative game theory, cooperative game theory and percolation theory are summarized in a clear and succinct way. Another important reference on complex networks is *The Structure and Dynamics of Networks* [Newman et al. 2006] which has also been published by the Princeton University Press. However, it is more focused on dynamics of networks and does not consider game theoretic aspects of complex networks.

The bibliography of *Social and Economic Networks* is encyclopedic and provides comprehensive coverage of important papers and books. There are almost 700

references. This provides a reference point for the reader to explore sub-topics on social networks in greater depth. Each chapter includes exercises. The questions in the exercises illuminate important points which the author some times leaves out in the chapter.

Although the book focuses more on different models for social and economics networks, it implicitly raises many algorithmic questions which computer scientists may want to investigate. The future research agenda in complex networks has also been discussed elsewhere [Mitzenmacher 2006].

The book is suitable both as a reference and a textbook for a postgraduate or advanced undergraduate course in economics, mathematics, physics, computer science, sociology and management studies. The only problem I foresee is that librarians will be scratching their heads and wondering which subject category the book should be placed in.

REFERENCES

Barabasi, A.-L. 2003. *Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life*. Plume Books.

Brandes, U. and Erlebach, T. 2005. *Network Analysis: Methodological Foundations*. Springer.

Demange, G. and Wooders, M. H. 2005. *Group Formation in Economics: Networks, Clubs, and Coalitions*. Cambridge University Press.

Gladwell, M. 2002. *The Tipping Point: How Little Things Can Make a Big Difference*. Abacus.

Goyal, S. 2007. *Connections: An Introduction to the Economics of Networks*. Princeton University Press.

Jackson, M. O. 2003. A survey of models of network formation: stability and efficiency. In *In Group Formation in Economics: Networks, Clubs and Coalitions*. Cambridge University Press.

Jackson, M. O. 2005. The economics of social networks. Working Papers 1237, California Institute of Technology, Division of the Humanities and Social Sciences. Aug.

Kleinberg, J. M. 1999. Authoritative sources in a hyperlinked environment. *J. ACM 46,* 5, 604–632.

Mitzenmacher, M. 2006. Editorial: The future of power law research. *Internet Mathematics 2*, 525–534.

Newman, M. E. J., Barabási, A. L., and Watts, D. J., Eds. 2006. *The Structure and Dynamics of Networks*. Princeton University Press.

Slikker, M. and van den Nouweland, A. 2001. *Social and Economic Networks in Cooperative Game Theory*. Springer.

Wasserman, S., Faust, K., and Iacobucci, D. 1994. *Social Network Analysis : Methods and Applications (Structural Analysis in the Social Sciences)*. Cambridge University Press.