

Economic Aspects of Social Networks

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General Description

The primary aim of this course is to study the growing literatures surrounding the paradigm of social and economic networks. To this aim we will explore quite a range of models and questions that share some aspect of this broad topic as an important ingredient in the analysis. While we will predominantly approach these models from an economic perspective, at times the questions will be more “mechanical” or empirical in nature. We will touch on work that has originated in mathematics (properties of random graphs), statistical physics (growing random networks), and sociology (much of the empirical foundations, as well as models of persuasion and influence).

Such diversity of research reflects the fact that interesting questions come in many flavors. Let me offer a very coarse classification of such questions here, as it will help to organize the various units of the course. The reason, from our point of view, to study networks in the first place is that they govern many different kinds of interactions that have real consequences for individuals, firms, industries and markets. Additionally, in various settings, network structure influences behavior patterns, disease and information transmission, and learning dynamics. We can ask (broadly speaking), how do structural properties of relevant networks influence likely outcomes in these different settings?

Such questions can largely be asked for exogenously given patterns of relationships. A second class of questions concerns making predictions about which network architectures are most likely to form, as a function of the underlying incentives of the agents involved in the network. A recent literature has developed that seeks to answer these questions via game theoretic analysis of network formation, treating link creation and deletion as corresponding in some way to strategies of the players involved.

A third set of questions seeks to explain how different (macro) structural properties of networks relate to the (micro) details of the link formation process. Models of this kind typically view networks as being created (often over time) as an accumulation of individual links being formed according to some given process. As such, the models are often difficult to justify as outcomes of individual optimization. On the

other hand, some of them are able to capture an impressive array of empirical (stylized) facts concerning social networks across many settings.

Finally, and arguably most importantly, we will take the opportunity to think critically about the literature and, in particular, to look for open questions that should be answered.

Familiarity with basic linear algebra, probability theory, game theory and Markov chains will be useful.

I will lecture heavily from the textbook: Matthew O. Jackson, (2007) Social and Economic Networks, Princeton University Press.

Course Outline

Lecture 1

Title: Strategic Models of Network Formation

Textbook: Chapters 6 and 11

Topics:

- Pairwise stability, efficiency,
- Distance-based utilities
- Co-author model
- Dynamic selection
- Small worlds
- General tension between stability and efficiency
- Transfers
- Weighted graphs

Lecture 2

Title: Random Graphs and Networks I

Textbook: Chapter 4

Topics:

- Poisson random graphs
- Configuration model
- Connectedness
- Component sizes and giant components
- Diameter

Lecture 3

Title: Random Graphs and Networks II

Textbook: Chapter 5

Topics:

- Growing a Poisson network
- Mean-field theory
- Preferential attachment
- Hybrid models, degree distributions
- Small diameter, assortativity, clustering

Lecture 4

Title: Learning Across Networks; Strategic Interactions

Textbook: Chapter 8

Topics:

- Imitation and influence
- Convergence, consensus, and wisdom
- Bayesian models of learning
- Graphical games

Lecture 5

Title: Diffusion Processes

Textbook: Chapter 7

Topics:

- Basic diffusion
- Component size and immunity
- Attacks on networks
- SIR and SIS
- Strategic immunization decisions