

COURSE SCHEDULE

Lecture Session title.

1. Introduction

Overview of the course. Network science and economics. The viewpoints of the two perspectives.

2. Homophily and social networks

Social networks in their surrounding contexts. Homophily. Mechanisms underlying homophily. Affiliation. Spatial segregation.

3. Structural balance

Positive and negative relationships in networks. The concept of structural balance. Structures of balanced networks. Strong form, weak form and generalization of structural balance.

4. Networked markets

The labor market. Strong and weak ties. Boorman model. Calvò-Armengol and Jackson model.

5. The iGraph library.

Basic elements of R. The iGraph library as an open source computation tool.

6. Herding models and information cascades

Herding in biological and social systems. Kirman's model of herding. Bayesian description of an information cascade. Herding in financial markets. Information cascades in economic and financial systems.

7. Network effects and externalities

Multiple equilibria in the presence of positive externalities. Binary choices with externalities. Negative externalities. The "El Farol" Bar problem. The minority game. Emergence in the presence of network effects.

8. Diffusion on networks

The SI model in epidemiology. The SIR model. The SIRS model. Elements of percolation theory. The SIS model on a network. Models of epidemics on networks.

9. Viral marketing

The concept of viral marketing. Classical studies of diffusion of innovation. Case study: the viral marketing of a large online retailer.

10. Core-periphery structure in economic networks

The core-periphery structure. Maximum entropy for networks. The approach of minimum density. An application: The interbank market.

11. Exponential Random Graphs

The concept of exponential random graphs. The two star model. Stauss's model.

A time dependent model of network formation. Hysteresis in network dynamics.

12 Project presentation

Suggested reading

D. Easley and J. Kleinberg, *Networks, Crowds, and Markets: Reasoning about a highly connected world*, Cambridge University Press 2010.

M.O. Jackson, *Social and Economic Networks*, Princeton University Press 2008.