

14D009

6 ECTS

## Social and Economic Networks

### Overview and Objectives

Nowadays, networks are pervasive and influence many of our decisions and outcomes. We are going to explore models about how networks form (both from a random and incentive point of view), about how they influence individual and aggregate behavior (through, for example, social learning or peer effects, among other kind of influence factors) , or about how dynamic processes evolve (like the spread of viruses and information, social revolts,...). If the shape and structure of the network matters, and if individual positions in such network lead to different outcomes, we need to quantify and measure network and individual actor properties; therefore, we are also going to introduce network-based concepts and measures that show up in theoretical and empirical studies. The course provides a multifaceted approach to the study of networks, bringing together concepts, models, algorithms, and tools from graph theory, game theory, sociology, economics, computer science, and statistics, among other areas.

### Prerequisite reading

This course has no prerequisite readings.

### Course Outline

#### **Introduction. Networks, an Interdisciplinary View**

- Sociology and Social Network Analysis
- Statistical Physics, Biology, Computer Science
- Economics: Networks and Incentives

#### **Networks: Definitions, Concepts, Measurement, and Structure**

##### **Random graphs**

##### **Game Theory: Basic Concepts**

- Nash Equilibrium and Bayesian Equilibrium; Repeated Games; Mechanism Design

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### **Strategic Network Formation: Incentives and Matching**

### **Individual and Aggregate Behavior in Networks**

Dynamic Processes in Networks

### **Network Industries**

### **Required Activities**

Standard attendance to theory class and problem sets (that may include theory problems as well as practice with software and data sets).

### **Evaluation**

Problem sets and a project covering topics and methodologies (models, algorithms,...) from the course.

The final grade will be calculated as follows: 45% problem sets and 55% project.

### **Materials**

#### **Books:**

D. Easley and J. Kleinberg, Networks, Crowds, and Markets, Cambridge University Press 2010

Matthew Jackson, Social and Economic Networks, Princeton University Press 2010

Mark Newman, Networks: An Introduction, Oxford University Press 2010

S. Wasserman and K. Faust, Social Network Analysis: Methods and Applications, Cambridge University Press 1994

M. Osborne, An Introduction to Game Theory, Oxford University Press 2003

#### **Other:**

A list of other resources (data sets, papers,...) will be provided as the course progresses.