Social networks in socio-economic environments
Short syllabus
Bocconi University, Ph. D. Program, 2024-5
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The course will be divided into two parts. The first part, amounting to 75% of time of the course, will be based on my lectures and will cover some of the central topics of the field. A schematic description of these topis is included below. The lectures will be self-contained and supported by a corresponding set of slides, while three books mentioned below can be used to support and further extend the teaching material.

On the other hand, the second part will be devoted to stimulating/ supporting the student research. To this end, the students will prepare and present in class some preliminary ideas on economic research approached from a "network perspective". Rather than providing here in advance a concrete list of possible topics, I will develop that list in dure time that is tailored to the research interests of the students joining the course.

Topic structure of the lectures

1. Introduction
    a. A multidisciplinary field: examples from various areas
    b. Preliminaries: networks representations, and network measures
    c. Social networks in the real world:
    small worlds, scale-free networks, complex networks
    d. How networks form, why are they important?
    Closures, homophily, and peer effects

2. Four paradigmatic network phenomena
    a. Epidemics: endemic and ephemeral contagion
        i. A simple branching model
        ii. Contagion and prevalence
    b. Behavioral diffusion: fads, norms, and standards
        i. Diffusion and network density
        ii. Diffusion and cascade capacity
    c. Social learning and opinion formation: DeGroot Model
        i. Network-based characterization of long-run learning
        ii. Social learning and the "wisdom of crowds"
    d. Searching for information from the web: search engines
        i. Guiding search: hubs and authorities
        ii. Search algorithms: Google's PageRank
    e. Searching for others along the web: we live in a small world
        i. Searchabilty with supporting "geography"
        ii. Searchability with small-world networks

3. Networks, economies, and games

    a. Matching, networks and markets
        i. Perfect matching and the Matching Theorem
        ii. Matching, optimality, and market equilibrium

    b. Traffic in networks
        i. Equilibrium and congestion in traffic games
        ii. Braess Paradox and traffic inefficiencies

    c. Coordination games in networks
        i. Best-response learning in potential games
        ii. Equilibrium behavior and network architecture
        iii. Equilibrium selection
        iv. Common knowledge and coordination

The following two books can be used to support and expand on the topics discussed in the lectures:

- *Networks, Crowds, and Markets,* by David Easley and Jon Kleinberg, Cambridge University Press, 2010. (*Free-print copy available at* http://www.cs.cornell.edu/home/kleinber/)
- *Complex Social Networks,* by Fernando Vega-Redondo, Cambridge University Press, 2007.
- *Social and Economic Networks,* by Mathew Jackson, Princeton University Press, 2008.

d. Bargaining in networks
    i. Bargaining in laboratory experiments
    ii. Balanced and stable outcomes
    iii. Strategic bargaining
        - The bilateral case
        - The large-population case

e. Network formation
    i. Two canonical setups
        - The access model
        - The connections model
    ii. Signed networks
        - Structural balance
        - Strategic foundation

Support material:

- Self-contained slides
- book by Easley and Kleinberg, which is freely available through the authors' website at https://www.cs.cornell.edu/home/kleinber/networks-book/