université de BORDEAUX / Faculté d'économie, gestion et AES

SYLLABUS

Intitulé du cours	Social Networks Analysis and network economics
Numéro de l'UE	
Volume horaire (en heures maquettes)	18
Année d'étude et Semestre	2021
Objectifs et compétences développées	Our every day life is shaped by social and economic networks: the information we have, how we learn and form opinions, the diseases that hurt us, our job decisions, the prices we charge or pay and even how we make friends and enjoy life. Though it does not require strong prerequisites, this course provides advanced materials on some of the main themes in the theory of networks that will help us understand and deal will all those questions, and some more. Studying networks is fun and open minded as it lies at the cross roads of different fields of science. We will discuss models from economics, sociology, math, physics, statistics and computer science. Finally, we will use network data and learn how to manipulate and interpret those data.
Contenu et moyens pédagogiques	In the course, the students will learn and understand the following notions: 1 Introduction: the ubiquity of social networks Examples of social networks 2 Small worlds and random networks Basic graph notations The Milgram experiment Small worlds Poisson random networks 3 Degree distributions in networks Degree distributions Preferential attachment The configuration model The friendship paradox 4 Clustering, communities and homophily Clustering coefficients Detecting communities Small worlds À la Watts \& Strogatz Local search on networks à la Kleinberg Homophily on networks 5 Centrality and influence on social networks Network centrality indicators Bonacich centrality, Prestige centrality and the Page Rank

	5 Network data Meeting 1 Get started with R and package ``igraph'' (import datasets, create and start manipulating graphs). Meeting 2 Compute graph statistics and indicators. Meeting 3 Algoritmic detection of communities and sub-structures. Meeting 4 Create nice and meaningful graph representations. Meeting 5 Generate network structures and compute Monte Carlo simulations.
Pré-requis	This course builds on no specific mandatory previous course. However, some knowledge of economics, of maths, of data analysis, of statistics, and of programming with R and Python are welcomed.
Modalités d'évaluation	Students will be evaluated: \begin{itemize \item Individual evaluation on applied data work (40\% of total grade); \item Mini project: students may match in pairs to realize a research project with will bring three grades: Data treatments (20\%), Reasoning (20\%), Presentation (20\%). \end{itemize
Références bibliographiques	1 Matthew Jackson, 2019, The Human Network, Pantheon Books: New York. 2 Matthew Jackson, 2008, Social and Economic Networks, Princeton University Press : Princeton and Oxford. 3 David Easley and Jon Kleinberg, 2010, Networks, Crowds, and Markets: Reasoning about a Highly Connected World, Cambridge University Press : Cambridge, New York. https://www.cs.cornell.edu/home/kleinber/networks-book/networks-book.pdf 4 Mark E.J. Newmann, 2010, Networks, An Introduction, Oxford University Press: Oxford, New York. The easiest to read and most recent book is (1). You can easily buy it and read it on your own (starting before first class meeting would be great). The most important reference for this class is (2). (3) has some nice chapters and is also a great book. (4) is the best reference for a very complete introduction of the physics literature.

Mots Clefs	basic graph notations, Poisson random networks, preferential attachment in growing networks, Milgram experiment, clustering coefficient, small worlds à la Watts & Strogatz, network centrality notions (including Bonacich, Katz and Page Rank), degree distribution