

Networks, Crowds, and Markets
GREDEG March 2018
(Tentative)

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Course Description

Networks are everywhere. Global trade, supply chains, financial markets, the World Wide Web, professional and social communities are examples of interconnected systems that are important to the structure and function of the modern world. The pattern of connections in such systems can often be represented as a network, the components of the system being the nodes and the connections the links. Networks are a general yet powerful means of representing patterns of connections or interactions between parts of such systems. The first part of this course will introduce tools for the study of networks and show how common principles permeate the functioning of diverse networks and how the same issues related to robustness, fragility, and interlinkages arise in different types of networks. The second part of this course will use examples and applications of the network approach to reveal new and useful insights into trade, finance, business, and society.

Prerequisites

This course will use some game theory, statistics, econometrics, and analytical reasoning. The course will aim to be self-contained and develop concepts and tools from the ground up, but some (undergraduate-level) background in these areas is highly recommended.

Learning Objectives

At the end of this course students should be able to:

- Represent a wide variety of real world business environments, such as in trade, finance, and supply chains as networks.
- Examine the structure, function, robustness, and efficiency of such interconnected systems.
- Suggest improvements to the design of existing networks in business.
- Develop approaches to studying networks for research.

Readings

1. Social and Economic Networks, by Matthew O. Jackson, Princeton University Press, 2008. Specific chapters as referenced below and available online. (MJ).
2. Networks, Crowds, and Markets: Reasoning about a Highly Connected World, by David Easley and Jon Kleinberg, Cambridge University Press, 2010. Specific Chapters as referenced below and available online. (EK).
A complete pre-publication draft is available for free at <http://www.cs.cornell.edu/home/kleinber/networks-book/>
3. Lecture notes from Daron Acemoglu's course on Networks at MIT. Available at <http://economics.mit.edu/faculty/acemoglu/courses> (scroll down to the course on Networks)
4. Articles as referenced below. Additional articles may be added.

Videos and Software

UCINET, an off-the-shelf software program for network analysis can be downloaded and used for free for 90 days at <https://sites.google.com/site/ucinetsoftware/home>.

Gephi is free, available at <https://gephi.org/users/download/>

Pajek, available at <http://mrvar.fdv.uni-lj.si/pajek/>

Videos as hyperlinked below.

Coverage

The following is a list of topics the course will aim to cover:

1. **Introduction to economic, social, and communication networks.**
MJ, Chapter 1, <http://www.stanford.edu/~jacksonm/netbook.pdf>
EK, Chapter 1, <http://www.cs.cornell.edu/home/kleinber/networks-book/>
Lecture 1 slides from MIT at <http://economics.mit.edu/files/4619>
Videos
[A Social Contagion \(old, but gold\)](#)
[The spread of the ice-bucket challenge](#)
2. **Graph theory and social networks.**
MJ, Chapter 2, http://press.princeton.edu/chapters/s2_8767.pdf
EK, Chapter 2, <http://www.cs.cornell.edu/home/kleinber/networks-book/>
Lecture 2 slides from MIT at <http://economics.mit.edu/files/4620>

A.-L. Barabai and E. Bonabeau, Scale-Free Networks, Scientific American, May 2003, <http://barabasi.com/f/124.pdf>

Fun with your social data
<http://thenextweb.com/apps/2013/08/22/15-apps-and-resources-that-do-cool-things-with-your-social-data/>
<http://mashable.com/2009/08/21/gorgeous-facebook-visualizations/>
3. **Strong Ties, Weak Ties, and Small Worlds**
EK, Chapters 3, 20 <http://www.cs.cornell.edu/home/kleinber/networks-book/>

Duncan J. Watts and Steven H. Strogatz, Collective dynamics of 'small-world' networks, *Nature* 393, 440-442 (4 June 1998).

<http://www.nature.com/nature/journal/v393/n6684/abs/393440a0.html>

R. Albert and A.-L. Barabási, Statistical mechanics of complex networks, *Reviews of Modern Physics* 74, 47-97 (2002).

<https://arxiv.org/pdf/cond-mat/0106096.pdf>

Erdos Number Project, <http://www.oakland.edu/enp/>,

Small World Experiment,

http://en.wikipedia.org/wiki/Small-world_experiment

Watts, D. J., P.S. Dodds, and M.E.J. Newman, Identity and Search in Social Networks, *Science* 17 May 2002.

<https://www.sciencemag.org/content/296/5571/1302.full>

4. Network Effects and Power Laws

EK, Chapters 17, 18.

<http://www.cs.cornell.edu/home/kleinber/networks-book/>

[Power Users on Facebook](#)

5. Information Networks and the World Wide Web

EK, Chapters 13, 14.

<http://www.cs.cornell.edu/home/kleinber/networks-book/>

6. Diffusion and Contagion on Networks.

EK, Chapters 19, 21.

<http://www.cs.cornell.edu/home/kleinber/networks-book/>

AB, Chapters 5-7.

[The 2014 Ebola crisis network](#)

[Facebook Contagion](#)

7. Networks in Trade and Finance.

Kali, Raja and Javier Reyes (2007), "[The Architecture of Globalization: A Network Approach to International Economic Integration](#)," *Journal of International Business Studies*, vol. 38, pp. 595-620.

Raja Kali, Javier Reyes, Josh McGee & Stuart Shirrell, "[Growth Networks](#)," *Journal of Development Economics*. 101, March 2013.

Kali, Raja and Javier Reyes (2010), "[Financial Contagion on the International Trade Network](#)," *Economic Inquiry*, 48(4), October 2010.

Turkina, E., A. VanAssche & Raja Kali (2016), "[Structure and Evolution of Global Cluster Networks: Evidence from the Aerospace Industry](#)," *Journal of Economic Geography*. 16(6), November 2016.

Chaney, T. (2014), "[The Network Structure of International Trade](#)," *American Economic Review*, 104(11): 3600-34.

8. Other Applications
[The Beautiful Game](#)

[Netflix vs HBO](#)