Overview: Complex Networks in IT Economics

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Information technology alters the extent to which economic outcomes are affected by "local" structures, and may also change local structures that affect economic outcomes. This tutorial will introduce theory about the structure of complex networks, and describe how it can be applied to studying problems in which local structure is important.

Readings

There are 4 assigned readings:


Preparing for the session

(a) Start by reading through Newman’s survey of complex networks [1]. Focus on sections I-IV and VI (though you may find sections VII and VIII quite fascinating as well). We will begin the session with an introduction to some of the theory of complex networks.

(b) Some of this theory is used in [2] to study how local structure affects the adoption of a network good with local network effects. We will spend the next part of the session discussing its model development and key results. Read through the paper towards understanding how local structure matters in this scenario, and thinking about what characteristics of local structure would make the most economically interesting difference to the results.

(c) An interesting model of how local structure can affect incentives to innovate is developed in [3]. While the networks used to represent local structure in this paper are not ‘complex’, the model (or a closely related one) could be used to study sharing digital IP, collaborative filtering networks and local search. We’ll discuss the model briefly and make these connections during the session.
(d) After reading [2] and [3], you’ll have a clearer understanding of what I mean by associating local structure with economic outcomes, and can spend some time on the pre-session assignment (described below). We’ll conclude the session discussing your proposals.

(e) The model in [4] provides a neat economic justification for the structure of many widely studied social networks. While this is a paper about how local structure emerges, rather than how it affects outcomes, it is a useful read for two reasons. First, because IT can also change existing local structures, or create new ones, and modeling how local structure changes can be important in a dynamic model (we will discuss this briefly towards the end of the session). Second, because it connects what we will discuss to a larger (and rapidly growing) literature on network formation.

(f) Van Zandt (and coauthors) studies a specific kind of local structure and how it affects economic outcomes in his papers on information processing in hierarchies. Since there will be an independent tutorial devoted to this topic, we won’t discuss them during this session.

Pre-workshop assignment

Formulate a very short research proposal that:

1. Identifies a problem related to IT economics in which local structure is likely to be important.
2. Briefly summarizes a couple of key existing results that would emerge from (existing or new) models that do not take this structure into account.
3. Suggests one or more of the families of models of complex networks from [1] that would be most effective at modeling local structure for the problem.

Keep this to about half a typewritten page or less, and bring along a printout. We will recognize especially promising ones.

Related papers

This list will be expanded substantially before the session.

