Rationality and Randomness

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Abstract

Game theory provides a powerful framework to study strategic interactions among agents of a system. The assumption about the "rationality" of the agents is at the heart of classical solution concepts like Nash equilibria. However, in several scenarios those solution concepts often fall short of expectations when used to make predictions; some branches of game theory are thus trying to relax the rationality assumption. The *Logit* dynamics is a model for strategic interactions, inspired by statistical mechanics, that uses "randomness" to model the uncertainty about the rationality level of the agents.

In the first part of the talk I will sum up our research programme on the Logit dynamics for strategic games, in which we proposed to consider the unique stationary distribution of the induced ergodic Markov chain as the long-term solution concept for the game, we analyzed the mixing time of the chains for some classes of games, and we defined the concept of *metastable* probability distribution for Markov chains with exponential mixing time.

The usefulness of reasoning about "metastability" goes beyond the realm of game theory and Markov chains. In the second part of the talk, I will discuss a recent work where the analysis of the metastable phase of a simple dynamics allowed us to come up with an efficient fully-distributed algorithm for the community detection problem.