



NORTHWESTERN INSTITUTE
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NORTHWESTERN
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**Northwestern Institute on Complex Systems
invites you to its**

Weekly Seminar

Speaker: Dr. Sevan Ficici, Post Doctoral Fellow, Harvard University

Title: Evolutionary Dynamics and Equilibria in Finite Agent Populations

When: Wednesday, January 24, 2007

Where: Chambers Hall, 600 Foster Street, Lower Classroom Level

Time: 12:00 – 1:00

NICO Coffee Hour will follow for questions, networking, and collaboration

Abstract

Since its introduction, evolutionary game theory (EGT) [Maynard Smith 1982] has become a popular framework for modeling biological and economic systems because it obviates the need for fully rational agents. Instead, strategic behavior is evolved through a process of natural selection. The conventional EGT framework assumes an infinitely large population of pure-strategist agents. Each agent interacts with every other agent and accumulates payoff as it goes; agents then reproduce offspring in proportion to their cumulative payoffs to form the next generation of the population. Many games played under this framework lead the population to a dynamical point-attractor known as a polymorphic fitness equilibrium, where the population contains two or more of the game's pure strategies, and agents playing these pure strategies obtain identical cumulative payoffs.

An infinite population makes the selection dynamics deterministic; the population's expected behavior corresponds exactly with the population's actual behavior. Nevertheless, real-world populations are finite, and selection dynamics are actually stochastic. In this talk, we investigate how well the polymorphic fitness-equilibrium attractors obtained under infinite populations predict the behaviors of finite-population systems. Though the finite population will almost always be away from fitness equilibrium, due to stochastic selection, we may naively expect that the fitness equilibrium will predict the mean population state. In fact, this is almost always not the case. We show that this divergence in outcome occurs when the selection pressures that surround the fitness equilibrium are asymmetric. We also show that the mean population state of a finite population represents, instead, an equilibrium with respect to this asymmetry in selection pressure.

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