SOE 17: Evolutionary Game Theory (joint session SOE/DY)

Time: Thursday 15:00–15:30 Location: ZEU 260

SOE 17.1 Thu 15:00 ZEU 260

Bet hedging in populations evolving in fluctuating environments — Rubén Calvo[1] and •Tobias Galla[2] — [1]Instituto Carlos I de Física Téorica y Computaciona, and Departamento de Electromagnetismo y Física de la Materia, Facultad de Ciencias, Universidad de Granada, 18071 Granada, Spain — [2]Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (CSIC-UIB), Campus Universitat de les Illes Balears, E-07122 Palma de Mallorca, Spain

Bet-hedging strategies are strategies aimed at reducing risk in the face of uncertainty. For example, biological organisms face uncertain time-varying environmental conditions, such as dry years versus wet years. Similarly, future conditions in financial markets or other social systems are often unknown. Traditional bet-hedging theory shows that a reduction of the variance of an agent's payoff may increase their success even when their mean payoff is also reduced. Bet-hedging strategies are often built on maximum growth. Here instead, we ask how a mutant invading a resident wildtype population can maximise its chances of taking over the population (i.e., the fixation probability of the mutant). We consider a birth-death dynamics in fluctuating environments, and show that, depending on the distribution of payoffs across environmental states, a reduction in variance can either be beneficial or detrimental to the mutant. We establish conditions for either scenario to be realised, and show how this is related to the skewness of the payoff distribution.

SOE 17.2 Thu 15:15 ZEU 260

Hawk Dove Game on Networks with Continuous Populations — •Lennart Gevers[1,2], Tobias Wand[1,2], and Svetlana V. Gurevich[1,2] — [1]Institute for Theoretical Physics, University of Münster, Wilhelm-Klemm-Straße 9, D-48149 Münster, Germany — [2]Center for Nonlinear Science (CeNoS), University of Münster, Corrensstrasse 2, D-48149 Münster, Germany

Evolutionary game theory is a population-based approach to game theoretical scenarios by analyzing the evolution of populations resembling competing strategies.
We expand the classical model analysed by (1), which assumes that no spatial or social segregation of populations occurs, with a network-based approach to the hawk-dove game which models the ability of contestants to migrate between neighboring realizations of the game by adapting different migratory behaviors.
Our model reveals that competitive and cooperative populations can show preferred strategies on how to spatially organize on such territories.
Furthermore, we find that the resulting outcomes of the participating species diverge from the original model with increasing mobility of species.

(1) F. Stollmeier and J. Nagler, Phys. Rev. Lett. 120, 058101, 2018.