Advanced Game Theory 243B

Evolution & Learning in Games

Jean-Paul Carvalho

Spring 2019

Syllabus

Summary

The standard rational agent in economics has unrealistic endowments of knowledge and computational power. Equilibrium knowledge and common knowledge of rationality in games compound the problem. This course explores an approach to bounded rationality in which knowledge and computation are distributed. Learning about the environment and behavior takes place at the population level through dynamic processes including natural selection, imitation, reinforcement learning, Bayesian social learning, myopic best responses, and cultural transmission. This brings us to the literature on evolution and learning in games.

Textbooks

We will introduce and work with rigorous mathematical methods for studying evolution and learning in games. The following textbook is essential reading for mastery of the subject:

(Y) Young, H.P. *Individual Strategy and Social Structure*, 1998, Princeton University Press.

We will also draw on:

(S) Sandholm, W.H. *Population Games and Evolutionary Dynamics*, 2010, MIT Press.

A less advanced treatment is provided by:

(W) Weibull, J. *Evolutionary Game Theory*, 1995, MIT Press.

My lecture notes will draw on all three texts and many other sources.

Course Outline (indicative, subject to change):

1. The Rational Agent and Its Limitations
2. The Interactive Knowledge Problem
3. Social Learning
4. Evolution in Games (W: 3; Y: 1-2, 5; S: 1)
5. Learning Protocols (W: 3; S: 4-6)

6. Determinsitic Dynamics (W: 3; S: 4-6)
7. Evolutionary Stability (S: 8.3)
8. Local Stability (S: 8.4-8.6)
9. Cultural Transmission
10. Stochastic Dynamics (Y: 3-4; S: 10-12)
11. Stochastic Stability (Y: 3-4, 7; S: 10-12)
12. Emergence of Segregation (Y: 3.5)
13. Adaptive play (Y: 2.6, 4)
14. Bargaining Conventions (Y: 8-9)
15. Games Played on Networks (Y: 6)
16. Heterogeneous Agents (Y: 5)
17. Fast Convergence

Exams and Grading Policy

The final grade for the course will be determined as follows:

Class participation: 10%
Final Exam: 50%
Research proposal (five-page limit, due Friday week 10): 40%

Please note that there will be NO MAKE-UP FINAL EXAM.

Contact info

My office hours are by appointment. My e-mail address is jpcarv (at) uci.edu.