

**Seminar on Philosophy of Science:  
Evolutionary Game Theory**  
Carnegie Mellon University  
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Game theory is an analytical tool which has found a home in a number of different disciplines: economics, sociology, anthropology, political science, biology, and philosophy. Much of the first 50 years of game theory research worked with an intuitive notion of “rational” behavior which help to guide the development of so-called “solutions” to games. These solutions, it was supposed, were predictively accurate and to some extent normatively recommended.

In the late 1990s, questions began to arise about the foundations of these intuitive notions of rationality. To what extent were they required for the legitimacy of the predictions and normative recommendations of game theory? If people aren't rational, should we throw away game theory? Can some or all of it be saved? Etc.

These questions led to the development of two foundational programs in game theory. Evolutionary game theory is one of these two programs which attempts to develop solution concepts that apply to individuals who are not supremely rational in the way original supposed by early game theorists. This course is an exploration of this foundational program.

**Text:** Ross Cressman, *Evolutionary Dynamics and Extensive Form Games* MIT Press

**Requirements:** 7 problem sets

If you are so inclined, you may substitute a 15 page paper for 4 of the problem sets. The paper is due the Friday durring finals week.

# Outline

- I. Introductory game theory (lecture notes)
- II. Normal form
  - A. Differential equations and symmetric normal form (Cressman Chapter 2)
  - B. Differential equations and bimatrix normal form (Cressman Chapter 3)
  - C. Stochastic stability (Online reading)
  - D. Reinforcement learning (Online reading)
- III. Extensive form
  - A. Replicator dynamics and Asymmetric games (Cressman Chapter 4)
  - B. Replicator dynamics and extensive form games (Cressman Chapter 6)
  - C. Simultaneity games (Cressman Chapter 7)
  - D. Perfect information games (Cressman Chapter 8)
- IV. Applications
  - A. Signaling (Online reading)
  - B. Coordination problems (Online reading)
  - C. Bargaining (Online reading)