Abstract

Epistemic game theory (coming from the Greek word episteme: knowledge, understanding) is a relatively new branch of game theory that explores how participants of a game reason about their opponents’ choices before they make their final choice. It studies games from a decision-theoretic perspective and aims at disclosing the decision-theoretic assumptions underlying solution concepts of games. This branch of game theory has increasingly gained importance in solution theory, in particular in the equilibrium refinement program.

Standard game theory starts with a solution concept and examines its properties, e.g. uniqueness or stability. In the standard approach, it is usually taken for granted that the proposed solution concept embodies some ideas of rational behavior. However, these ideas of rationality remain vague and uncovered. Epistemic game theory addresses this deficiency and formalizes the decision-making of the players. The starting point of the standard analysis of games is the endpoint of the epistemic analysis. The primitives of the epistemic analysis are the strategic decision problems of the players and the endpoint is a decision-theoretic characterization of the solution concept. Such characterization result states conditions on the players’ decision making and belief about the opponents’ decision making and belief so that the proposed solutions could be interpreted as a result of rational decisions.

Investigating the decision-theoretic basis of existing solution concepts is one part of work in epistemic game theory. The other part is to uncover new solution concepts that are based on specific reasoning and decision models (e.g. reasoning in different forms of logic or departures from the expected utility model).

In these three two-hour lectures, we provide an introduction to the epistemic approach to games and point to issues of ongoing research. We discuss its methodology and the basic concepts. As applications, the epistemic characterizations of prominent solution concepts like Nash equilibrium, iterated removal of dominated strategies and backward induction are presented.

This course is an introductory course in epistemic game theory and is designed for graduate students. It requires only basic knowledge in decision theory and standard game theory. No prior knowledge of epistemic game theory is presupposed.
Short Lectures in Epistemic Game Theory

Tentative outline of the course:

- The methodology of epistemic game theory
- Modelling strategic uncertainty: Harsanyi’s type space model and belief hierarchies
- Rational choices in games
- Knowledge vs. belief
  Application: Epistemic characterization of the Nash equilibrium concept
- The nth-order belief in rationality and common belief in rationality
  Application: Epistemic characterization of iterated removal of strictly dominated strategies
- Conditional beliefs and belief revision
  Application: Epistemic characterization of backward induction

Introductory literature:

- Textbook

- Surveys
  Battigalli, Pierpaolo and Bonanno, Giacomo (1999), Recent results on belief, knowledge and the epistemic foundations of game theory, Research in Economics, 53 (2), 149-225.

- Work on history