

Introduction to game theory

Game theory is now an integral part of business and politics, showing how decisively it has shaped modern notions of strategy. Consultants use it for projects; managers swot up on it to make smarter decisions.

The crucial aim of mathematical game theory is to characterise and establish rational decisions for conflict and cooperation situations. The problem with it is that none of the actors know the plans of the other “players” or how they will make the appropriate decisions. This makes it unclear for each player to know how their own specific decisions will impact on the plan of action (strategy). However, you can think about the situation from the perspective of the other players to build an expectation of what they are going to do.

Game theory therefore makes it possible to illustrate social conflict situations, which are called “games” in game theory, and solve them mathematically on the basis of probabilities. It is assumed that all participants behave “rationally”. Then you can assign a value and a probability to each decision option, which ultimately allows a computational solution in terms of “benefit or profit optimisation”.

However, people are not always strictly rational because seemingly “irrational” results also play a big role for them, e.g. gain in prestige, loss of face, traditions, preference for certain colours, etc. However, these “irrational” goals can also be measured with useful values so that “restricted rational behaviour” can result in computational results, even with these kinds of models.

Social conflict situations and decision situations constantly occur in every business, e.g.:

- The two owners of a company no longer get on and want to separate. Now a decision has to be made about who is leaving the company and how much the amount of compensation should be.
- An eBay seller thinks about the minimum price he should charge in an auction.
- A private creditor must decide whether he wants to waive part of his claims from an insolvent company.
- An employee at a company, looking for a promotion, considers whether he works better with or without his colleagues.

Etc.

Game theory has now developed into a universal theory. Whether in sociology when looking at human relationships, sport, economics, or politics, experts everywhere base their decisions on game theory observations.

The Nobel Prize in Economics has been awarded eight times for work relating to game theory, which illustrates the great importance of game theory in modern economic theory: John

Forbes Nash Jr., John Harsanyi and Reinhard Selten in 1994, William Vickrey in 1996, Robert Aumann und Thomas Schelling in 2005 and Alvin Roth and Lloyd S. Shapley in 2012. Herbert A. Simon and Daniel Kahneman 2002 received the Nobel Prize in 1978 and 2002 respectively for their research on bounded rationality. Leonid Hurwicz, Eric S. Maskin and Roger B. Myerson received the prize in 2007 for their research on mechanism design theory, which is closely related to game theory questions.

Exercises:

1. Describe the game theory solution to the “guard” example in the “game theory” video and substantiate it.

www.mediatheque.lindau-nobel.org/videos/34653/2015-mini-lecture-game-theory-en
2. You should give a short lecture in front of the class about the basic ideas and inventors of game theory. Here you should explain the Nash equilibrium using the example of the prisoner’s dilemma. You can also look on the Internet if you have any unanswered questions.
3. What chance do players in the real world have of breaking the prisoner’s dilemma? For example, think about three supermarket chains that are constantly undercutting each other’s prices.