Equilibrium Concepts in Game Theory

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Abstract: Game theory is the mathematical modeling of strategic interactions between rational decision makers. It is used to analyze scenarios where the outcome of a participant’s choice of action depends on the actions of other participants. The most pressing question in game theory is how to accurately characterize intelligent decision making in games. For a given game, it is not immediately obvious which actions each participant should choose because of the interdependence of actions. One objective of game theory is to produce a mathematical characterization of outcomes which are the result of reasonable behavior by the players. Such a characterization is referred to as an equilibrium.

Nash equilibrium is the most fundamental equilibrium concept. In this equilibrium, no player, while completely aware of the actions of their opponents, has any incentive to unilaterally change their action. However, in many ways a Nash equilibrium is an unsatisfactory equilibrium concept as it allows for behavior which is intuitively unreasonable, such as non-credible threats.

In this talk I will develop the basic structure of games in normal and in extensive form, along with the definition of Nash equilibrium in these games. Further equilibrium concepts will be presented, such as subgame perfect equilibrium and sequential equilibrium, along with an explanation of why they may be more favorable than Nash. Lastly, I will discuss the complications of attempting to extend the definition of sequential equilibrium to games where players can choose from an infinite set actions.

(Jeremy Kettering has studied under the supervision of Seyfi Turkelli.)