

## INTRODUCTION TO GAME THEORY

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Game theory is a branch of mathematics and economics that studies strategic decision-making between rational individuals or groups. It provides a framework for analyzing and understanding the behavior of individuals in competitive situations where the outcome of one's decision depends on the actions of others. The study of game theory has applications in a wide range of fields, including economics, political science, psychology, and biology. At the heart of game theory is the concept of a «game». In this context, a game refers to any situation in which individuals or groups interact with each other and have a choice to make. Each player in the game has a set of possible actions they can take, and the outcome of the game depends on the combination of actions taken by all the players. Game theory is often used to study situations where there is a conflict of interest between players, and each player is trying to maximize their own payoff. These types of games are called «non-cooperative» games, because the players are not able to coordinate their actions with each other. In the Prisoner's Dilemma, two suspects are arrested for a crime and are being held separately. They are both given the option to either confess or remain silent. If both confess, they both receive a harsh sentence. If both remain silent, they both receive a lighter sentence. However, if one confesses and the other remains silent, the one who confesses goes free, while the one who remained silent receives the harshest sentence. This game demonstrates the tension between cooperation and self-interest. Game theory is also used to study situations where players can coordinate their actions with each other. These types of games are called «cooperative» games, because the players can work together to achieve a common goal. Examples of cooperative games include «Prisoner's Dilemma with Communication» and «Stag Hunt». In the Prisoner's Dilemma with Communication, the two suspects are allowed to communicate with each other before making their decision. This allows them to coordinate their actions and choose to both remain silent, resulting in a lighter sentence for both. In the Stag Hunt, two hunters are trying to catch either a stag or a hare. If they both hunt for the stag, they will have a large payoff. However, if one hunter hunts for the hare while the other hunts for the stag, the hunter who hunted for the hare will have a smaller payoff. This game demonstrates the importance of trust and coordination. Game theory has important applications in many areas of life, including economics, politics, and biology. In economics, game theory is used to study the behavior of firms in competitive markets and the interactions between buyers and sellers. In politics, game theory is used to study voting behavior and the strategies used by political candidates.

In conclusion, game theory is a powerful tool for analyzing strategic decision-making in a wide range of situations. It provides a framework for understanding the behavior of individuals in competitive situations and can be used to study the behavior of firms, political candidates, and animals. By studying game theory, we can gain insights into the behavior of others and make better decisions in our own lives.