Game Theory

The IEMT model is developed around the model of Zero-Sum Game Theory, particularly with regard to the Five Patterns of Chronicity. Game theory[1)] is a mathematical framework for modelling and analysing situations in which decision-makers interact to maximise their own interests. It is used to study decision-making in various fields, such as economics, political science, psychology, and biology. The theory considers the strategic interdependence between players and provides methods for predicting and explaining the outcome of interactions in different types of games, such as cooperative and non-cooperative games. Some of the key concepts in game theory include Nash equilibrium, the prisoner's dilemma, and bargaining solutions.

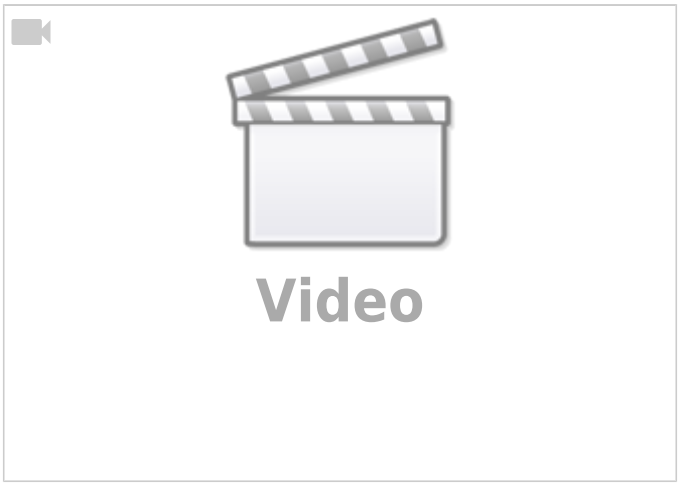
Nash Equilibrium

The Nash Equilibrium[2)] is a solution concept in game theory named after mathematician and economist John Nash. It is a situation in which each player in a game has determined the best strategy for themselves based on the strategies chosen by the other players.John Nash was a mathematician and economist who was awarded the Nobel Prize in Economics in 1994 for his work in game theory. He was also known for his battle with schizophrenia, which was depicted in the film “A Beautiful Mind.”

Formally, a Nash Equilibrium is a set of strategies, one for each player, such that no player has an incentive to deviate from their strategy given the strategies of the other players. This means that if all players follow their Nash Equilibrium strategies, the outcome is stable and cannot be improved upon by any single player changing their strategy.

Nash Equilibrium is a key concept in game theory and is widely used to analyse and understand the behaviour of individuals in strategic situations, such as in economics, political science, and psychology.

In real-world situations, Nash Equilibria may not always reflect the socially optimal outcome, as the individual incentives may not align with the social good. In such cases, alternative solution concepts, such as the Pareto efficiency or the Correlated Equilibrium, may provide a more realistic representation of the situation.



The Pareto Efficiency

The Pareto Efficiency[3] , named after economist Vilfredo Pareto, is a concept in economics that describes a situation in which it is impossible to make any one individual better off without making another individual worse off. In other words, a Pareto efficient outcome is one in which no further improvement can be made without making at least one person worse off. Vilfredo Pareto (1848–1923) was an Italian engineer, sociologist, and economist. He made significant contributions to a wide range of fields, including economics, sociology, and political science.

The concept of Pareto Efficiency is used to assess the efficiency of economic systems and is often used as a benchmark for determining whether a proposed change will lead to a more efficient outcome. A change that makes one person better off and no one worse off is considered to be a Pareto improvement, while a change that makes one person worse off is considered to be a Pareto regression.

In practical terms, Pareto Efficiency is often used to evaluate the distribution of resources in a society and determine whether there is room for improvement. For example, if a society is Pareto Efficient, it means that no one can be made better off without making someone else worse off, and thus, any further improvements must involve trade-offs and compromises.

It is important to note that while Pareto Efficiency is a useful benchmark, it does not account for fairness or justice and may not reflect the most desirable outcome from a social or ethical perspective. In such cases, other solution concepts, such as the Rawlsian fairness criterion or the Kaldor-Hicks efficiency, may provide a more appropriate representation of the situation.

Correlated Equilibrium

Correlated Equilibrium[4] is a solution concept in game theory that extends the Nash Equilibrium by allowing for randomization or correlation in the strategies of the players. In a Correlated Equilibrium, each player's strategy is determined by a random process that takes into account the strategies of all the players, rather than just the strategies of the other players, as in a Nash Equilibrium.

The concept of Correlated Equilibrium allows for the possibility of coordination and cooperation between players, as their strategies can be correlated in a way that benefits all players. This makes Correlated Equilibrium a more realistic solution concept in situations where coordination and cooperation are important.

For example, consider a situation in which two players are playing a coordination game, such as the classic coordination game known as “Battle of the Sexes.” In this game, each player must choose between two strategies, but both players prefer to choose the same strategy. In a Nash Equilibrium, both players would choose different strategies, but in a Correlated Equilibrium, the players' strategies can be correlated so that both players choose the same preferred strategy.

Correlated Equilibrium is an important concept in game theory and is widely used in the analysis of multi-player games, particularly in situations where coordination and cooperation are important. However, it is important to note that Correlated Equilibrium is not always guaranteed to exist and may not always reflect the most desirable outcome from a social or ethical perspective. In such cases, alternative solution concepts, such as the Pareto efficiency or the Rawlsian fairness criterion, may provide a more appropriate representation of the situation.

Rawlsian Fairness Criterion

The Rawlsian[5] fairness criterion is a solution concept in social and political philosophy that is named after philosopher John Rawls. The Rawlsian fairness criterion is used to evaluate the fairness of a particular outcome or distribution of resources in a society. John Rawls (1921–2002) was an American philosopher and political economist. He is widely regarded as one of the most important political philosophers of the 20th century and is best known for his theory of justice as fairness, which is presented in his seminal work “A Theory of Justice.” Rawls believed that a just society is one in which the basic structure of society, including the distribution of resources and opportunities, is arranged to benefit the least advantaged members of society.

The Rawlsian fairness criterion is based on two principles of justice: the first, the principle of equal basic liberties, states that everyone is entitled to a set of basic liberties and rights that cannot be taken away; the second, the difference principle, states that social and economic inequalities are only just if they are to the greatest benefit of the least advantaged.

If a society is arranged according to the Rawlsian fairness criterion, it means that the basic liberties and rights of everyone are protected and that social and economic inequalities are arranged so that they benefit the least advantaged members of society.

It is important to note that the Rawlsian fairness criterion is a normative concept, meaning that it represents a desirable ideal rather than a description of the way things are.

Zero-Sum Game Theory

Zero-sum game[6] theory is a branch of game theory where the total benefit or gain of all players in the game is equal to zero. In other words, in a zero-sum game, one player's gain is exactly balanced by the losses of the other players. The concept is based on the idea that the total benefit of a game remains constant and that any gain by one player must come at the expense of another player.

Examples of zero-sum games include chess, poker, and rock-paper-scissors. In these games, one player's win results in the loss of the other player, and the total winnings and losses balance out to zero. In poker, for instance, if one player wins a hand, the other players must have lost that same amount.

In contrast, non-zero-sum games, such as many real-world economic and political interactions, do not have a constant total benefit. In these games, the actions of one player can increase the total benefit for all players, such as in a cooperative game where players work together to achieve a common goal.

In zero-sum games, the concept of the Nash Equilibrium is often used to analyze and predict the outcome of the game. The Nash Equilibrium is a state in which each player's strategy is optimal given the strategies of the other players, and no player has the incentive to change their strategy. In a zero-sum game, the Nash Equilibrium represents the most balanced outcome, with one player's gain being exactly offset by the losses of the other players.

Positive-Sum Game Theory

A positive-sum game[7] is one in which the total benefit or gain of all players in the game is greater than zero. In other words, in a positive-sum game, the collective benefit of all players is increased as a result of their interaction.

Positive-sum games are often characterized by cooperation and mutual benefit, where the actions of one player can lead to increased benefits for all players. For example, trade between countries can be seen as a positive-sum game, where both countries benefit from the exchange of goods and services. Another example is a cooperative game, where players work together to achieve a common goal, and each player's efforts increase the overall benefit for all players.

In contrast to zero-sum games, positive-sum games have the potential to create mutual benefits and create a more prosperous outcome for all players involved. However, they also present challenges in terms of finding solutions that are fair and equitable to all players, and in overcoming obstacles such as mistrust, self-interest, and conflicting objectives.

Negative-Sum Game Theory

Negative-sum game theory is a branch of game theory where the total benefit or gain of all players in the game is less than zero. In other words, in a negative-sum game, the collective losses of all players are greater than their collective gains.

Negative-sum games often occur in situations where resources are scarce, and the actions of one player lead to a decrease in the resources available for others. For example, a war between two countries can be seen as a negative-sum game, where both countries suffer losses in terms of lives, resources, and economic damage, and the total benefits of the conflict are less than zero. Another example is a prisoner's dilemma, where the cooperative solution would result in a positive sum outcome, but the rational self-interested behavior of each player results in a negative sum outcome for all.

Negative-sum games present challenges in terms of finding solutions that lead to a more positive outcome for all players involved. They often require cooperation, compromise, and a willingness to sacrifice individual benefits for the collective good.

The Prisoner's Dilemma

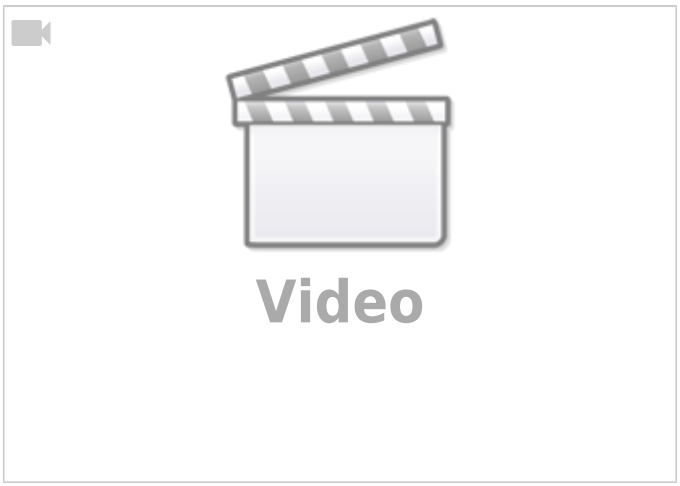
The prisoner's dilemma[8] is a classic example of a non-cooperative game in game theory, used to illustrate the conflicts that can arise from rational self-interest. It is a two-player game that models a situation in which two individuals are accused of a crime and are held in separate cells, unable to communicate with each other.

In the game, each player must decide whether to confess or remain silent. If both players confess, they both receive a severe punishment. If both players remain silent, they receive a lesser punishment. If one player confesses and the other remains silent, the player who confesses receives a reduced punishment while the other player receives a severe punishment.

The logic of the prisoner's dilemma is based on the idea that each player will act in their own self-interest and try to minimize their punishment. However, when both players act in this manner, they end up with a worse outcome than if they had both remained silent. This creates a situation in which rational self-interest leads to an undesirable outcome for both players.

Examples of the prisoner's dilemma can be found in a variety of real-world situations, such as international relations, business competition, and environmental policy. For example, in international relations, two countries may both have the option to build up their military or reduce their military spending. If both countries build up their military, they both face the risk of war and increased military spending. If both countries reduce their military spending, they both benefit from peace and decreased military spending. However, if one country builds up its military and the other reduces its military spending, the country that builds up its military will be more secure, while the other country will be less secure.

The prisoner's dilemma provides a powerful illustration of the challenges and conflicts that can arise from rational self-interest and the importance of cooperation in achieving mutually beneficial outcomes.



Other Common Examples of Game Theory

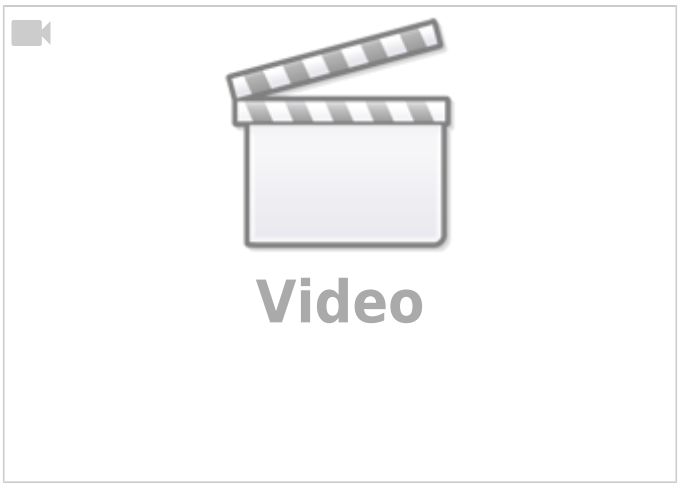
There are many other examples of game theory, some of which are:

- **Chicken**[9]: This is a game in which two drivers race towards each other on a collision course. The driver who swerves first is the loser, while the driver who continues straight on is the winner.
- **Tragedy of the Commons**[10]: This is a game in which multiple individuals share a common resource, such as a fishery or a forest, and must decide how much of the resource to extract. If all individuals extract as much as they can, the resource becomes depleted and everyone is worse off.
- **Stag Hunt**[11]: This is a game in which two individuals must decide whether to hunt a stag or a hare. Hunting a stag requires cooperation, while hunting a hare can be done individually. If one person hunts a stag and the other hunts a hare, the person who hunted the stag will be left empty-handed.
- **Battle of the Sexes**[12]: This is a game in which a couple must decide whether to attend a ballet or a football game. If they both attend the same event, they are both happy. If they attend different events, they will both be unhappy.
- **Ultimatum Game**[13]: This is a game in which one player must make a proposal for how to divide a sum of money between the two players. The other player must then decide whether to accept or reject the proposal. If the proposal is rejected, both players receive nothing.

These games illustrate different aspects of game theory and decision-making and are used to study various aspects of human behavior, including cooperation, competition, fairness, and bargaining.

Tragedy of The Commons

The Tragedy of the Commons[14] is a concept in game theory that describes a situation in which multiple individuals share a common resource, such as a fishery or a forest, and must decide how much of the resource to extract. In this game, each individual acts in their own self-interest and tries to maximize their extraction of the resource. However, if all individuals extract as much as they can, the resource becomes depleted and everyone is worse off.



The Tragedy of the Commons is often referred to as a “tragedy” because the outcome is not in the best interest of the group as a whole, despite each individual acting in their own self-interest. The tragedy occurs because there is a lack of incentives for individuals to conserve the resource and a lack of mechanisms for enforcing conservation.

Examples of the Tragedy of the Commons can be seen in many real-world situations, such as overfishing, deforestation, and pollution. For example, consider a fishery that is shared by multiple fishing boats. Each boat has the incentive to catch as many fish as possible, but if all boats do this, the fishery will become depleted and the catch of each boat will decrease. In this case, the tragedy occurs because each boat acts in its own self-interest, but the result is a depleted fishery that is worse for everyone.

Another example is air pollution, where each individual or company has the incentive to emit as much pollution as possible though maximum production at a minimal cost, but if everyone does this, the air quality decreases and everyone's health is impacted.

The Tragedy of the Commons highlights the importance of considering the long-term consequences of individual actions and the need for collective action to address common problems. It also highlights the importance of finding mechanisms to manage common resources, such as regulations, taxes, and tradable permit systems, that can encourage conservation and reduce the tragedy.

This game theory can be also applied to emotions and human relationships. In the context of emotions and relationships, the Tragedy of the Commons can refer to situations in which individuals act in their own self-interest, but their actions negatively impact the emotional well-being of the group as a whole.

For example, consider a group of friends who frequently spend time together. Each friend has the incentive to prioritize their own needs and desires, such as pursuing individual interests or spending time with other people. However, if everyone does this, the group dynamic can become strained and the emotional well-being of the group as a whole can decrease.

In romantic relationships, the Tragedy of the Commons can occur when partners prioritize their individual needs and desires but neglect the needs and well-being of the relationship as a whole. This can lead to a breakdown in communication and a decrease in emotional and relationship satisfaction.

Tragedy of The Commons and Narcisissm

The relationship between narcissism and the Tragedy of the Commons game theory[15] can be seen in the sense that individuals with narcissistic tendencies may prioritise their own needs and desires and act in their own self-interest at the expense of the group or relationship as a whole. This behaviour can be seen as a form of “emotional depletion” of the group or relationship, similar to the depletion of a common resource in the Tragedy of the Commons game.

In situations where a narcissistic individual is part of a group or relationship, their actions and decisions may prioritise their own desires and needs, leading to a breakdown in communication, cooperation, and trust within the group or relationship. This can result in a decrease in the emotional well-being and satisfaction of the group or relationship as a whole, similar to the tragedy that occurs in the Tragedy of the Commons game.

For example, a narcissistic individual in a romantic relationship may prioritise their own needs and desires and neglect the needs and desires of their partner, leading to a breakdown in the relationship. In a group setting, a narcissistic individual may prioritise their own goals and ambitions and not consider the goals and ambitions of the group, leading to a decrease in group cohesion and cooperation.

It is important to note that not all individuals with narcissistic tendencies engage in behaviours that cause a “tragedy of the commons” in emotions and relationships, and that individual and situational factors also play a role. However, the concept of the “tragedy of the commons” provides a useful framework for understanding how individual actions can negatively impact the emotional well-being of a group or relationship.

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[1] Game theoryWikipedia
[2] Nash equilibriumWikipedia
[3] Pareto efficiencyWikipedia
[4] Correlated equilibriumWikipedia
[5] Justice as FairnessWikipedia
[6] Zero-sum gameWikipedia
[7] Win–win gameWikipedia
[8] Prisoner's dilemmaWikipedia
[9] Chicken (game)Wikipedia
[10], [14] Tragedy of the commonsWikipedia
[11] Stag huntWikipedia
[12] Battle of the sexes (game theory)Wikipedia
[13] Ultimatum gameWikipedia
[15] Understanding the social costs of narcissism: the case of the tragedy of the commonsPers Soc Psychol Bull. 2005 Oct;31(10):1358-68.doi: 10.1177/0146167205274855.