Game Theory

John Nash John Forbes Nash Jr. (June 13, 1928 – May 23, 2015) was an American mathematician who made fundamental contributions to game theory, differential geometry, and the study of partial differential equations.

Any interaction between multiple people in which each person's payoff is affected by the decisions made by the other

- multiple players
- interact
- reward
- players act rationally
- personal self interest

Relevant games and players
Poker
Economist, political sciences, psychology etc

Types of finite games:

- cooperative/ non-cooperative
- competitive: winner and losers

The prisoner's dilemma

Wanda and fred (No communication)

Police
- if you confess to the crime and your partner doesn't you will be granted immunity: partner stays 10 years in jail
- Both confess : dirt talk about each other : 10 years for each of you in jail
- Neither confesses: both spends 2 year in jail

Wanda and fred are split up, no loyalty.

	Dont confess	confess
dont confess	2/2	10/0
Confess	0/10	5/5 (solution)

Nash equilibrium

A player in a game has found nash equilibrium when they make the choice that leaves them better off no matter what their opponents decide to do.

Cooperative games (works towards a common goal)

Group of players in a cooperative game
- fairness

Shapley value

- A method of dividing up gains or costs amount players according to the value of their individual contribution.

- #1 contribution of each player is decided by what is gained or lost by removing them from the game (Marginal Contribution)

- #2 Interchangeable players have equal value
- 2 parties bring the same thing to the coalition they should have to contribute the same amount, & should be rewarded for their contribution equally. (example: same food same bills)

- #3 If a member of the coalition contributes nothing then they should receive nothing. (Exception are cases like: Maternity leave)

- #4 if a game has multiple parts, cost or payment should be decomposed across those parts. (different work different pay)

Example :

- Individually 10, 20: combine 40 how to divide the earnings.
- friend marginal contribution : 30()remove your 10 (10 cookies/hr)
- your marginal contribution : 20()remove your 20 (20 cookies/hr)
- Average the numbers together 30/2 = 15, friend gets 25

In competitive situation game theory tells you how to be smart
In cooperative situation game theory tells you how to be fair

Humans thrive in cooperation, Game theory can be used in most challenging decision in life.

When you come across a situation in life, try to find:

Rational players
Self interest
Rules of the game
Dominant strategy

Find the Nash Equilibrium, If all are not met and favourable : change the game (step aside and play other games)

Winners are the ones who know how to play!

References
https://www.youtube.com/watch?v=7szPBZxBIg4
https://www.youtube.com/watch?v=MHS-htjGgSY

Images References:
https://www.history.com
(Vietnam War and World War 2)
Cheating Image : Here
Wanda And Fred animations: https://www.youtube.com/watch?v=MHS-htjGgSY