

Elements of Game Theory

• Basic Game Theory Terms.

Game: Description of the situation, includes the rules of the game;

Players: decision makers in the game;

Payoffs: expected rewards enjoyed at the end of the game

Actions: possible choices made by the player

Strategies: specified plan of action for every contingency played by other players

• Basic assumptions.

1. Rationality: everyone maximizes payoffs
2. Common knowledge of rationality: everyone understands that everyone is rational
3. No outside communication: players communicate only through actions.
4. Full knowledge of the game: payoffs and actions are observable and known by all.

• Types of games. Game are simultaneous or sequential.

• Simultaneous games

- Games with finite # of actions represented in normal form (table listing actions and payoffs)
- Actions and strategies are the same.
- Equilibrium concept: **NASH Equilibrium**

A set of actions where every players selects the action that maximizes his payoffs given that other players also do the same.

- How to find NASH equilibrium? By looking for mutual best response.

• Sequential games.

- Games with finite # of actions represented in extensive form (decision tree).
- Some agents have only actions, some have strategies.
- Game also represented in normal form where the table lists strategies and payoffs.
- Equilibrium concept: Nash Equilibrium applied to strategies (instead of only actions) give often multiple equilibria (by looking for Nash in the normal form). We use a refinement called the **SUBGAME PERFECT equilibrium** that selects the Nash equilibrium that makes sense.

A set of strategies where every player selects the strategy that maximizes his payoff given that the other players do the same at every decision node given that the node is reached.

- How to find SUBGAME PERFECT equilibrium? By working backwards.