Game Theory

Static and Complete Information Games

Titles

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Some Notes and Assumptions

- We assume that players are rational (means that selects the choice which gives him/her the maximum payoff).
- Other than rationality assumption, we also assume that each players know that all the other players are rational, which is a different and more strong assumption from the rationality assumption of each players.
- And for this case, the discreet games, there are finite numbers of strategies for each player.

Mathematical Notations

$$\text{Number of Players} = n$$

$$\text{Set of Possible Strategies for ith Player} = S_i = \{s_i^1, s_i^2 ... s_i^m\}$$

$$\text{Utility of ith Player from the Strategies of Players} = u_i(s_i, s_{-i})$$

Dominant Strategy Games

- In this kind of games, players will be able to eliminate some of their choices, which narrows down to the dominant strategy

Dominant Strategy Games

$$\begin{pmatrix} & L & R \\ L & 0,0 & 0,2 \\ R & 2,0 & 1,1 \end{pmatrix}$$

- Since in this game, for the first player, irrespective of second player's strategy, he/she should choose R because if second player choose L, in order to maximize its payoff, it should choose R, which is 2. And it is also valid if second play R. Thus we can eliminate the choice of L for first player, which means that the L is dominated by R
- This interpretation should be carried for second player as well. Which eliminates the choice of L and means that R dominates L.

Dominant Strategy Games

$$\begin{pmatrix} & L & R \\ \cancel{L} & \cancel{0,0} & \cancel{0,2} \\ R & 2,0 & 1,1 \end{pmatrix}$$

- As we have indicated, irrespective of the choice of their competitors, both player will eliminate the choice of L. We can show it mathematically:

$$u_1(R, L) > u_1(L, L) \mid u_1(R, R) > u_1(R, R)$$

$$u_2(L, R) > u_2(L, L) \mid u_2(R, R) > u_2(R, L)$$

Dominant Strategy Games

- Thus, we have only the solution of right and right.

$$\{R, R\}$$

- We call this solution as Dominant Strategy Equilibrium.