

2. Strategic Games

- a finite set of players
- each player has a set of actions/strategies
- The outcome (utility) for each player depends on the actions of all players (= action profile)

Beauty Contest

Everybody chooses a number n with $0 \leq n \leq 100$. We consider the average of all numbers. The agent that comes closest to $2/3$ of the average (rounded up) wins ... and gets a US\$ such,

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2.2 Payoff matrix

For 2 players and finite games G we can represent strategic games by payoff matrices, e.g. for $N = \{1, 2\}$, $A_1 = \{T, B\}$, $A_2 = \{L, R\}$,
player 1 player 2

		Player 2	
		L	R
Player 1	T	w_1, w_2 x_1, x_2	z_1, z_2
	B	y_1, y_2	z_1, z_2

$$w_1, w_2, x_1, x_2, \dots, z_2 \in \mathbb{R}^+$$

Profiles (T, L) (T, R) (B, L) (B, R)

$$\begin{aligned} & \downarrow \\ & (w_1, w_2) \\ u_1(T, L) &= w_1 \quad u_2(T, L) = w_2 \end{aligned}$$

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2.1 Definition

DEF. A strategic game is a triple

$$G = \langle N, (A_i)_{i \in N}, (u_i)_{i \in N} \rangle \text{ with}$$

- N is a finite set (of agents/players)
- for player $i \in N$, a non empty set A_i (set of actions/strategies),
 $A = \prod_{i \in N} A_i$ is called set of action profiles
- for each player $i \in N$, a utility function,
 $u_i: A \rightarrow \mathbb{R}$

Finite game has only finite sets of actions

2.1.2 \rightarrow 2.2 is the winner

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2.2 Example games

Prisoner's dilemma:

Two suspects in crime are brought for questioning in adjacent cells:

- * If both confess, then both will receive 3 year sentence in prison
- * If neither of them confess, they only go into prison for 1 year,
- * If one confesses and the other does not, the first one walks free, the second one goes in to prison for 4 years

	Prisoner 1 Confess	Prisoner 1 Does not Confess
Prisoner 2 Confess	-3, -3	0, -4
Prisoner 2 Does not Confess	-4, 0	-1, -1

add +4 to everything

	Prisoner 1 Confess	Prisoner 1 Does not Confess
Prisoner 2 Confess	1, 1	4, 0
Prisoner 2 Does not Confess	0, 4	3, 3