Game Theory Basics

- Game theory is designed to model
  - How rational (payoff-maximizing) ``agents" will behave
  - When individual outcomes are determined by collective behavior.
  - Rules of a game specify agent payoffs as a function of actions taken by different agents.

Game defined by

n: # of players $(n=2)$

S_i : set of possible strategies for player i $\quad 1 \le i \le n$

$u_i(s_1, \dots, s_n)$ = payoff to player i when player j plays strategy $s_j \in S_j$ $\quad 1 \le j \le n$

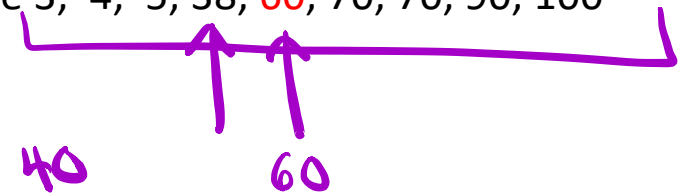
$\vec{s} = (s_1, \dots, s_n)$

action/strategy profile

Let's play the median game

strategy: {0, .., 100}

- In a **private** message to Aditya Saraf, write down
  - An integer between 0 and 100 (inclusive).
- Later in the lecture, the person (or people) whose selected number is closest to 2/3 of the median of all the numbers (rounded down) wins the game!
- E.g., if the numbers are 3, 4, 5, 38, 60, 70, 70, 90, 100



0 3 14 23 23 33 33 33 66

Prisoner's Dilemma

normal form simultaneous game.

Prisoner II

Separately, each prisoner is offered deal.

Prisoner I

	stay silent	confess/betray
→stay silent	$(-1, -1)$	$(-10, 0)$
→confess/betray	$(0, -10)$	$(-8, -8)$

in either case, best response to betray