

Beyond Sample Equilibrium Computation



Several Questions

- Given a game G , does there exist a unique equilibrium in G ?
- Given a game G , does there exist a strictly Pareto efficient equilibrium in G ?
- Given a game G and a value v , does there exist an equilibrium in G in which some player i obtains an expected payoff of at least v ?



Several Questions

- Given a game G , does there exist an equilibrium in which the sum of agents' utilities is at least k ?
- Given a game G and an action a_i , does there exist an equilibrium of G in which player i plays action a_i with positive probability? Same question, but with probability 0?



Hardness results

- All of the above questions are NP-hard when applied to Nash equilibria.
- Even for 2-player games
- Further, guaranteed payoff and social welfare problems cannot be approximated to any constant factor in poly. time



Hardness results

- Computing all equilibria of a 2-player, general-sum game requires worst-case that is exponential in the number of actions for each player

