

Statistics and Data Science Seminar

A Graphical Algorithm for the Nucleolus of Binary Assignment Games / Multivariate Final-Offer Arbitration

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Abstract: (Hardwick) An assignment game is a cooperative game with its player set divided into two groups, where a coalition receives a positive payoff if and only if it contains at least one player from both groups. In other words, it concerns a bipartite matching, with a payoff defined for each pair (payoffs for larger coalitions are determined additively). The 1994 paper by Solymosi and Raghavan gives an algorithm for finding the nucleolus (an optimal solution) of such a game, requiring $O(n^4)$ operations (assuming that n is the size of both groups). In this paper, we examine the special case in which the payoffs for each pair take only binary values, which we can think of as an indicator of whether or not the pair is compatible. For this case, we present a new algorithm which capitalizes on the graphical aspect of the previous one. This algorithm is shown to be an improvement, requiring only $O(n^3)$ operations. We also discuss sociological implications of this solution, considering each pair's split of the payoff to be their relationship's balance of power.

(Powers) Final-Offer Arbitration is used in major league baseball to determine players' salaries, and has been used in various other wage disputes. In Final-Offer Arbitration, two contesting parties each provide a mediator with a final offer. The mediator must choose one of the two offers with no option for compromise. Under certain conditions, Nash equilibria are

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known for the single-variable case. Here we will explore solution points when players have multiple components to their offer, effectively bringing the dimension of the game to 2 or higher.

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