An Ordinal Shapley Value for Economic Environments

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ABSTRACT

We propose a new solution concept to address the problem of sharing a surplus among the agents generating it. The sharing problem is formulated in the preferences-endowments space. The solution is defined in a recursive manner incorporating notions of consistency and fairness and relying on properties satisfied by the Shapley value for Transferable Utility (TU) games. We show a solution exists, and refer to it as an Ordinal Shapley value (OSV). The OSV associates with each problem an allocation as well as a matrix of concessions ``measuring" the gains each agent foregoes in favor of the other agents. We analyze the structure of the concessions, and show they are unique and symmetric. Next we characterize the OSV using the notion of coalitional dividends, and furthermore show it is monotone in anagent's initial endowments and satisfies anonymity. Finally, similarly to the weighted Shapley value for TU games, we construct a weighted OSV as well.