



Discrete Mathematics and Computer Science Seminars  
Department of Mathematical Sciences, Sharif University of Technology

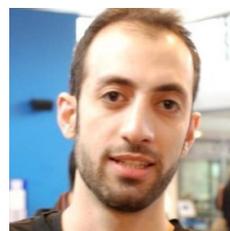
# Cooperative Games and The Problem of Dividing the Payoff

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**Sasan Maleki** obtained his PhD and MSc from the University of Southampton (United Kingdom) in Computer Science and Artificial Intelligence. His PhD research has addressed the computational issues of the Shapley value and its applications in the Smart Grid. He was also a member of the teams IAMPower and SotonPower in Power Trading Agent Competition, in charge of developing demand prediction algorithms and optimal bidding strategies.

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## Abstract

Coalition formation is an important tool for enabling cooperation in multiagent systems. Many researchers have studied scenarios where individuals and businesses benefit from joining forces. In practice, this would boil down to two problems which are extensively studied in cooperative game theory. First, the way the coalition members are grouped, after which the coalition achieves its goals and receives a reward (payoff). Second, how this collective payoff is divided among individual members such that they have an incentive to join and remain in the coalition. The latter case is complicated by the fact that a rational agent will not accept to be a member of a coalition if it can get a higher reward by joining a different coalition. Ensuring that such a case does not happen would require checking the potential payoff of each member in every possible coalition; a combinatorial problem that has an exponential time complexity.

In this talk, we will review the basic concepts of cooperative game theory in the context of multiagent systems, and will look at methods for dividing the payoff that ensure stability and fairness. We will particularly focus on the Shapley value, a payoff division method that fosters fairness. We will show, in the context of the Smart Grid, how one can overcome the exponential time complexity of the Shapley value so that it can be applied in large scale real world problems.

**Wednesday, 3 Azar 1395** (23 November 2016), **12:45-14:00**  
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