Measures of influence in social structures

PhD Thesis Proposal

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Subject:

In the literature of **cooperative games**, the notion of **power index** has been widely used to evaluate the **"influence" of individual players** (e.g., voters, political parties, nations, etc.) involved in a **collective decision process**, i.e., their ability to force a decision in situations like an electoral system, parliament, governing council, management board, etc. In practical situations, however, the information concerning the strength of coalitions and their effective possibilities of cooperation is not easily accessible due to heterogeneous and hardly quantifiable factors about the performance of groups, their bargaining abilities, moral and ethical codes and other "psychological" attributes (e.g., the power obtained by threatening not to cooperate with other players). So, any attempt to numerically represent the influence of groups and individuals conflicts with the complex and multi-attribute qualitative nature of the problem. Previous applications of cooperative games show that this type of qualitative information is central for the evaluation of the individual influence in **voting systems** and in **social networks**, the degree of acceptability of arguments in a debate, or the importance of criteria in a **multi-criteria decision-making process**, etc.

The thesis is devoted to study models for cooperative interaction situations and power indices based on the evidence that the nature of available information about the interaction of individuals and groups is mostly ordinal. More concretely, the thesis will focus on the structure of relations between groups of individuals (or sets of objects or subsets of criteria, etc.), analyse special structures due to domain restrictions (e.g., single-peaked), or due to contextual effects (such as rules that are used to extent some relations on individuals) or due to some mathematical properties (such as monotonicity, cardinality effects, etc.). There will be two main relevant research directions: the characterization of such structures and the algorithmic analysis of rules on these structures (the computational complexity of their evaluation, the manipulability of such rules, the possibility of representing them compactly). The PhD student will also investigate the effect of social ranking solutions on the behaviour of individuals to form coalitions: is it better to cooperate in larger or smaller coalitions? Is it convenient for two or more coalitions to merge? Is a solution resistant to the manipulation of individuals, who could strategically affect the position of groups in the ranking? These questions are also related to the dynamics of coalition formation in hedonic games.

DESIRED QUALIFICATIONS: The ideal applicant possesses strong game theoretical skills (preferably on cooperative games and coalition formation) and good basis in social choice theory and voting theory.

References

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