Algorithmic Game Theory and Computational Social Choice with Agent Hierarchies

This PhD project lies within the fields of algorithmic game theory and computational social choice. In both settings, we consider a set of interacting agents who evaluate a common outcome—such as an equilibrium or a resource allocation—using individual cost functions.

Interactions between agents may arise from their strategic behavior, when individual actions influence the cost incurred by others. They may also stem from potentially divergent preferences, in situations where agents must agree on a collective outcome.

In general, no hierarchical structure among agents is assumed. However, some settings naturally motivate the introduction of an a priori hierarchy, as in the case of multiple creditors in bankruptcy proceedings, or when resource allocation takes into account the history of past allocations within the same population of agents. In these examples, the size of the claims or the value of previously allocated resources can be used to rank agents according to priority.

It is also possible to consider an a posteriori hierarchy, obtained by ordering agents according to their costs for a given outcome (or equilibrium). Indeed, beyond their individual costs, agents may also be sensitive to their relative rank, as in auctions where only the highest bidder wins, or in competitions where only the top three participants receive a medal.

This PhD topic in computer science aims to explore game-theoretic and social choice settings that incorporate such agent hierarchies, whether defined a priori or emerging a posteriori. After a review of the related literature, the goal of the candidate will be to identify suitable—possibly novel—solution concepts, and to study their existence, computational complexity, and quality in terms of social cost.

This PhD topic is proposed by Laurent Gourvès, LAMSADE, Université Paris Dauphine. Interested candidates should contact him at **laurent.gourves@dauphine.fr** and submit a detailed CV, a cover letter, recent academic transcripts, and academic references. Applicants are expected to hold a Master's degree by Fall 2026, preferably in Computer Science.