8th Seminar
Ordered Structures in Games and Decisions
(OSGAD 2014)

Abstracts

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Université Paris I — Panthéon-Sorbonne

Centre d'Économie de la Sorbonne
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`http://ces.univ-paris1.fr/membre/seminaire/OSGAD/OSGAD.htm`

PROGRAM

♦ **9:00 Welcome to participants**

❑ 9:15-10:00 : José Manuel ZARZUELO

Highway Games and Airport Games

❑ 10:00-10:45 : André CASAJUS

The Herfindahl-Shapley power index

♦ **10:45-11:15 Coffee break**

❑ 11:15-12:00 : Philippe SOLAL

A Decomposition of the Space of TU-games Using Addition and Transfer Invariance

❑ 12:00-12:45 : Stéphane ZUBER

Probability adjusted rank-discounted utilitarianism

♦ **12:45-14:30 Lunch**

❑ 14:30-15:15 : Jean-Luc MARICHAL

On the use of power indices in reliability theory

❑ 15:15-16:00 : Christophe GONZALES

On the use of GAI networks for Choquet optimization

♦ **16:00-16:30 Coffee break**

❑ 16:30-17:15 : Gaëtan FOURNIER

Efficiency of equilibrium in Hotelling games

1. **José Manuel ZARZUELO (University of the Basque Country, Dept. of Applied Economics, Bilbao, Spain)**

   Highway Games and Airport Games

   We study some particular cost allocation problems in which some agents jointly use a common resource or facility. The peculiarity is that this resource is an ordered set of several indivisible sections, where each agent requires some consecutive sections, and each section has an associated a fixed cost. The issue is how to share the total cost of these sections among the users in an efficient and fair way. A simple example that illustrates these situations is the case of a linear highway, where the sections are delimited by the entry and exit points, and each car or truck only needs the highway sections between his entry and exit point.

   Game theory has proved to be very useful to solve these problems, since cooperative games are especially appropriate to model these situations. And, moreover, the solution concepts of these games embody a criterion of fairness in their definition and satisfy certain properties or axioms which make them particularly suitable for solving these problems. In this paper we will mainly focus on two solution concepts: the Shapley value and the nucleolus, and their application to some instances of these special cost allocation problems.

   Firstly, we will consider the case of airport problems: These classical problems refer to the particular case of a highway problem in which all the agents use the same entry. We recall the formula for the Shapley value of Littlechild and Owen (1973), and also Littlechild's (1974) algorithm to find the nucleolus of airport problems whose calculation is considerably more complex. Next we consider a richer model by considering the potential revenues or benefits by the agents for using the facility, and we provide an algorithm to find the nucleolus in this special case. Next we consider highway problems and describe analogously we provide a formula for the Shapley value and algorithm to find the nucleolus in this general situation.

   Finally we address the initial question of how to share the total cost from a non-cooperative perspective, seeking to complement cooperative approach. Namely, we propose two non-cooperative bargaining games games with a unique subgame perfect equilibrium outcome whose payoffs are respectively the Shapley value and the nucleolus of an airport problem. Furthermore, it is shown that all the subgame perfect equilibria of these games are also coalition-proof.

   (joint work with Peter Sudhölter)

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2. **André CASAJUS (HHL Leipzig Graduate School of Management, Leipzig, Germany)**

   The Herfindahl-Shapley power index

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3. **Philippe SOLAL (Université de Saint Etienne, GATE Lyon Saint Etienne)**

   A Decomposition of the Space of TU-games Using Addition and Transfer Invariance

   In Béal et al. (2013a) two new axioms of invariance, called Addition invariance and Transfer invariance respectively, are introduced to design allocation rules for TU-games. Here, we derive direct-sum decompositions of the linear space of TU-games by using the TU-games selected to construct the operations of Addition and Transfer. These decompositions allow us to recover previous characterization results obtained by Béal et al. (2013a), to provide new characterizations of well-known (class of) of allocation rules and also to design new allocation rules.

   (joint work with Sylvain Béal and Erci Rémila)

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4. **Stéphane ZUBER (Paris School of Economics, Centre d'Economie de la Sorbonne, Paris)**

   Probability adjusted rank-discounted utilitarianism

   We propose and axiomatize probability adjusted rank-discounted critical-level generalized utilitarianism (PARDCLU). We thus generalize rank-discounted utilitarianism (RDU) (proposed by Zuber and Asheim, 2012) to variable population and risky situations and thereby take important steps towards preparing RDU for practical use, e.g., for evaluation of climate policies and other policy issues with long-run consequences. We illustrate how PARDCLU yields rank-dependent expected utilitarianism—but with additional structure—in a special case, and show how PARDCLU can handle a situation with positive probability of human extinction.

   (joint work with Geir B. Asheim)

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5. **Jean-Luc MARICHAL (University of Luxembourg, Mathematics Research Unit, Luxembourg, Luxembourg)**

   On the use of power indices in reliability theory

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6. **Chrsitophe GONZALES (Universit Paris VI, LIP6, Paris, France)**

   On the use of GAI networks for Choquet optimization

   In this talk, we study the use of decomposable utility functions in the search for Choquet-optimal solutions on combinatorial domains. More precisely, we investigate the potential of GAI-networks to represent and solve decision making problems

where the performance of a solution is evaluated according to different points of view. This type of problem occurs when several criteria, possibly conflicting, must be considered in the decision analysis, or when several agents are involved in the decision process. In both cases, any feasible solution is represented by a vector of utilities. Assuming that each of these utilities is defined by a GAI-decomposable model, we study the use of GAI-networks to determine efficiently a solution having a utility vector maximizing an overall utility function defined by a Choquet integral.

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7. **Gaëtan FOURNIER (Centre d'Economie de la Sorbonne, Université Paris I, Paris, France)**

Efficiency of equilibria in Hotelling games

We consider a Hotelling game where a finite number of retailers choose a location, given that their potential customers are distributed on a network. Retailers do not compete on price but only on location. We show that when the number of retailers is large enough, the game admits a pure Nash equilibrium and we construct it. We then compare the equilibrium cost bore by the consumers with the cost that could be achieved if the retailers followed the dictate of a benevolent planner. We look at this efficiency of equilibrium asymptotically in the number of retailers.

(joint work with Marco Scarsini)

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