A one-day conference

Decision making and Social Choice

April 29, 2015

Venue : Université libre de Bruxelles (ULB), Campus Plaine, Bâtiment NO, 9th Floor
Organization and contact : Yves De Smet (ULB) yves.de.smet@ulb.ac.be , Marc Pirlot (UMONS) marc.pirlot@umons.ac.be
Inscription is free but requested (for organizational purposes): please send an e-mail to marc.pirlot@umons.ac.be

Programme

8:45 Welcoming the participants

9:00 **Thierry MARCHANT**, Universiteit Gent,
Decision under complete uncertainty: recent theoretical and empirical advances

10:00 **Yves CRAMA**, Université de Liège,
Functions of binary variables

11:00 Coffee break

11:20 **Jérôme LANG**, CNRS-LAMSADE, Université Paris-Dauphine
Picking sequences (joint work with Sylvain Bouveret)

12:20 – 14:15 Lunch time

14:15 **Olivier HUDRY**, Telecom ParisTech,
Computation of the winner of an election

15:15 **Michel GRABISCH**, Université Paris I Panthéon-Sorbonne,
k-ary capacities and the GAI model (joint work with Christophe Labreuche)

16:15 Closing

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ABSTRACTS

Decision under complete uncertainty: recent theoretical and empirical advances

Thierry MARCHANT, Universiteit Gent

A possible approach to the modelling of uncertainty is the Bayesian one, which claims that, in the absence of objective probabilities, the decision maker should have her own subjective probabilities. Another approach, not using probabilities, considers that decisions are described by nothing more than the sets of their possible outcomes. Comparing decisions hence reduces to comparing sets of possible outcomes. The most frequently studied models of decision under uncertainty are based on the comparison of the best outcome in the set, or the worst one, or lexicographic comparisons.

A radically different model was recently proposed and axiomatized: the Uniform Expected Utility model. It considers that individuals compare sets on the basis of their average utility. This axiomatization will be discussed in detail.

We will then present some very recent empirical evidence that the Uniform Expected Utility model is not descriptively valid. This will lead us to proposing a new model.

Functions of binary variables

Yves CRAMA, Université de Liège

Picking sequences

Jérôme LANG, CNRS-LAMSADE, Université Paris-Dauphine
(joint work with Sylvain Bouveret)

Picking sequences are a natural way of allocating indivisible items to agents in a decentralized manner: in each stage, a designated agent chooses an item among those that remain available. Some picking sequences are fairer than others (for instance, for two agents and four items, the fairest sequence could be one agent picking one item, the second one picking two, and the first one picking the last item). We give a general model for "fair" picking sequences, some results about their characterization, and discuss their computation. Then we address the manipulation of picking sequences by an agent or a coalition of agents.

Computation of the winner of an election

Olivier HUDRY, Telecom ParisTech

We consider an election with a finite set C of candidates and with a finite number v of voters, and we would like to determine the winner of the election. The talk will contain the following steps:

1. We show through an easy example that the voting rule plays an important role in the determination of the winner.
2. This example is also the opportunity to define the so-called median procedure. For this, consider two orders O and O' defined on C; the symmetric difference distance d(O, O') is the number of candidates which are not ranked in a similar way by O and by O'. In other words, d(O, O') specifies the number of disagreements between O and O'. If $(P_1, P_2, ..., P_v)$ denotes the collection of the voters' preferences over C and if O is an order defined on C, we define $R(O; P_1, P_2, ..., P_v)$ as the sum of the distances $d(O, P_i)$ for $1 \leq i \leq v$: $R(O; P_1, P_2, ..., P_v)$, called the remoteness of O from $(P_1, P_2, ..., P_v)$, provides the total number of disagreements between O and the voters' preferences. A median order of $(P_1, P_2, ..., P_v)$ is an order O* minimizing the remoteness R. In other words, a median order minimizes the total number of disagreements w.r.t. the preferences of the voters. In the median procedure, O* can be considered as the collective ranking which summarizes the preferences of the voters as well as possible; the winner is then the candidate ranked first in O*.
3. Then we pay attention to the complexity of the computation of a median order. For instance, if the v preferences of the voters are all linear orders and if O* is also assumed to be a linear order on C, then the computation of O* is an NP-hard problem.
4. Last, we focus on some algorithmic aspects of the computation of a linear median order. In particular, we design a branch and bound method to compute such a linear median order and we display some experimental results provided by this method.

k-ary capacities and the GAI model

Michel GRABISCH, Université Paris I Panthéon-Sorbonne
(joint work with Christophe Labreuche)

GAI (Generalized Additive Independence) models belong to the class of additive-decomposable models and permit to model interaction between criteria by defining the utility function as a sum of terms pertaining to some subsets of criteria. In this paper, we show that discrete GAI models are basically k-ary capacities, i.e., real-valued monotone functions on $\{0,1,2,...,k\}^n$ (a.k.a. multi-choice games). As for capacities, p-additive k-ary capacities are defined. Similarly, a p-additive GAI model is a sum of terms which depend on at most p variables. It is shown that a 2-additive GAI model can be written as a sum of positive and monotone terms, which correspond to the extreme points of the polytope of 2-additive k-ary capacities.