Workshop "Games and Optimization"

21-22 november 2016,
maison de l'Université, 10 rue Tréfilerie, Saint-Etienne

This workshop is organized conjointly by the federative research structure MODMAD (MODélisation Mathématique et Aide à la Décision), the ANR Dynamite and GATE Lyon Saint-Etienne.

Program

Monday 21 November

- 13 h 30. Receipt of participants.
- 14 h 00. Opening.
- 14 h 10. Giulia Cesari (LAMSADE, U. Paris Dauphine and Politecnico Milano) *A game theoretic generalized additive model on networks : theory and applications.*
- 15 h 00. Michel Grabisch (CES, U. Paris 1 Panthéon Sorbonne and IUF) *On a class of vertices of the core.*
- 15 h 50. Coffee-break
- 16 h 10. Christoph Durr (LIP6, UPMC and CNRS) *Mechanism design for aggregating energy consumption and quality of service in speed scaling scheduling.*
- 17 h 00. Christophe Bravard (GAEL, U. Grenoble Alpes) *Optimal Design and Defense of Networks Under Link Attacks.*
- 19 h 30. Workshop Dinner

Tuesday 22 November

- 9 h 00. Gaetan Fournier (Institute for Advanced Study, U. Toulouse 1 Capitole) *Location Games on Networks.*
- 9 h 50. Emily Tanimura (CES, U. Paris 1 Panthéon Sorbonne) *The Principle of Minimum Differentiation Revisited : Return of the Median Voter.*
- 10 h 40. Coffee-break
- 11 h 00. Miklos Pinter (U. Pécs) *Consistent values and two player games.*
- 11 h 50. Dimitry Levando (National Research University Higher School of Economics (Moscow)) *Formation of coalition structures as a non-cooperative game.*
- 12 h 40. Lunch break
- 14 h 00. Encarnacion Algaba (U. Sevilla) *A unified approach of values for games on union stable system.*
- 14 h 50. Philippe Solal (GATE LSE, U. Lyon, UJM St-Etienne) *A Class of Solidarity Allocation Rules for TU-games : Axiomatic Characterization and Implementation.*

15 h 40. Closing coffee

Abstracts

Encarnacion Algaba

A unified approach of values for games on union stable system

This talk deals with TU-games with restricted cooperation where the formation of feasible coalitions satisfies the following cooperative rule: if two feasible coalitions have a non-empty intersection, the players in common will act as intermediaries in order to achieve meaningful cooperation in the union of these coalitions. These systems contain as particular cases the well-known communication situations and the permission structures and allow for the study of economic applications that arise in this context. The main purpose is to present some values for these communication structures and analyze their main properties. In order to reach a better knowledge of the Myerson and position values in this context, the class of Harsanyi power solutions is introduced, showing that on a special subclass the essential difference between them will be the power measure applied.

Christophe Bravard

Optimal Design and Defense of Networks Under Link Attacks

Networks facilitate the exchange of goods and information and create benefits. We consider a net- work with n complementary nodes, i.e. nodes that need to be connected to generate a positive payoff. This network may face intelligent attacks on links. To study how the network should be designed and protected, we develop a strategic model inspired by Dziubin´ski and Goyal (2013) with two players: a Designer and an Adversary. First, the Designer forms costly protected and non-protected links. Then, the Adversary attacks at most k links given that attacks are costly and that protected links cannot be removed by her attacks. The Adversary aims at disconnecting the network shaped by the Designer. The Designer builds a protected network that minimizes her costs given that it has to resist the attacks of the Adversary. We establish that in equilibrium the Designer forms a minimal 1-link-connected network which contains only protected links, or a minimal (k + 1, n)-link-connected network which contains only non-protected links, or a network which contains one protected link and $\lceil (n-1)(k+1)/2 \rceil$ non-protected links. We also examine situations where the Designer can only create a limited number of protected links and situations where protected links are imperfect, that is, protected links can be removed by attacks with some probabilities. We show that if the available number of protected links is limited, then, in equi- librium, there exists a network which contains several protected and non-protected links. In the imperfect defense framework, we provide conditions under which the results of the benchmark model are preserved.

Joint work with Liza Charroin and Corinne Touati

Giulia Cesari

A game theoretic generalized additive model on networks: theory and applications.

We deal with the theoretical analysis and the application of a new family of cooperative games, where the worth of each coalition can be computed from the contributions of single players via an additive operator describing how the individual abilities interact within groups. We introduce the class of Generalized Additive Games and we show that it encompasses several classes of cooperative games from the literature, in particular of graph games, where a network describes the restriction of the interaction possibilities among players. Moreover, we study the properties and solutions of such class of games and we present two approaches using our model to real-world problems described by graph games, in the fields of Argumentation Theory and Biomedicine.

Christoph Durr

Mechanism design for aggregating energy consumption and quality of service in speed scaling scheduling

We consider a strategic game, where players submit jobs to a machine that executes all jobs in a way that minimizes energy while respecting the given eadlines. The energy consumption is then charged to the players in some way. Each player wants to minimize the sum of that charge and of their job's deadline ultiplied by a priority weight. Two charging schemes are studied, the proportional cost share which does not always admit pure Nash equilibria, and the arginal cost share, which does always admit pure Nash equilibria, at the price of overcharging by a constant factor.

Joint work with Łukasz Jeż and Óscar C. Vásquez.

Gaetan Fournier

Location Games on Networks

We consider a location game where a finite number of sellers choose a location, given that their potential customers are distributed on a network. Each consumer shops at the closest shop. We show that when the number of sellers is large enough, the game admits a pure Nash equilibrium and we compute the efficiency of equilibrium. We also investigate the case where consumers are not uniformly distributed.

Michel Grabisch

On a class of vertices of the core

It is known that for supermodular TU-games, the vertices of the core are the marginal vectors, and this result remains true for games where the setof feasible coalitions is a distributive lattice. Such games are induced by a hierarchy (partial order) on players. We propose a larger class of vertices for games on distributive lattices, called min-max vertices, obtained by minimizing or maximizing in a given order the coordinates of a core element. We give a simple formula which does not need to solve an optimization problem to compute these vertices, valid for connected hierarchies and for the general case under some restrictions. We find under which conditions two different orders induce the same vertex for every game, and show that there existbalanced games whose core has vertices which are not min-max vertices if and only if $n>4$.

Joint work with P. Sudhölter

Dimitry Levando

Formation of coalition structures as a non-cooperative game

The paper defines a non-cooperative simultaneous finite game to study coalition structure formation. A definition of the game embeds a coalition formation mechanism, which includes a number of deviators, a set of eligible partitions and coalition structure formation rule. The paper defines a family of nested non-cooperative games parametrized by a size of a max- imum coalition size. Every game in the family has an equilibrium in mixed strategies. The equilibrium encompasses intra and inter group externalities, what makes it different from Shapley value. Presence of individual payoff allocation make it different from a strong Nash, coalition-proof equilibrium, and certain other equilibrium concepts. We offer a non-cooperative stability criterion for coalition structures. The criterion may serve to measure the self-enforcement property of an equilibrium and focal points of a game.

Miklos Pinter

Consistent values and two player games

A class of reduced game concepts is considered. This class in- cludes the Davis-Maschler reduced game (Davis and Maschler, 1965), the Moulin reduced game (Moulin, 1985) and the Hart-Mas-Colell re- duced game (Hart and Mas-Colell, 1989) among others. We discuss values which are consistent to a reduced game notion from the consid- ered class. We show that an above kind of consistent value which also meets the so called ADAG (Additivity to Additive Games) property is completely characterized by its restriction on the two player games. That is, if one fix a value of this kind on the two player games, then the value is defined on the whole class of games. By this insight we can give shorter proofs for characterization re- sults like Sobolev (1975) and Snijders (1995), among others; we can define new values; and we can extend values to the whole class of games, see e.g. the nucleolus (Schmeidler, 1969).

Philippe Solal

A Class of Solidarity Allocation Rules for TU-games: Axiomatic Characterization and Implementation

A new class of allocation rules combining marginalistic and egalitarian principles is introduced for cooperative TU-games. It includes some modes of solidarity among the players by taking the collective contribution of some coalitions to the grand coalition into account. Relationships with other class of allocation rules such as the Egalitarian Shapley values and the Procedural values are discussed. An axiomatic characterization and an implementation in subgame perfect equilibria are provided.

Joint work with Sylvain Béal and Eric Rémila

Emily Tanimura

The Principle of Minimum Differentiation Revisited: Return of the Median Voter,

We study a linear location model (Hotelling, 1929) in which n (with n>=2) boundedly rational players follow (noisy) myopic best-reply behavior.We show through numerical and mathematical analysis that such players spend almost all the time clustered together near the center, re-establishing the "Principle of Minimum Differentiation" that had been discredited by equilibrium analyses.

Joint work with Nobuyuki Hanaki and Nicolaas J. Vriend