

ERCIM “Alain Bensoussan” Fellowship Scientific Report

Fellow: Jesus Rios
Visited Location : University of Luxembourg
Duration of Visit: From 1 - Oct - 2008 to 31 - March - 2009

I - Scientific activity

During my ERCIM fellowship, I have been working on themes related with the COST Action on Algorithmic Decision Theory where the team of University of Luxembourg is a active member. Specifically, he worked on the following research topics:

- Adversarial Risk Analysis. Developing methods aimed at prescribing advice to one side in decision problems with intelligent opponents and uncertain outcomes. I have also worked in its applications to counterterrorism (paper in progress) and corporate competition (the paper published in *Annales du LAMSADE*).
- Modelling languages for multi-agent decision problems and solution algorithms. Graphical representations including joint and separate agent decisions (JASA paper). Elicitation protocols for assessing adversaries’ thinking. Algorithm for the computation of non-dominated solutions, (Bayes) Nash Equilibrium and individual’s maximum expected utility strategies over graphical models (JASA paper).
- Universal Multiple Criteria Decision Analysis – Modelling Language (UMCDA-ML). Study of the differences and similarities among different streams in MCDA. To increase my knowledge on this topic I have attended a 15 hours course thought by Prof. Raymond Bisdorff on “Intelligent and Adaptive Systems: Decision Aid Systems”

II- Publication(s) during your fellowship

Please insert the title(s), author(s) and abstract(s) of the published paper(s). You may also mention the paper(s) which were prepared during your fellowship period and are under reviewing.

- David Rios Insua, **J. Rios**, David Banks “Adversarial risk analysis” to *Journal of the American Statistical Association (JASA)*. ACCEPTED for PUBLICATION (in press)

Abstract: Applications in counterterrorism and corporate competition have led to the development of new methods for the analysis of decision making when there are intelligent opponents and uncertain outcomes. This field represents a combination of statistical risk analysis and game theory, and is sometimes called adversarial risk analysis. In this paper, we describe several formulations of adversarial risk problems, and provide a framework that extends traditional risk analysis tools, such as influence diagrams and probabilistic reasoning, to adversarial problems. We also discuss the research challenges that arise when dealing with these models, illustrate the ideas with examples from business, and point out relevance to national defense.

- **J. Rios**, David Rios Insua, David Banks “One-sided decision support for competitive bidding”, *Annales du LAMSADE*, No 9, pp 175-185, 2008

Abstract: Applications in counterterrorism and corporate competition have led to the development of new methods for the analysis of decision-making when there are intelligent opponents and uncertain outcomes. This field is sometimes called adversarial risk analysis. In this paper, we illustrate a general framework developed for supporting a decision maker in a problem with intelligent opponents through a simple price-sealed bid auction case.

- **J. Rios**, D. Rios Insua “Supporting negotiations over influence diagrams”, to *Decision Analysis*. UNDER REVIEW

Abstract: We reconsider bargaining models developed to determine fair and reasonable solution outcomes for bargaining problems. Based on these models we develop novel negotiation support methods that will be able to produce on demand recommendations during a negotiation process. We first briefly discuss Raiffa's solution of balanced increments and, based on that idea, propose another solution based on balanced concessions. The combined application of the bargaining process models associated with these solutions leads to a flexible negotiation support method. A risk sharing negotiation problem illustrates how to implement our negotiation support method in a negotiation case.

III -Attended Seminars, Workshops, and Conferences

- DIMACS and LAMSADE workshop on Algorithmic Decision Theory, Université Paris Dauphine, France, October 2008.