

REPORT ON THE RESEARCH ACTIVITIES AT THE  
**FACULTY OF MATHEMATICS,**  
**COMPLUTENSE UNIVERSITY OF MADRID**

by Javier Montero

This research team located at the Department of Statistics and Operational Research I, Complutense University of Madrid, has actually ten members, developing a research project granted by the government of Spain ("Decision Aid, Learning and Negotiation with Valued Preferences"). Prof. J. Montero is its principal investigator and most of his collaborators within this team are working at Complutense University (prof. J. Yáñez, prof. J. Tejada, prof. T. Ortuno, prof. A. Del Amo, prof. P. Martínez-Talaván, and the Ph.D. student D. Gómez). Two more researchers in the team are working at other universities in Madrid (prof. J. González-Pachón at the Politechnic University and prof. B. Vitoriano at the Universidad Pontificia de Comillas). In fact, the core of this team has been working together for a while, being successively granted by the government of Spain and other institutions since 1989.

The main theoretical aspect we study are those related to Preference Modeling, including Decision Making and its applications to related fields: Group Decision Making and Multicriteria Decision Making on one hand, and Classification, Graph Theory, Game Theory and Reliability Theory on the other hand. We frequently adopt a fuzzy approach, and part of our research is being lately devoted to analyze basic aspects on aggregation procedures.

Main past results have been published in the European Journal of Operational Research, the Journal of the Royal O.R. Society, Journal of Algorithms, Game Theory, Fuzzy Sets and Systems, Approximate Reasoning, Intelligent Systems, General Systems, Kybernetes, Behavioral Science, UFKB Systems and of course, the two Journals of the national Society of Statistics and Operational Research of Spain.

Two sub-projects in course are particularly interesting due to their direct potential applications:

- Development of a Dimension Theory for Valued Preferences, with the declared objective of searching for useful representations allowing a better understanding of the complexity of particular decision making problems.
- Classification in Remote Sensing (in collaboration with prof. Biging at U.C. Berkeley), by means of a basic outranking multicriteria approach, being the main objective to obtain a fuzzy classification, hopefully more accurate to real earth surface data than standard classical crisp approaches.

Moreover, two members of the group (prof. Montero and González-Pachón) are organizing together with profs. G. Fernández-Barberis and M.C. Escribano (Universidad San Pablo-CEU) the next meeting of the European Working Group on Multicriteria Aid for Decisions (Madrid, 30-31 March, 2000), putting together the effort of three universities in Madrid (San Pablo-CEU, Politechnic and Complutense).

Selected list of publications (since 1995):

J. Montero, A. Pearman, J. Tejada: "Fuzzy multicriteria support for budget allocation in the transport sector". TOP 3 (1995), 47-68

V. Cutello, J. Montero: "Hierarchical aggregation of OWA operators: basic measures and related computational problems". Uncertainty, Fuzziness and Knowledge-Based Systems 3 (1995), 17-26

C. Manuel, J. Tejada: "Reciprocal cooperation in the prisoner's dilemma repeated with random horizon". TOP 3 (1995), 97-116

L.F. Escudero, T. Ortuno: "Comment on combinatorial optimization and small polytopes". TOP 4 (1996), 54-58

- V. Cutello, J. Montero, J. Yanez: "Structure functions with fuzzy states". *Fuzzy Sets and Systems* 82 (1996), 189-202
- L.F. Escudero, T. Ortuno: "On due-date based valid cuts for the sequential ordering problem". *TOP* 5 (1997), 159-166
- J. Yanez, T. Ortuno, B. Vitoriano: "A simulation approach to reliability analysis of weapon systems". *European Journal of Operational Research* 100 (1997), 216-224
- V. Cutello, J. Montero, J. Yanez: "Equivalence and compositions of fuzzy rationality measures". *Fuzzy Sets and Systems* 85 (1997), 31-43
- J. Montero, J. Tejada, V. Cutello: "A general model for deriving preference structures from data". *European Journal of Operational Research* 98 (1997), 98-110
- C. Fernández, J. Tejada, M. Carrasco: "Multivariate time series analysis in nosocomial infection surveillance: a case study". *Int. J. Epidemiology* 27 (1998), 282-288
- V. Cutello, J. Montero: "Non deterministic aggregation operators and systems". *Int. J. Intelligent Systems* 13 (1998), 181-192
- B. Vitoriano, M. Sánchez, M.I. Sobrón: "On the set covering polytope: facets with coefficients in  $\{0,1,2,3\}$ ". *Annals of Operations Research* 81 (1998), 343-356
- L.F. Escudero, T. Ortuno, M.C. Martínez: "On surrogate constraints based tightening approaches for 0-1 programs". *TOP* 7 (1999), 155-161
- J. González-Pachón, S. Ríos: "Mixture of maximal quasi orders: a new approach for preference modeling". *Theory and Decision* 47 (1999), 73-88
- J. González-Pachón, C. Romero: "Distance-based consensus methods: a goal programming approach". *Int. J. Management Science* 27 (1999), 341-347
- J. Yanez, J. Montero: "A poset dimension algorithm". *Journal of Algorithms* 30 (1999), 185-208
- V. Cutello, J. Montero: "Recursive connective rules". *Int. J. Intelligent Systems* 14 (1999), 3-20.