

## Guest Editorial

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# Special issue on intelligent technologies for planning and decision making under uncertainty

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One of the main challenges for intelligent decision technologies is to support decision making processes in which uncertainties about data, parameters or preferences are a major concern. The Operational Research and Computer Science communities have developed a large number of quite diverse models and software tools with this purpose in mind.

With the aim of gathering researchers presenting the most recent advances in these topics, the 25th Mini EURO Conference was held at the University of Coimbra, Portugal, 15–17 April 2010, on the theme “Uncertainty and Robustness in Planning and Decision Making”, with the support of the European Association of Operational Research Societies (EURO) and the COST Action “Algorithmic Decision Theory”. The conference provided a forum in which researchers coming from different scientific disciplines and backgrounds discussed case studies and methodological approaches to address uncertainty to obtain robust conclusions with applications in several domains, thus paving the way for a cross-fertilization between distinct areas concerning the treatment of uncertainty in planning and decision support models. An unexpected case study, the Eyjafjallajökull volcano eruption in Iceland occurring during the conference and causing an ash cloud that

closed most of Western Europe’s airspace, challenged many delegates on planning and decision making about when and how to return to their homes!

The authors of 77 communications contributed to the conference were invited to submit improved versions of their papers to this special issue, where they underwent a new rigorous refereeing process supervised by the guest editors. This special issue contains four papers resulting from this selection process (presented in alphabetical order of the first author), preceded by an invited review by the guest editors on dealing with uncertainty in Decision Support Systems, encompassing roughly the last decade.

In the paper “SA Tabu Miner – A Hybrid Heuristic Algorithm for Rule Induction”, Ivan Chorbev, Boban Joksimoski, and discovering Dragan Mihajlov address the problem of discovering unknown knowledge hidden in data, in a data mining context. The discovered knowledge is expressed in the form of IF-THEN rules. They present a new heuristic algorithm to extract knowledge in the form of classification rules, which is compared with other well-known data mining approaches. The authors incorporate uncertainty concepts (entropy and probabilities) in their search algorithm using a combined simulated annealing and tabu search approach.

A different type of uncertainty holds when it concerns the future. Lourenço and Santos, in their paper

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“Short-term load forecasting using a Gaussian Process Model – The influence of a derivative term in the input regressor”, address a forecasting problem in the context of the electrical distribution sector. They propose a regression methodology to predict the load in the system for the next hour, and test it on a real-load case-study. A Gaussian process model was used that provides not only the forecast but also information about confidence levels in the forecasts results.

The contribution “diviz: a software for modeling, processing and sharing algorithmic workflows in MC-DA”, by Patrick Meyer and Sébastien Bigaret, is focused on a software implementation of methods for multi-criteria decision aiding. The diviz software platform allows combining calculation components, from elementary formulas to complex algorithms, to define a workflow capable of obtaining the results sought by the software user. This is possible through a user-friendly interface and access to several web services. One of the advantages of the platform emphasized by its authors is that it facilitates solving problems using different input instances and different multi-criteria decision aiding methods, allowing to identify the conclusions that are more robust, thus coping with uncertainties in the mind of the decision maker about some input values or about the method that should be used.

In many cases, uncertainty can be mitigated by acquiring information. However, it is necessary to estimate whether this information is worthwhile to acquire, given the costs or resources involved. In the paper “Rational Value of Information Estimation for Measurement Selection”, authors David Tolpin and Solomon Eyal Shimony examine the trade-off between the accuracy of estimating the value of information (VOI) and the computational resources used for its estimation, under a probabilistic framework. They extend a greedy algorithm in order to reuse the computations of VOI estimations by recomputing the VOI only for the measurements more likely to have significant impact.

The guest editors would like to express their gratitude to all the authors who contributed to the conference and, especially, to those who have submitted their papers to this special issue. This gratitude is extended to the referees who collaborated in the revision of the papers. We are also indebted to Prof. Gloria Phillips-Wren, Prof. Lakhmi C. Jain, and Prof. Junzo Watada, Editors-in-Chief of IDT, for their friendly and careful support throughout this project.

The Guest Editors