

Proceedings of the Workshop on

**Uncertainty Management  
in Information Systems:  
From Needs to Solutions**

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## Foreword

This volume is the proceedings of the second meeting of the workshop on Uncertainty Management in Information Systems. This meeting was held in Avalon, California, in April 1993. The first meeting of this workshop was held in Puerto de Andraitx, Spain, in September 1992. The overall goals and format of this project are best described in the following extract from the foreword to the proceedings of the first meeting:

Uncertainty permeates real world scenarios, and must therefore be incorporated into every information system that attempts to provide a complete and accurate model of the real world. Yet, present generation information systems have limited capabilities in this regard. On the other hand, many theoretical models have been proposed for the management of uncertainty, but often without thorough understanding of the problems that are faced by researchers, developers, designers and users of information systems.

The aim of the workshop, entitled *Uncertainty Management in Information Systems: From Needs to Solutions* (UMIS), is to bring together leading researchers in the scientific communities of *information systems* (e.g., database systems, information retrieval systems, expert systems, office information systems) and *uncertainty modeling* (often working within frameworks such as mathematical logic, probability theory, fuzzy set theory, possibility theory, and evidential models) to study the needs of the information systems community and to tap the expertise of the uncertainty modeling community, for solutions that respond to these needs.

To assure maximal benefits from this exchange, this workshop will hold *two meetings*. This first meeting will focus on the *types of uncertainty* that are encountered in common applications, and on the *practical constraints* that must be considered by developers, designers and users of information systems. Thus, the purpose of this meeting is to advise the uncertainty modeling community of the needs and experience of the information systems community. An interim period of several months will then give the parties opportunity to consider the issues, and devise solutions that build on the experience of the information systems community and respond to its needs. The second meeting will consider various uncertainty models, and discuss their applicability and limitations. Thus, the workshop will examine past experience and present needs, but will also devise new solutions and energize future research.

We hope that this planning workshop will establish the state of the art in this field and set the course for future research, and that it will promote a true

dialogue between the two research communities and foster collaborations between researchers in the United States and Western Europe.

This volume contains contributions that were prepared for the second meeting. The first report is a general introduction to the area of uncertainty modeling. The next four reports describe uncertainty models that are based on specific theories: mathematical logic, fuzzy set and possibility theory, probability theory, and belief functions. The next two reports discuss and compare different approaches to uncertainty modeling. The eighth report is a survey of imperfect information in relational databases (it should have appeared in the first volume). Concluding this volume is an extensive bibliography on the management of uncertainty in information systems.

Together, this volume and the proceedings of the first meeting contain the preliminary versions of fifteen reports. Eventually, the final versions will be published in a book. In the meantime, these two volumes will assure timely dissemination of this material.

We are grateful to the researchers that accepted our invitation to participate in this project for their valuable contributions, in suggesting issues that should be discussed in this workshop, in writing reports and position papers, in reviewing the reports written by their fellow participants, and, most of all, in attending the meetings. The thirty researchers who attended the meetings were Philippe Besnard, Piero Bonissone, Alex Borgida, Patrick Bosc, Robert Demolombe, Alessandro D'Atri, Curtis Dyerson, Christos Faloutsos, Luis Fariñas del Cerro, Hector Garcia-Molina, David Heckerman, Max Henrion, Guy Hulin, Tony Hunter, Werner Kiessling, Rudolf Kruse, Abe Mamdani, Amihai Motro, Judea Pearl, Gregory Piatetsky-Shapiro, Alain Pirotte, Henri Prade, Doron Rotem, Avi Silberschatz, Philippe Smets, Jaap Suermondt, Howard Turtle, Maria Zemankova, Roberto Zicari, and Esteban Zimányi.

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