

Lecture Notes in Artificial Intelligence 4724

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

Khaled Mellouli (Ed.)

# Symbolic and Quantitative Approaches to Reasoning with Uncertainty

9th European Conference, ECSQARU 2007  
Hammamet, Tunisia, October 31 - November 2, 2007  
Proceedings

**Series Editors**

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA  
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

**Volume Editor**

Khaled Mellouli  
LARODEC  
Institut Supérieur de Gestion de Tunis  
41 Avenue de la liberté  
2000 Le Bardo, Tunisie  
E-mail: khaled.mellouli@ihec.rnu.tn

Library of Congress Control Number: 2007935607

CR Subject Classification (1998): I.2, F.4.1

LNCS Sublibrary: SL 7 – Artificial Intelligence

ISSN 0302-9743  
ISBN-10 3-540-75255-2 Springer Berlin Heidelberg New York  
ISBN-13 978-3-540-75255-4 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

[springer.com](http://springer.com)

© Springer-Verlag Berlin Heidelberg 2007  
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India  
Printed on acid-free paper SPIN: 12166039 06/3180 5 4 3 2 1 0

# Preface

These are the proceedings of the Ninth European Conference on Symbolic and Qualitative Approaches to Reasoning with Uncertainty, ECSQARU 2007, held in Hammamet (Tunisia), October 31, November 1–2 2007. The biannual ECSQARU conferences are a major forum for advances in the theory and practice of reasoning under uncertainty. The first ECSQARU conference was held in Marseille (1991), and since then it has been held in Granada (1993), Fribourg (1995), Bonn (1997), London (1999), Toulouse (2001), Aalborg (2003) and Barcelona (2005).

The papers gathered in this volume were selected out of 120 submissions from 25 countries, after a rigorous reviewing process by three Program Committee members and a restricted Program Committee. In addition to the regular presentations, the technical program of ECSQARU 2007 also included invited lectures by three outstanding researchers: Thierry Denoeux (Pattern Recognition and Information Fusion Using Belief Functions: Some Recent Developments), Salem Benferhat (Qualitative Models for Reasoning Under Uncertainty: From Non-monotonicity and Causality to Applications) and Anthony Hunter (Elements of Argumentation).

A special dedication to the memory of Philippe Smets, who collaborated with our team for several years and who gave full support to the organization of ECSQARU in Tunisia. In his memory we have organized a permanent special session grouping an overview of his main contributions in the artificial intelligence field.

Finally, I would like to thank the members of the Program Committee and all the additional referees for their valuable work. I also want to express my acknowledgment to all of my colleagues of the Organizing Committee for their support in making this conference successful.

July 2007

Khaled Mellouli

# Organization

ECSQARU 2007 was organized by Laboratoire de Recherche Operationnelle, de Decision et de Controle de Processus (LARODEC) and Tunisian Management Science Society (TMSS) (Institut Supérieur de Gestion Tunis, Tunisia).

## Executive Committee

Conference Chair	Khaled Mellouli (IHEC, Tunisia)
Organizing Committee	Nahla Ben Amor (ISG, Tunisia)
	Amel Ben Yaghlane (ISG, Tunisia)
	Boutheina Ben Yaghlane (IHEC, Tunisia)
	Zied Elouedi (ISG, Tunisia)
	Hajer Esseghir (ISG, Tunisia)
	Ilyes Jenhani (ISG, Tunisia)
	Fedia Khalfallah (FSEGT, Tunisia)

## Program Committee

Foued Ben Abdelaziz (Tunisia)	Angelo Gilio (Italy)
Nahla Ben Amor (Tunisia)	Lluis Godo (Spain)
Salem Benferhat (France)	Michel Grabisch (France)
Boutheina Ben Yaghlane (Tunisia)	Petr Hjek (Czech Republic)
Isabelle Bloch (France)	Andreas Herzog (France)
Philippe Besnard (France)	Eyke Hellermeier (Germany)
Gerd Brewka (Germany)	Anthony Hunter (UK)
Luis M. de Campos (Spain)	Audun Jøsang (Australia)
Carlos Chesevar (Spain)	Gabriele Kern-Isberner (Germany)
Giulianella Coletti (Italy)	Rudolf Kruse (Germany)
Fabio Cozman (Brazil)	Jrme Lang (France)
Adnan Darwiche (USA)	Jonathan Lawry (UK)
James P. Delgrande (Canada)	Pedro Larraaga (Spain)
Thierry Denoeux (France)	Churn-Jung Liau (Taiwan)
Habiba Drias (Algeria)	Weiru Liu (UK)
Marek Drzadzel (USA)	Thomas Lukasiewicz (Italy)
Didier Dubois (France)	Pierre Marquis (France)
Abdelkader El Kamel (France)	Serafn Moral (Spain)
Zied Elouedi (Tunisia)	Thomas Nielsen (Denmark)
Hlne Fargier (France)	Kristian Olesen (Denmark)
Linda van der Gaag (Netherlands)	Ewa Orlowska (Poland)
Hector Geffner (Spain)	Odile Papini (France)

## VIII Organization

Simon Parsons (USA)  
Lus Moniz Pereira (Portugal)  
Ramon Pino-Prez (Venezuela)  
David Poole (Canada)  
Henri Prade (France)  
Mohamed Ramdani (France)  
Abdelwahab Rebai (Tunisia)  
Maria Rifqi (France)  
Alessandro Saffiotti (Sweden)  
Sandra Sandri (Spain)  
Torsten Schaub (Germany)

Romano Scozzafava (Italy)  
Glenn Shafer (USA)  
Prakash P. Shenoy (USA)  
Guillermo Simari (Argentina)  
Claudio Sossai (Italy)  
Milan Studeny (Czech Republic)  
Leon van der Torre (Netherlands)  
Emil Weydert (Luxembourg)  
Mary-Anne Williams (Australia)  
Nevin L. Zhang (HK, China)

## Additional Reviewers

Carol Adam  
Teresa Alsinet  
Guillaume Aucher  
Gaetano Chemello  
Tao Chen  
Sylvie Coste-Marquis  
Patricia Everaere  
Rim Faiz  
Andrea Formesani  
Benoit Gaudou  
Martin Gebser  
Joanna Golinska-Pillarek  
Janusz Granat  
Juan Huete  
Robert Jeansoulin  
Jaber Jemai  
Mohamed Kissi

Sebastien Konieczny  
Ivan Kramosil  
Sylvain Lagrue  
Helge Langseth  
Dominique Longin  
Tsai-Ching Lu  
Jianbing Ma  
Sehl Mellouli  
Robert Mercer  
Matthias Steinbrecher  
Andzej Szalas  
Barbara Vantaggi  
Ivan Varzinczak  
Yi Wang  
Eric Wurbel  
Safa Yahi  
Adam Zagorecki

## Sponsoring Institutions

Tunisian Management Science Society (TMSS)  
Institut Supérieur de Gestion Tunis (ISG, Tunis)  
Institut des Hautes Etudes Commerciales de Carthage (IHEC, Carthage)

# Table of Contents

## Invited Talks

Pattern Recognition and Information Fusion Using Belief Functions: Some Recent Developments .....	1
<i>Thierry Denœux</i>	
Causality and Dynamics of Beliefs in Qualitative Uncertainty Frameworks .....	2
<i>Salem Benferhat</i>	
Elements of Argumentation .....	4
<i>Anthony Hunter</i>	

## Causal Networks

Causal Graphical Models with Latent Variables: Learning and Inference .....	5
<i>Stijn Meganck, Philippe Leray, and Bernard Manderick</i>	
Learning Causal Bayesian Networks from Incomplete Observational Data and Interventions .....	17
<i>Hanen Borchani, Maher Chaouachi, and Nahla Ben Amor</i>	

## Belief Revision and Inconsistency Handling

Measuring Inconsistency for Description Logics Based on Paraconsistent Semantics .....	30
<i>Yue Ma, Guilin Qi, Pascal Hitzler, and Zuoquan Lin</i>	
On the Dynamics of Total Preorders: Revising Abstract Interval Orders .....	42
<i>Richard Booth and Thomas Meyer</i>	
Approaches to Constructing a Stratified Merged Knowledge Base .....	54
<i>Anbu Yue, Weiru Liu, and Anthony Hunter</i>	
Syntactic Propositional Belief Bases Fusion with Removed Sets .....	66
<i>Julien Hue, Odile Papini, and Eric Wurbel</i>	
COBA 2.0: A Consistency-Based Belief Change System .....	78
<i>James P. Delgrande, Daphne H. Liu, Torsten Schaub, and Sven Thiele</i>	

An Algorithm for Computing Inconsistency Measurement by Paraconsistent Semantics .....	91
<i>Yue Ma, Guilin Qi, Pascal Hitzler, and Zuoquan Lin</i>	

How Dirty Is Your Relational Database? An Axiomatic Approach .....	103
<i>Maria Vanina Martinez, Andrea Pugliese, Gerardo I. Simari, V.S. Subrahmanian, and Henri Prade</i>	

## Logics Under Uncertainty

A Top-Down Query Answering Procedure for Normal Logic Programs Under the Any-World Assumption .....	115
<i>Umberto Straccia</i>	

Measure Logic .....	128
<i>Nebojsa Ikodinovic, Miodrag Raskovic, Zoran Markovic, and Zoran Ognjanovic</i>	

Weak Implication in Terms of Conditional Uncertainty Measures .....	139
<i>Giulianella Coletti, Romano Scozzafava, and Barbara Vantaggi</i>	

Language Invariance and Spectrum Exchangeability in Inductive Logic .....	151
<i>Jürgen Landes, Jeff Paris, and Alena Vencovská</i>	

Best Approximation of Ruspini Partitions in Gödel Logic .....	161
<i>Pietro Codara, Ottavio M. D'Antona, and Vincenzo Marra</i>	

A Logical Approach to Qualitative and Quantitative Reasoning .....	173
<i>Emad Saad</i>	

Description Logic Programs Under Probabilistic Uncertainty and Fuzzy Vagueness .....	187
<i>Thomas Lukasiewicz and Umberto Straccia</i>	

From DEL to EDL: Exploring the Power of Converse Events .....	199
<i>Guillaume Aucher and Andreas Herzig</i>	

## Argumentation Systems

Comparing Argumentation Semantics with Respect to Skepticism .....	210
<i>Pietro Baroni and Massimiliano Giacomin</i>	

An Algorithm for Computing Semi-stable Semantics .....	222
<i>Martin Caminada</i>	

The Logical Handling of Threats, Rewards, Tips, and Warnings .....	235
<i>Leila Amgoud, Jean-Francois Bonnefon, and Henri Prade</i>	

On the Acceptability of Incompatible Arguments.....	247
<i>Souhila Kaci, Leendert van der Torre, and Emil Weydert</i>	
Handling Ignorance in Argumentation: Semantics of Partial Argumentation Frameworks .....	259
<i>C. Cayrol, C. Devred, and M.C. Lagasquie-Schiex</i>	
Dialectical Proof Theories for the Credulous Prudent Preferred Semantics of Argumentation.....	271
<i>Caroline Devred and Sylvie Doutre</i>	
Towards an Extensible Argumentation System .....	283
<i>Adam Z. Wyner and Trevor J.M. Bench-Capon</i>	
Dialectical Explanations in Defeasible Argumentation .....	295
<i>Alejandro J. García, Nicolás D. Rotstein, and Guillermo R. Simari</i>	
Arguing over Actions That Involve Multiple Criteria: A Critical Review .....	308
<i>Wassila Ouerdane, Nicolas Maudet, and Alexis Tsoukias</i>	

## Belief Functions

Shared Ordered Binary Decision Diagrams for Dempster-Shafer Theory .....	320
<i>Norbert Lehmann</i>	
Cautious Conjunctive Merging of Belief Functions.....	332
<i>Sebastien Destercke, Didier Dubois, and Eric Chojnacki</i>	
Consonant Belief Function Induced by a Confidence Set of Pignistic Probabilities .....	344
<i>Astride Aregui and Thierry Denœux</i>	
On the Orthogonal Projection of a Belief Function .....	356
<i>Fabio Cuzzolin</i>	
On Latent Belief Structures .....	368
<i>Frédéric Pichon and Thierry Denœux</i>	
The DSm Approach as a Special Case of the Dempster-Shafer Theory .....	381
<i>Milan Daniel</i>	
Interpreting Belief Functions as Dirichlet Distributions .....	393
<i>Audun Jøsang and Zied Elouedi</i>	
Forward-Backward-Viterbi Procedures in the Transferable Belief Model for State Sequence Analysis Using Belief Functions .....	405
<i>Emmanuel Ramasso, Michèle Rombaut, and Denis Pellerin</i>	

Uncertainty in Semantic Ontology Mapping: An Evidential Approach . . . . .	418
<i>Najoua Laamari and Boutheina Ben Yaghlane</i>	

## Learning and Classification

Measures of Ruleset Quality Capable to Represent Uncertain Validity . . . . .	430
<i>Martin Holeňa</i>	
A Discriminative Learning Method of TAN Classifier . . . . .	443
<i>Qi Feng, Fengzhan Tian, and Houkuan Huang</i>	
Discriminative vs. Generative Learning of Bayesian Network Classifiers . . . . .	453
<i>Guzmán Santafé, Jose A. Lozano, and Pedro Larrañaga</i>	
PADUA Protocol: Strategies and Tactics . . . . .	465
<i>Maya Wardeh, Trevor Bench-Capon, and Frans Coenen</i>	
A Semi-naïve Bayes Classifier with Grouping of Cases . . . . .	477
<i>Joaquín Abellán, Andrés Cano, Andrés R. Masegosa, and Serafín Moral</i>	
Split Criterions for Variable Selection Using Decision Trees . . . . .	489
<i>Joaquín Abellán and Andrés R. Masegosa</i>	
Inference and Learning in Multi-dimensional Bayesian Network Classifiers . . . . .	501
<i>Peter R. de Waal and Linda C. van der Gaag</i>	
Combining Decision Trees Based on Imprecise Probabilities and Uncertainty Measures . . . . .	512
<i>Joaquín Abellán and Andrés R. Masegosa</i>	
Belief Classification Approach Based on Generalized Credal EM . . . . .	524
<i>Imene Jraidi and Zied Elouedi</i>	

## Bayesian Networks and Probabilistic Reasoning

Logical Compilation of Bayesian Networks with Discrete Variables . . . . .	536
<i>Michael Wachter and Rolf Haenni</i>	
Local Monotonicity in Probabilistic Networks . . . . .	548
<i>Johan Kwisthout, Hans Bodlaender, and Gerard Tel</i>	
Independence Decomposition in Dynamic Bayesian Networks . . . . .	560
<i>Ildikó Flesch and Peter Lucas</i>	

Average and Majority Gates: Combining Information by Means of Bayesian Networks .....	572
<i>Luis M. de Campos, Juan M. Fernández-Luna, Juan F. Huete, and Miguel A. Rueda-Morales</i>	
A Fast Hill-Climbing Algorithm for Bayesian Networks Structure Learning .....	585
<i>José A. Gámez, Juan L. Mateo, and José M. Puerto</i>	
On Directed and Undirected Propagation Algorithms for Bayesian Networks .....	598
<i>Christophe Gonzales, Khaled Mellouli, and Olfa Mourali</i>	

## Reasoning About Preferences

Lexicographic refinements of Sugeno Integrals .....	611
<i>Didier Dubois and Hélène Fargier</i>	
Algebraic Structures for Bipolar Constraint-Based Reasoning .....	623
<i>Hélène Fargier and Nic Wilson</i>	
A Revised Qualitative Choice Logic for Handling Prioritized Preferences .....	635
<i>Salem Benferhat and Karima Sedki</i>	
An Abstract Theory of Argumentation That Accommodates Defeasible Reasoning About Preferences .....	648
<i>Sanjay Modgil</i>	
Relaxing Ceteris Paribus Preferences with Partially Ordered Priorities .....	660
<i>Souhila Kaci and Henri Prade</i>	

## Reasoning and Decision Making Under Uncertainty

Conceptual Uncertainty and Reasoning Tools .....	672
<i>Bertil Rolf</i>	
Reasoning with an Incomplete Information Exchange Policy .....	683
<i>Laurence Cholvy and Stéphanie Roussel</i>	
Qualitative Constraint Enforcement in Advanced Policy Specification ...	695
<i>Alessandra Mileo and Torsten Schaub</i>	
A Qualitative Hidden Markov Model for Spatio-temporal Reasoning ....	707
<i>Zina M. Ibrahim, Ahmed Y. Tawfik, and Alioune Ngom</i>	
A Multiobjective Resource-Constrained Project-Scheduling Problem ....	719
<i>Fouad Ben Abdelaziz, Saoussen Krichen, and Olfa Dridi</i>	

## Game Theory

Extending Classical Planning to the Multi-agent Case: A Game-Theoretic Approach .....	731
<i>Ramzi Ben Larbi, Sébastien Konieczny, and Pierre Marquis</i>	

Dependencies Between Players in Boolean Games .....	743
<i>Elise Bonzon, Marie-Christine Lagasquie-Schiex, and Jérôme Lang</i>	

## Fuzzy Sets and Fuzzy Logic

The Use of Fuzzy t-Conorm Integral for Combining Classifiers .....	755
<i>David Štefka and Martin Holeňa</i>	
Integrated Query Answering with Weighted Fuzzy Rules .....	767
<i>Alexandros Chortaras, Giorgos Stamou, and Andreas Stafylopatis</i>	
On Decision Support Under Risk by the WOWA Optimization.....	779
<i>Włodzimierz Ogrzyczak and Tomasz Śliwiński</i>	
Transposing the Sociology of Organized Action into a Fuzzy Environment .....	791
<i>Sandra Sandri and Christophe Sibertin-Blanc</i>	

## Possibility Theory

An Axiomatization of Conditional Possibilistic Preference Functionals .....	803
<i>Didier Dubois, Hélène Fargier, and Barbara Vantaggi</i>	
Conflict Analysis and Merging Operators Selection in Possibility Theory .....	816
<i>Weiru Liu</i>	
Extending Description Logics with Uncertainty Reasoning in Possibilistic Logic .....	828
<i>Guilin Qi, Jeff Z. Pan, and Qiu Ji</i>	
Information Affinity: A New Similarity Measure for Possibilistic Uncertain Information .....	840
<i>Ilyes Jenhani, Nahla Ben Amor, Zied Elouedi, Salem Benferhat, and Khaled Mellouli</i>	

## Applications

Measuring the Quality of Health-Care Services: A Likelihood-Based Fuzzy Modeling Approach.....	853
<i>Giulianella Coletti, Luca Paulon, Romano Scozzafava, and Barbara Vantaggi</i>	

Automatic Indexing from a Thesaurus Using Bayesian Networks: Application to the Classification of Parliamentary Initiatives .....	865
<i>Luis M. de Campos, Juan M. Fernández-Luna, Juan F. Huete, and Alfonso E. Romero</i>	
A Genetic Programming Classifier Design Approach for Cell Images ....	878
<i>Aydin Akyol, Yusuf Yaslan, and Osman Kaan Erol</i>	
Use of Radio Frequency Identification for Targeted Advertising: A Collaborative Filtering Approach Using Bayesian Networks .....	889
<i>Esma Nur Cinicioglu, Prakash P. Shenoy, and Canan Kocabasoglu</i>	
Development of an Intelligent Assessment System for Solo Taxonomies Using Fuzzy Logic .....	901
<i>John Vrettaros, George Vouros, and Athanasios Drigas</i>	
<b>Author Index</b> .....	913