

SPECIAL ISSUE ON UNCERTAINTY PROCESSING

Uncertainty processing is one of the most important and challenging fields of artificial intelligence. There are few real applications in which knowledge is fully deterministic, i.e. representable by means of classic logic. The last few decades gave rise to several alternative theories for uncertainty modelling, and many international conferences and workshops have been devoted to this topic. One of them is the *Workshop on Uncertainty Processing* (WUPES, formerly the Workshop on Uncertainty Processing in Expert Systems), held every three years since 1988 in the Czech Republic.

This special issue of *Kybernetika* is devoted to selected papers from the 4th Workshop on Uncertainty Processing (WUPES'97), held in Prague during January 22–25, 1997. The meeting was attended by about 40 participants from eight European countries; more than 20 mostly one-hour lectures were presented. As in previous years, the participants created an informal working atmosphere, in which the discussions both during the lectures and at moments of leisure constitute a substantial part of the scientific programme. Though we can not reproduce these discussions for the readers, they are not completely deprived of these discussions, as several authors incorporated some points raised in these discussions into their contributions.

It need not be stressed that selecting the papers was not an easy task. The selection process was organized and carried out by the Programme Committee, composed of Ivan Kramosil (Czech Republic), Peter Naeve (Germany), Romano Scozzafava (Italy) and Philippe Smets (Belgium), to whom we want to express our gratitude. We also want to thank the other reviewers: Michael Goldstein, Jiří Grim, David Spiegelhalter and Joe Wittacker, who contributed significantly to the quality of the presented papers. The selection was based not only on quality, but the goal was also to provide the reader with a consistent and representative perspective on the issues discussed at the workshop. The Programme Committee therefore did not select two papers — *Definition and Approximation of Probabilistic Measures by Boolean-Valued Possibilistic Measures* by Ivan Kramosil, and *Probability Assessment on Hyperstructure of Events* by Antonio Mauro — because they would have been too long if written at a similar level of explanation as others. Their authors were invited to publish their papers in a future issue of this journal.

Though the participants to WUPES were from eight European countries, the authors of the presented papers are primarily from the Czech Republic and Italy (the only exception is Bernhard Strohmeier from Germany, whose co-author is from

Prague). And yet these papers deal with a great variety of problems of uncertainty processing, and employ many different theoretical approaches. More than one half of them deal with problems of modelling uncertainty by different probabilistic methods, which corresponds to the reality that, historically these two countries have a strong tradition in probability theory. In Italy, the strong influence of de Finetti is quite natural. His concept of coherence appears in the paper by Gilio and Ingrassia, who study the problem of computation with imprecisely given probabilities of conditional events. The paper by Vejnarová deals with the marginal problem with interval valued probabilities; this work represents another point of view on imprecisely given probabilities. The marginal problem is one of the repeating problems in this field, since it is one way to formalize what the artificial intelligence community calls the *knowledge integration* process. Thus it is not surprising that another paper deals with this topic; Kříž describes how to generalize the marginal problem to conditional probabilities. Quite another approach to knowledge integration appears in the paper by Janžura and Boček, who present a technique based on the newly popular Markov Chain Monte Carlo method.

An extremely interesting paper is that by Coletti and Scozzafava, who break down taboos of some (perhaps too practically oriented) researchers, by dealing with conditioning by events of zero probability. The last paper belonging to the group of purely probabilistic papers is that by Matúš and Strohmeier. They introduce a new type of factorization of probability distributions by directed, but not necessarily acyclic, graphs.

The rest of the papers are those going beyond the framework of probability theory. The algebraic approach of Daniel derives from the algebraic way of handling uncertainty in compositional expert systems. The other algebraic approach, presented by Capotorti, Coletti and Vantaggi, solves the problem when a preference relation on events can be represented as lower or upper probabilities. The wide variety of topics is concluded by the remaining two papers, which are of a more philosophical character, discussing different types of uncertainty and dependence. This concerns mainly the paper by Baroni, Guida and Mussi, whereas the paper by Navara and Pták proposes a solution in the framework of different fuzzy logics.

Concluding these editorial comments, we would like to thank the local organizers of the workshop, Ivana Gálová, Milan Studený, Jiřina Vejnarová and Jan Vyšehradský. The Czech–Austrian cooperation was supported by the programme AKTION of cooperation in science and technology between the Czech Republic and Austria within the project 7p3 *Constructing Bayesian Networks from Incomplete Information*. The workshop was supported also by Bank Austria.