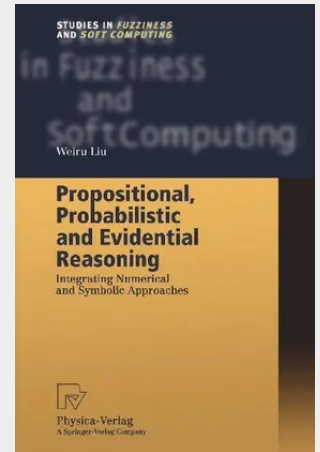


Propositional, Probabilistic and Evidential Reasoning

Integrating Numerical and Symbolic Approaches

How to draw plausible conclusions from uncertain and conflicting sources of evidence is one of the major intellectual challenges of Artificial Intelligence. It is a prerequisite of the smart technology needed to help humans cope with the information explosion of the modern world. In addition, computational modelling of uncertain reasoning is a key to understanding human rationality. Previous computational accounts of uncertain reasoning have fallen into two camps: purely symbolic and numeric. This book represents a major advance by presenting a unifying framework which unites these opposing camps. The Incidence Calculus can be viewed as both a symbolic and a numeric mechanism. Numeric values are assigned indirectly to evidence via the possible worlds in which that evidence is true. This facilitates purely symbolic reasoning using the possible worlds and numeric reasoning via the probabilities of those possible worlds. Moreover, the indirect assignment solves some difficult technical problems, like the combination of dependent sources of evidence, which had defeated earlier mechanisms. Weiru Liu generalises the Incidence Calculus and then compares it to a succession of earlier computational mechanisms for uncertain reasoning: Dempster-Shafer Theory, Assumption-Based Truth Maintenance, Probabilistic Logic, Rough Sets, etc. She shows how each of them is represented and interpreted in Incidence Calculus. The consequence is a unified mechanism which includes both symbolic and numeric mechanisms as special cases. It provides a bridge between symbolic and numeric approaches, retaining the advantages of both and overcoming some of their disadvantages.

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