Probabilistic Reasoning in Intelligent Systems

Description: Probabilistic Reasoning in Intelligent Systems is a complete and accessible account of the theoretical foundations and computational methods that underlie plausible reasoning under uncertainty. The author provides a coherent explication of probability as a language for reasoning with partial belief and offers a unifying perspective on other AI approaches to uncertainty, such as the Dempster-Shafer formalism, truth maintenance systems, and nonmonotonic logic.

The author distinguishes syntactic and semantic approaches to uncertainty—and offers techniques, based on belief networks, that provide a mechanism for making semantics-based systems operational. Specifically, network-propagation techniques serve as a mechanism for combining the theoretical coherence of probability theory with modern demands of reasoning-systems technology: modular declarative inputs, conceptually meaningful inferences, and parallel distributed computation. Application areas include diagnosis, forecasting, image interpretation, multi-sensor fusion, decision support systems, plan recognition, planning, speech recognition—in short, almost every task requiring that conclusions be drawn from uncertain clues and incomplete information.

Probabilistic Reasoning in Intelligent Systems will be of special interest to scholars and researchers in AI, decision theory, statistics, logic, philosophy, cognitive psychology, and the management sciences. Professionals in the areas of knowledge-based systems, operations research, engineering, and statistics will find theoretical and computational tools of immediate practical use. The book can also be used as an excellent text for graduate-level courses in AI, operations research, or applied probability.

Contents:
- Chapter 1  Uncertainty In AI Systems: An Overview
- Chapter 2  Bayesian Inference
- Chapter 3  Markov and Bayesian Networks: Two Graphical Representations of Probabilistic Knowledge
- Chapter 4  Belief Updating by Network Propagation
- Chapter 5  Distributed Revision of Composite Beliefs
- Chapter 6  Decision and Control
- Chapter 7  Taxonomic Hierarchies, Continuous Variables, and Uncertain Probabilities
- Chapter 8  Learning Structure from Data
- Chapter 9  Non-Bayesian Formalisms for Managing Uncertainty
- Chapter 10  Logic and Probability: The Strange Connection

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