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# Bayesian Networks and Decision Graphs

**Series: Information Science and Statistics**

- Gives a well-founded practical introduction to Bayesian networks
- Includes presentation of the most efficient algorithm for solving influence diagrams

Probabilistic graphical models and decision graphs are powerful modeling tools for reasoning and decision making under uncertainty. As modeling languages they allow a natural specification of problem domains with inherent uncertainty, and from a computational perspective they support efficient algorithms for automatic construction and query answering. This includes belief updating, finding the most probable explanation for the observed evidence, detecting conflicts in the evidence entered into the network, determining optimal strategies, analyzing for relevance, and performing sensitivity analysis. The book introduces probabilistic graphical models and decision graphs, including Bayesian networks and influence diagrams. The reader is introduced to the two types of frameworks through examples and exercises, which also instruct the reader on how to build these models. The book is a new edition of Bayesian Networks and Decision Graphs by Finn V. Jensen. The new edition is structured into two parts. The first part focuses on probabilistic graphical models. Compared with the previous book, the new edition also includes a thorough description of recent extensions to the Bayesian network modeling language, advances in exact and approximate belief updating algorithms, and methods for learning both the structure and the parameters of a Bayesian network. The second part deals with decision graphs, and in addition to the frameworks described in the previous edition, it also introduces Markov decision processes and partially ordered decision problems. The authors also provide a well-founded practical introduction to Bayesian networks, object-oriented Bayesian networks, decision trees, influence diagrams (and variants hereof), and Markov decision processes. give practical advice on the construction of Bayesian networks, decision trees, and influence diagrams from domain knowledge. < give several examples and exercises exploiting computer systems for dealing with Bayesian networks and decision graphs. present a thorough introduction to state-of-the-art solution and analysis algorithms.

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