Cabañas, Rafael; **Antonucci, Alessandro**; **Cano, Andrés**; **Gómez-Olmedo, Manuel**
Evaluating interval-valued influence diagrams. (English) Zbl 1401.68319
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Summary: Influence diagrams are probabilistic graphical models used to represent and solve sequential decision problems under uncertainty. Sharp numerical values are required to quantify probabilities and utilities. This might be an issue with real models, whose parameters are typically obtained from expert judgments or partially reliable data. We consider an interval-valued quantification of the parameters to gain realism in the modeling and evaluate the sensitivity of the inferences with respect to perturbations in the sharp values of the parameters. An extension of the classical influence diagrams formalism to support such interval-valued potentials is presented. The variable elimination and arc reversal inference algorithms are generalized to cope with these models. At the price of an outer approximation, the extension keeps the same complexity as with sharp values. Numerical experiments show improved performances with respect to previous methods. As a natural application, we propose these models for practical sensitivity analysis in traditional influence diagrams. The maximum perturbation level on single or multiple parameters preserving the optimal strategy can be computed. This allows the identification of the parameters deserving a more careful elicitation.

MSC:

68T37 Reasoning under uncertainty in the context of artificial intelligence
62C05 General considerations in statistical decision theory

Keywords:

influence diagrams; Bayesian networks; credal networks; probability intervals; sequential decision making; sensitivity analysis

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