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A concept for the evolution of relational probabilistic belief states and the computation of their changes under optimum entropy semantics. (English) Zbl 1401.68326

J. Appl. Log. 13, No. 4, Part 1, 414-440 (2015).

Summary: Coping with uncertain knowledge and changing beliefs is essential for reasoning in dynamic environments. We generalize an approach to adjust probabilistic belief states by use of the relative entropy in a propositional setting to relational languages, leading to a concept for the evolution of relational probabilistic belief states. As a second contribution of this paper, we present a method to compute the corresponding belief state changes by considering a dual problem and present first application and experimental results. The computed belief state usually factorizes and we explain how the factorization can be exploited to store the belief state more compactly and to simplify its computation by exploiting equivalences of worlds. Finally, we present results on the computational complexity of determining equivalence classes.

MSC:

68T37 Reasoning under uncertainty in the context of artificial intelligence
03B42 Logics of knowledge and belief (including belief change)
03B48 Probability and inductive logic
68T30 Knowledge representation

Keywords:

probabilistic logic; conditional logic; relational conditional; first-order knowledge base; maximum entropy; minimum relative entropy; belief state; belief change; iterative belief changes; computation of belief changes

Software:

L-BFGS; L-BFGS-B; LBFGS-B

Full Text: DOI

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