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**Inference using compiled min-based possibilistic causal networks in the presence of interventions.** (English) [Zbl 1315.68233](#)

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**Summary:** Qualitative possibilistic causal networks are important tools for handling uncertain information in the possibility theory framework. Contrary to possibilistic networks, the compilation principle has not been exploited to ensure causal reasoning in the possibility theory framework. This paper proposes mutilated-based inference approaches and augmented-based inference approaches for qualitative possibilistic causal networks using two compilation methods. The first one is a possibilistic adaptation of the probabilistic inference approach and the second is a purely possibilistic approach based on the transformation of the graphical-based representation into a logic-based one. Each of the proposed methods encodes the network or the possibilistic knowledge base into a propositional base and compiles this output in order to efficiently compute the effect of both observations and interventions. This paper also reports on a set of experimental results showing cases in which augmentation outperforms mutilation under compilation and vice versa.

**MSC:**

[68T37](#) Reasoning under uncertainty in the context of artificial intelligence

[62H86](#) Multivariate analysis and fuzziness

Cited in 1 Document

**Keywords:**

[possibilistic inference](#); [min-based possibilistic causal networks](#); [compilation techniques](#)

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**References:**

- [1] R. Ayachi, N. Ben Amor, S. Benferhat, Compiling min-based possibilistic causal networks: a mutilated-based approach, in: Proceedings of European Conference of Symbolic and Quantitative Approaches to Reasoning and Uncertainty, Belfast-UK, 2011, pp. 700-712. · [Zbl 1341.68236](#)
- [2] R. Ayachi, N. Ben Amor, S. Benferhat, R. Haenni, Compiling possibilistic networks: alternative approaches to possibilistic inference, in: Proceedings of Uncertainty on Artificial Intelligence, AUA I Press, 2010, pp. 40-47.
- [3] Benferhat, S.; Dubois, D.; Garcia, L.; Prade, H., On the transformation between possibilistic logic bases and possibilistic causal networks, Int. J. Approx. Reason., 29, 135-173, (2002) · [Zbl 1015.68204](#)
- [4] S. Benferhat, S. Smaoui, Possibilistic causal networks for handling interventions: a new propagation algorithm, in: Proceedings of the National Conference on Artificial Intelligence, 2007, pp. 373-378.
- [5] Benferhat, S.; Smaoui, S., Inferring interventions in product-based possibilistic causal networks, Fuzzy Sets Syst., 169, 26-50, (2011) · [Zbl 1214.68395](#)
- [6] S. Benferhat, S. Yahi, H. Drias, On the compilation of stratified belief bases under linear and possibilistic logic policies, in: Proceedings of the 20th international joint conference on Artificial intelligence, Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2007, pp. 2425-2430.
- [7] C. Borgelt, J. Gebhardt, R. Kruse, Proceedings of International School for the Synthesis of Expert Knowledge. Possibilistic Graphical Models, Italy, 1998.
- [8] Cadoli, M.; Donini, F., A survey on knowledge compilation, AI Communications, 3-4, 137-150, (1997)
- [9] M. Chavira, A. Darwiche, Compiling Bayesian networks with local structure, in: Proceedings of the International Joint Conference on Artificial Intelligence, 2005, pp. 1306-1312.
- [10] M. Chavira, A. Darwiche, Compiling Bayesian networks using variable elimination, in: Proceedings of the International Joint Conference on Artificial Intelligence, 2007, pp. 2443-2449.
- [11] Darwiche, A., Decomposable negation normal form, J. ACM, 48, 608-647, (2001) · [Zbl 1127.03321](#)
- [12] A. Darwiche, A compiler for deterministic, decomposable negation normal form, in: Proceedings of the 18th National Conference on Artificial Intelligence (AAAI), AAAI Press, Menlo Park, CA, 2002, pp. 627-634.
- [13] A. Darwiche, A logical approach to factoring belief networks, in: Proceedings of Knowledge Representation, 2002, pp. 409-420.
- [14] A. Darwiche, New advances in compiling CNF to decomposable negational normal form, in: Proceedings of European Con-

ference on Artificial Intelligence, 2004, pp. 328-332.

- [15] Darwiche, A., Modeling and reasoning with Bayesian networks, (2009), Cambridge University Press New York, NY, USA · [Zbl 1231.68003](#)
- [16] Darwiche, A.; Marquis, P., A knowledge compilation map, *J. Artif. Intell. Res.*, 17, 229-264, (2002) · [Zbl 1045.68131](#)
- [17] Dubois, D.; Prade, H., Possibility theory an approach to computerized, processing of uncertainty, (1988), Plenum Press New York
- [18] Dubois, D.; Prade, H., Possibility theory, (Meyers, R. A., Encyclopedia of Complexity and Systems Science, (2009), Springer), 6927-6939
- [19] H. Fargier, P. Marquis, On valued negation normal form formulas, in: Proceedings of the International Joint Conference on Artificial Intelligence, San Francisco, CA, USA, 2007, pp. 360-365.
- [20] A. Feldman, J. Pietersma, A. Gemund, All Roads Lead to Fault Diagnosis: Model-Based Reasoning with Lydia, in: Proceedings of the 8th Belgium-Netherlands Conference on Artificial Intelligence, 2006, pp. 123-131.
- [21] M. Goldszmidt, J. Pearl, Rank-based systems: a simple approach to belief revision, belief update, and reasoning about evidence and actions, in: Proceedings of Knowledge Representation, 1992, pp. 661-672.
- [22] Hisdal, E., Conditional possibilities independence and non interaction, *Fuzzy Sets Syst.*, 1, (1978) · [Zbl 0393.94050](#)
- [23] Pearl, J., Causality models, causality and intervention, *Stat. Sci.*, 8, (1993)
- [24] Pearl, J., Causality models, reasoning and inference, (2000), Cambridge University Press
- [25] Shafer, G., Mathematical theory of evidence, (1976), Princeton University Press · [Zbl 0359.62002](#)
- [26] Smaoui, S., Réseaux possibilistes hybrides: représentation des interventions et algorithmes, (2007), Université d'Artois
- [27] Smets, P., Belief functions, (Smets, P.; Mandani, A.; Dubois, H. P.D., Non Standard Logics for Automated Reasoning, (1988), Academic Press London), 253-286
- [28] Smets, P.; Kennes, R., The transferable belief model, *Artif. Intell.*, 66, 191-234, (1990) · [Zbl 0807.68087](#)
- [29] W. Spohn, A general non-probabilistic theory of inductive reasoning, in: Proceedings of Uncertainty in Artificial Intelligence, Elsevier Science Publishing Company, Inc., New York, NY, 1988, pp. 149-158.
- [30] W. Spohn, Ordinal conditional functions: a dynamic theory of epistemic states causation in decision, in: W. Harper, B. Skyrms (Eds.), Belief Changes and Statistics, Kluwer Academic Publishers, 1988, pp. 105-134.
- [31] Zadeh, L. A., Fuzzy sets, *Inf. Control*, 8, 338-353, (1965) · [Zbl 0139.24606](#)

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