

assumes marginal independence between inputs. This demonstrates that the importance of updating formulas can outweigh that of prior assumptions. Thus, when UISs are judged by their final accuracy after optimization, completely different results are obtained than when they are judged by whether or not their prior assumptions are perfectly satisfied.

Structuring Causal Tree Models with Continuous Variables

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This paper considers the problem of invoking auxiliary, unobservable variables to facilitate the structuring of causal tree models for a given set of continuous variables. Paralleling Pearl's 1986 treatment of bivalued variables, it is shown that if a collection of coupled variables are governed by a joint normal distribution and a tree-structured representation exists, then both the topology and all internal relationships of the tree can be uncovered by observing pairwise dependencies among the observed variables (i.e., the leaves of the tree). Furthermore, the conditions for normally distributed variables are less restrictive than those governing bivalued variables. The result extends the applications of causal tree models that were found useful in evidential reasoning tasks.

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Implementing Evidential Reasoning in Expert Systems

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The Dempster-Shafer theory has been extended recently for its application to expert systems. However, implementing the extended D-S reasoning model in rule-based systems greatly complicates the task of generating informative explanations. By implementing GERTIS, a prototype system for diagnosing rheumatoid arthritis, it is shown that two kinds of knowledge are essential for explanation generation: (1) taxonomic class relationships between hypotheses and (2) pointers to the rules that significantly contribute to belief in the hypothesis. As a result, the knowledge represented in GERTIS is richer and more complex than that of conventional rule-based systems. GERTIS not only demonstrates the feasibility of rule-based evidential reasoning systems, but also suggests ways to generate better explanations and to explicitly represent various useful relationships among hypotheses and rules.

Can Evidence Be Combined in the Dempster-Shafer Theory?

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