BELIEF FUNCTIONS BASED ON PARAMETER AND STRUCTURE LEARNING OF BAYESIAN NETWORKS IN THE PRESENCE OF MISSING DATA*

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ABSTRACT

Existing methods of parameter and structure learning of Bayesian Networks (BNs) from a database assume that the database is complete. If there are missing values, they are assumed to be missing at random. This paper incorporates the concepts used in Dempster-Shafer theory of belief functions to learn both the parameters and structure of BNs. Instead of filling the missing values by their estimates, as it is done in the conventional techniques, the proposed approach models the missing values as representing ignorance or lack of belief of a system modeler in the actual state of the corresponding variables. The proposed representation modifies the existing algorithms for parameter and structure learning of BNs. The representation also allows a system modeler to add new findings in terms of support functions as used in belief functions theory; thus, providing a richer way to enter evidence in BNs.

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