Solutions for Bayesian networks and decision graphs (second edition)

Finn V. Jensen and Thomas D. Nielsen

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Solution for exercise 8.1

The only indepencies you get are $I(MH, FC)$ and $I(MH, SC)$.

Rule 1 yields $MH \rightarrow BH \leftarrow FC$ and $MH \rightarrow BH \leftarrow SC$. the link $FC - SC$ can be directede either way.

Solution for exercise 8.2

Solution for exercise 8.3

The conditional mutual information for the three pairs of variables are $MI(MH, FC|BH) = 0.9121$, $MI(MH, SC|BH) = 0.8253$, and $MI(FC, SC|BH) = 0.8253$. Hence, there are two possible maximal-weight spanning trees: $MH - FC - SC$ and $SC - MH - FC$. By taking outset in the structure in Figure 8.4, the classifier (with ML parameter estimates) would assign probability 0 to the case $MH = 1a$, $FC = 1$, and $SC = 1$ (see Hugin network 8.3a). If we instead use Bayesian parameter estimates, the classifier would return the class label dr (see the Hugin network 8.3b).

Solution for exercise 8.4

Solution for exercise 8.5

We have $Ent(A|C = 1) = 0.9986$ and $Ent(A|C = 2) = 0.9183$, and the expected entropy of A given C is 0.9760.

For the variable B we have $Ent(A|B = 1) = 0.9576$, $Ent(A|B = 2) = 0$. The expected entropy of A given B is 0.8678. We conclude that B is the first variable in the tree.

When $B = 1, C = 1$ we have 11 cases with $A = 1$ and 12 with $A = 2$; when $B = 1, C = 2$ all cases have $A = 2$. That is, the answer is $A = 2$ regardles the value of C.

With $B = 2$, all cases have $A = 1$, and the answer is $A = 1$ regardless the value of C.