HOMEWORK ASSIGNMENT #7

DUE: Wednesday, April 22, 2016
CSCI573: Probabilistic Reasoning
Spring Semester, 2015

This assignment is to compute some steps of an EM algorithm for a simple Bayesian Network. Let us take the network given in Figure 19.6 of the book. Let us assume that data instances are available, consisting of $<a^0,?,?,d^1>$ and $<?,b^1,?,d^0>$ (note these are similar to Example 19.2.2.2 but the values have been changed). Also assume that initial parameters, $\boldsymbol{\theta}$, are as in the example (middle of page 870).

The task is now to apply one step of the EM algorithm to compute new parameter values, $\boldsymbol{\theta}'$. As the number of hidden variables is small, we can do data completion, as in book's calculations of page 870 but it is suggested that you use the method of section 19.2.2.3 (same as Algorithm 19.2) instead. As the network is small, you can do the needed probability inference calculations by hand; you may use any method you find convenient, it is not necessary to apply clique-tree or another specific algorithm.

Optional (no credit): verify that the likelihood of observed data is higher (at least not lower) by using $\boldsymbol{\theta}'$ compared to the initial parameters given by $\boldsymbol{\theta}$. This essentially requires a second round of doing inferences using the new parameters.