Exercise Sheet 7

Exercise 22 Probabilistic Propagation

Consider the following Bayesian network and the corresponding (conditional) probability distributions:

(Λ)							
(A)	P(A)	a_1	a_2		P(B A)	a_1	a_2
(B)		0.6	0.4		b_1	0.3	0.7
					b_2	0.7	0.3
(C) (D)	r	1		1			
\smile \downarrow	P(C B)	b_1	b_2		P(D B)	b_1	b_2
(E)	c_1	0.6	0.2		d_1	0.9	0.4
<u> </u>	c_2	0.4	0.8		d_2	0.1	0.6
					P(E D)	d_1	d_2
					e_1	0.75	0.5
					e_2	0.25	0.5

- a) Determine the a-priori distribution for all four variables!
- b) It becomes evident that variable D assumes value d_2 . Propagate this evidence across the network with the tree-based propagation algorithm presented in the lecture, i.e., compute all four a-posteriori distributions!

 e_2

b) After some time we get additional evidence about A. Assume a_2 being the observed value of A and propagate the evidence across the network with the tree-based propagation algorithm presented in the lecture. Which a-posteriori distributions are influenced by the additional evidence?

Exercise 23 Construction of Clique Trees



Construct stepwise for the depicted Bayesian network

- a) the moral graph,
- b) a triangulated moral graph,
- c) a perfect ordering using maximum cardinality search, and
- d) a cliquen tree/join tree!

At which steps of the construction do you have multiple options to proceed? Show that the resulting cliquen tree/join tree fulfills the running intersection property.

Exercise 24 Triangulation and Joint Tree Construction

Given the following three undirected graphs:



- a) Check which graphs are triangulated! Try to recognize this without applying the triangulation algorithm from the lecture.
- b) Triangulate the graphs that are not yet triangulated and determine for each of them a join tree!