Exercise Sheet 6
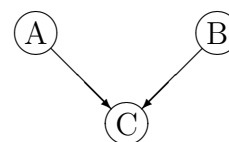
Exercise 19   Bayesian Networks

Consider the following three-dimensional probability distribution:

| p_{ABC}	$A = a_1$		$A = a_2$	
	$B = b_1$	$B = b_2$	$B = b_1$	$B = b_2$
$C = c_1$	$4/24$	$3/24$	$3/24$	$2/24$
$C = c_2$	$2/24$	$3/24$	$3/24$	$4/24$

Check whether the graph depicted next to the table can be the underlying network structure describing the distribution! If yes, specify the probability distributions that are needed to define the Bayesian network!

Exercise 20   Bayesian Networks

Consider the following four-dimensional probability distribution:

p_{ABCD}		$A = a_1$		$A = a_2$	
		$B = b_1$	$B = b_2$	$B = b_1$	$B = b_2$
$C = c_1$	$D = d_1$	$16/82$	$4/82$	$4/82$	$4/82$
	$D = d_2$	$4/82$	$1/82$	$4/82$	$4/82$
$C = c_2$	$D = d_1$	$4/82$	$4/82$	$1/82$	$4/82$
	$D = d_2$	$4/82$	$4/82$	$4/82$	$16/82$
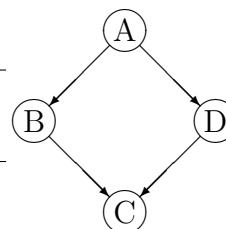
Check whether the graph depicted next to the table can be the underlying network structure describing the distribution! If yes, specify the probability distributions that are needed to define the Bayesian network!

Exercise 21   Probabilistic Propagation

Consider the following Bayesian network and the corresponding (conditional) probability distributions:
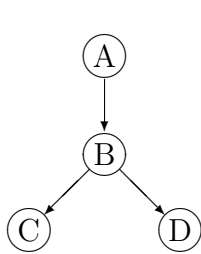
$P(A)$	a_1	a_2
	0.4	0.6

$P(B\|A)$	a_1	a_2
b_1	0.1	0.6
b_2	0.9	0.4

$P(C\|B)$	b_1	b_2
c_1	0.4	0.8
c_2	0.6	0.2

$P(D\|B)$	b_1	b_2
d_1	0.7	0.2
d_2	0.3	0.8

a) Determine the a-priori distribution for all four variables!

b) It becomes evident that variable C assumes value c_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!