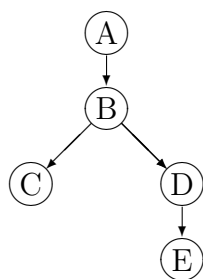## Exercise Sheet 7

Exercise 22   Probabilistic Propagation

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

$P(A)$	a_1	a_2
	0.6	0.4

| $P(B\|A)$	a_1	a_2
b_1	0.3	0.7
b_2	0.7	0.3

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

$P(D\|B)$	b_1	b_2
d_1	0.9	0.4
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!

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
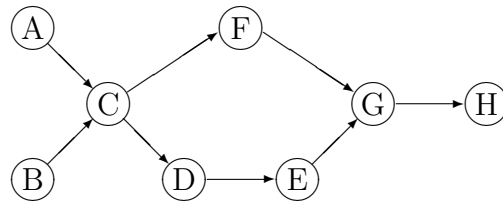
Construct stepwise for the depicted Bayesian network

  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:
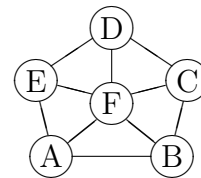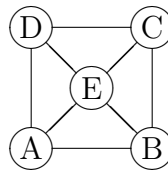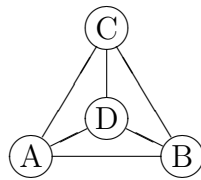
  a) Check which graphs are triangulated! Try to recognize this without applying the triangulation algorithm from the lecture.

  b) Triangulate the graphs that are not yet triangulated and determine for each of them a join tree!