Übung Bayessche Netze SS 2010
Wirtschaftsinformatik und Maschinelles Lernen (ISMLL)
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Übung 4

Markov Networks (1.)

Lösungen bitte via Moodle / learnweb, bis zum 08.06.2010, einreichen.

Aufgabe 1 Perfect ordering (10 Points)

a) [5 pts.] Let *G* denote a complete graph with *n* vertexes. How many different perfect orderings does *G* have?

b) [5 pts.] Does the graph in
   a. Figure 1
   b. Figure 2

   have a perfect ordering? If yes, show a perfect ordering. If not, prove why it does not have any perfect ordering.

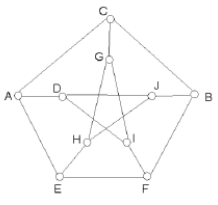


Fig.1. (Petersen Graph)

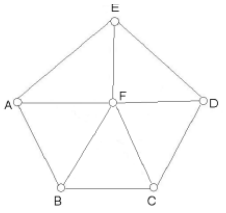


Fig.2.

Aufgabe 2 Bayesian Networks (10 Points)

Suppose we are given the following independence model:
I={ i(A, B | C), i(B, A | C), i(A, B | D), i(B, A | D),
i(A,{B C} | D), i({B,C}, A | D), i(A, C | D), i(C, A | D),
i(A, B | {C, D}), i(B, A | {C, D}), i(A, C | {B, D}), i(C, A | {B, D})
i(A, {B,C} | D), i({B,C}, A | D) }

a) [6 pts.] What is the minimal directed representation (Bayesian network) of this independence model, if the ordering of the vertexes is

   a. A, B, C, D
   b. D, C, B, A ?

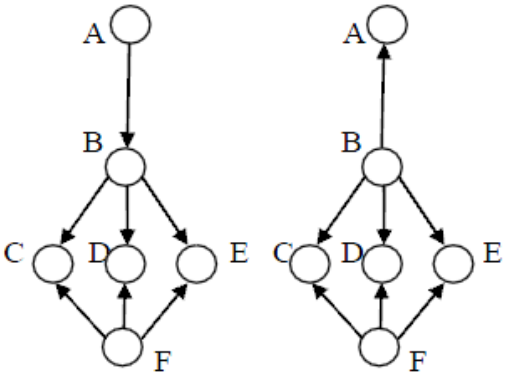
   Is it unique?

b) [4 pts.] Factorize the JDP *p*(A,B,C,D) according to the Bayesian networks constructed in the previous task.

Aufgabe 3 Markov equivalence (10 Points)

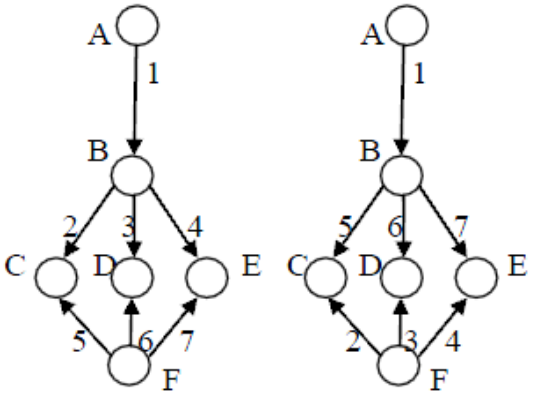
a) [5 pts.] How can you interpret Markov equivalence? Why is it interesting (important) whether two graphs are Markov equivalent or not? How is it related to causal interpretation of DAG-representation of independence models?

b) [5 pts.] Are the following graphs Markov equivalent? If your answer is yes, depict the DAG-pattern of the Markov equivalence class they belong to? If your answer is no, justify your answer!



Aufgabe 4 Topological edge ordering (10 Points)

a) [5 pts.] Which of the following edge orderings is a topological edge ordering?



b) [5 pts.] How can you describe what a topological edge ordering means?