The University of Texas at Dallas
CS 6364
Artificial Intelligence
Fall 2020
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Homework 4: 100 points
Issued November 9, 2020
Due November 25, 2020 before midnight
Submit only in eLearning

PROBLEM 1: Qualifying Uncertainty (**20 points**)
Problem 13.21 from the Textbook at page 509. (It should start with (Adapted from Pearl (1988)). Suppose you are a witness to a nightime….

(a) 10 points
(b) 10 points

PROBLEM 2: Naïve Bayesian Reasoning (**25 points**)

Consider a traveler that wants to climb the Everest. He gets to Nepal in summer and also finds an experienced guide. Use Naive Bayesian reasoning to decide if the traveler will climb to 1000 ft from the top of the Everest based (**15 points**) on the following information:

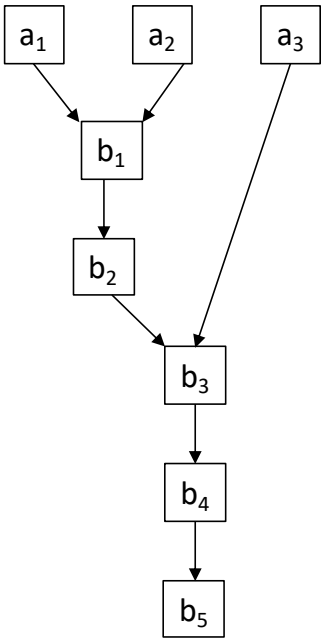
1. 10% of all climbers get to 1000 ft from the top of the Everest.

2. Among all travelers who get to 1000 ft from the top of the Everest, 90% went to Nepal in summer and 80% used an experienced guide.

3. 50% of climbers that cannot get to 1000 ft from the top of the Everest went to Nepal in summer and 30% were able to find an experienced guide.

Explain your conclusion. (**10 points)**

PROBLEM 3: Inference with Bayesian Networks (**55 points**)
Given the following Bayesian Network:



where:

at node a1 :

P(a1)
0.7

at node a2:

P(a2)
0.8

at node a3:

P(a3)
0.9

at node b1 :

a1	a2	P(b1)
0	0	0.2
0	1	0.6
1	0	0.7
1	1	0.9

at node b2:

b1	P(b2)
0	0.6
1	0.8

at node b3:

a3	b2	P(b3)
0	0	0
0	1	0.7
1	0	0.8
1	1	1

at node b4 :

b3	P(b4)
0	0.1
1	0.7

at node b5:

b4	P(b5)
0	0
1	1

You are asked to compute several probabilities by considering the above Bayesian network. In each case your answer can be a number or an expression that can be converted into a number by a pocket calculator.

A) (**5 points**) Compute the probability that: a1 = 1, a2 = 1, a3 = 1, b1 = 0, b2 = 0, b3 = 0, b4 = 0, b5 = 0

B) (**15 points**) Compute the probability that b5 = 1

C) (**10 points**) Compute the probability that b5 = 1 given that:
a1 = 1, a2 = 1, a3 = 1,
b1 = 0, b2 = 0, b3 = 0

D) (**5 points**) Compute the probability that b3=0 given that: b5=1

E) (**20 points**) The CPT in node a3 is changed to:

at node a3 :	P(a3)
	x

where the value of x is unknown. What values of x would make it make it more likely that b5 happened than that b5 did not happen?