Makerere University
College of Computing and Information Sciences

School of Computing and Informatics Technology
CS2114: Probabilistic Reasoning/Bayes Nets

1. If A and B are independent then ˜A is independent of ˜B. True or False? Show the work supporting your answer.

2. Two students and B are both registered for a certain course. Student A attends the class 80% of the time. Student B attends the class 60% of the time. Suppose their absences are independent.

   (a) What is the probability that neither show up to class on any given day?

   (b) What is the probability that at least one of them is in class on any given day?

   (c) Suppose there is also a student C who always comes to class if and only if student A or student B (or both) show up. is the absence of A still independent of the absence of B? (yes, no)

   (d) Construct a Bayes Net to show the relationships of A, B and C. Indicate the necessary Conditional Probability Tables.

   (e) Is A conditionally independent of B given C? (yes, no).

   (f) Suppose you know that C came to class, what is the probability of A coming if you know that B showed up too?

3. Consider the graph given in figure 1

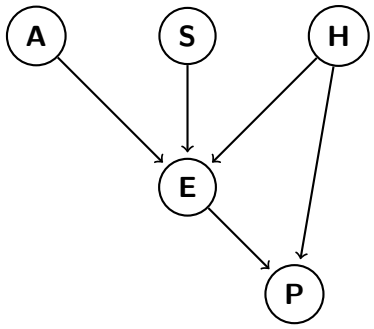

Figure 1:

Where A = Attend class, S= study, H =Do Homework, E =Pass Exam and P = pass class

(a) Write down the joint distribution as it factorizes according to the graph.

(b) Use variable elimination and your result from the previous question to write down the expression for the probability of passing the class, given that you attend class and study, but don't do the homeworks.

(c) Use the following Conditional probability tables (CPTS) for the graph to compute P(A|P,H). P(A) =0.5, P(S) =0.7 P(H)= 0.9

A	S	H	$P(E\|A,S,H)$
0	0	0	0.2
0	0	1	0.5
0	1	0	0.4
0	1	1	0.8
1	0	0	0.3
1	0	1	0.7
1	1	0	0.6
1	1	1	0.9

E	H	$P(P\|E,H)$
0	0	0.1
0	1	0.4
1	0	0.3
1	1	0.9

4. Let A and B be two binary random variables independent events with probabilities P(A = 1) = 0.1 and P(B = 1) = 0.4. Let C denote the event that at least one of the events A and B is on, i.e., C=A OR B, and let D be the event that exactly one of the events A and B occurs, i.e., D = A XOR B.

   (a) Compute P(C = 1).

   (b) Compute P(D = 1).

   (c) Compute $P(D|A)$.

   (d) Prove that A and D are not independent, using the results from the previous questions.

End