Assignment-2

Artificial Intelligence: Foundations and Applications

(AI61005)

Spring, 2024-25

IIT Kharagpur

Release Date: - [02/04/2025]
Submission Date: - [10/04/2025]
Total Marks: 20

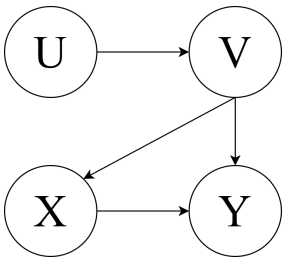
Instructions:

- All questions are compulsory to solve.
- Each step should be explained clearly in order to solve the questions.
- Each student has to submit ***only one pdf file*** named '***roll_number_A2.pdf***'.
- No late submissions will be entertained.

Problem Statement 1

[10]

Consider the Bayes' net shown below. All variables have binary domains.



Question:

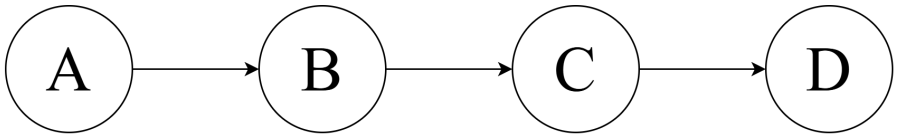
Perform variable elimination to compute the query $P(U|Y =+ y)$ and fill in the newly generated factors after eliminating each variable in the table given below. Consider the variable elimination ordering as V, X.

Factors Generated after Eliminating corresponding Variable (Left to right)	
V	X

Problem Statement 2

$[5 + 5 = 10]$

Consider the following Bayes' net and the corresponding distributions over the variables in the Bayes' net:



P(A)	
-a	3/4
+a	1/4

P(B|A)		
-a	-b	2/3
-a	+b	1/3
+a	-b	4/5
+a	+b	1/5

P(C|B)		
-b	-c	1/4
-b	+c	3/4
+b	-c	1/2
+b	+c	1/2

P(D|C)		
-c	-d	1/8
-c	+d	7/8
+c	-d	5/6
+c	+d	1/6

You are given the following samples:

$s_1: \ +a \ +b \ -c \ -d$	$s_5: \ +a \ -b \ -c \ +d$
$s_2: \ +a \ -b \ +c \ -d$	$s_6: \ +a \ +b \ +c \ -d$
$s_3: \ -a \ +b \ +c \ -d$	$s_7: \ -a \ +b \ -c \ +d$
$s_4: \ -a \ -b \ +c \ -d$	$s_8: \ -a \ -b \ +c \ +d$

a) If these samples come from performing prior sampling, then calculate the sample estimate $P(+ \ c)$.

b) What will be the sample estimate $P(+ \ c \mid \ +a, \ -d)$?