

执行测验: Homework 3

测试信息

描述

说明

多次尝试 不允许。此测试只能进行一次。

强制完成 本测试可保存并可稍后继续。

问题完成状态:

问题 1

20 分 已保存

Below is a table listing the probabilities of three binary random variables. In the empty table cells, fill in the correct values for each marginal or conditional probability. Round your answers to 3 decimal places.

$X_0$	$X_1$	$X_2$	$P(X_0, X_1, X_2)$
0	0	0	0.040
1	0	0	0.220
0	1	0	0.080
1	1	0	0.160
0	0	1	0.160
1	0	1	0.100
0	1	1	0.080
1	1	1	0.160

Please answer the following expressions:

$P(X_0 = 1, X_1 = 1, X_2 = 0)$  = 0.160

$P(X_1 = 0, X_2 = 1)$  = 0.260

$P(X_1 = 1)$  = 0.480

$P(X_0 = 1, X_1 = 0 | X_2 = 1)$  = 0.200

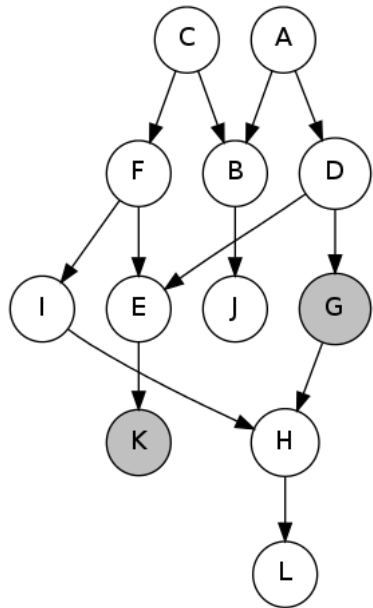
$P(X_0 = 1 | X_1 = 0, X_2 = 0)$  = 0.846

问题 2

10 分 已保存

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。

You are given several graphical models below, and each graphical model is associated with an independence (or conditional independence) assertion. Please specify if the assertion is **true** or **false**.



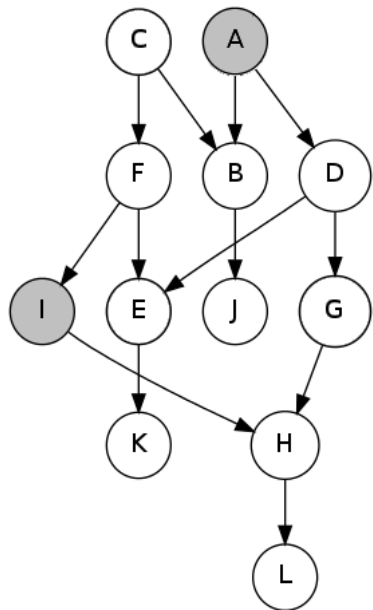
**Assertion:** It is guaranteed that A is independent of L given G, K.

- ☐ 对
- ☒ 错

问题 3

10 分

已保存



**Assertion:** It is guaranteed that C is independent of H given A, I.

- ☒ 对
- ☐ 错

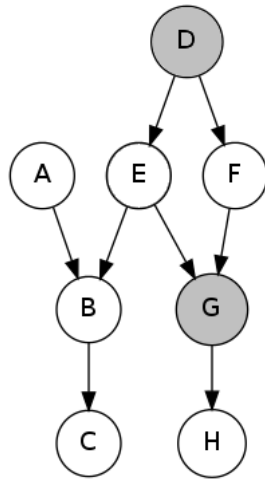
问题 4

10 分

已保存

- ☐ 对
- ☒ 错

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。



**Assertion:** It is guaranteed that C is independent of F given D, G.

## 问题 5

10 分

已保存

Given the factors  $P(A|B)$  and  $P(A|C)$  and  $P(B)$  which factor will be created after joining on  $B$  and summing out over  $B$ ?

- ☒  $P(A)$
- ☐  $P(B)$
- ☐  $P(C)$
- ☐  $P(B,C)$

## 问题 6

10 分

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Given the factors  $P(A|C)$  and  $P(B|A,C)$ , what is the resulting factor after joining over  $C$ ?

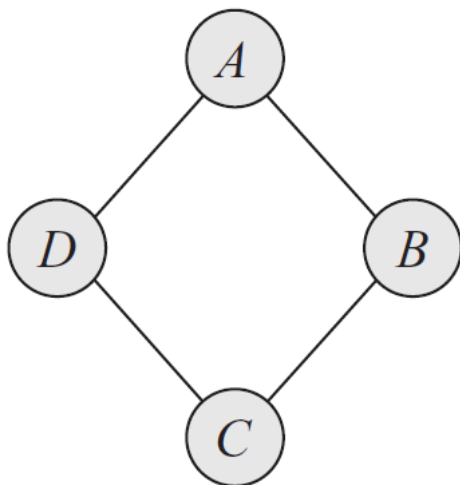
- ☐  $P(A,B,C)$
- ☒  $P(A,B|C)$
- ☐  $P(A|B,C)$
- ☐ None of the above

## 问题 7

10 分

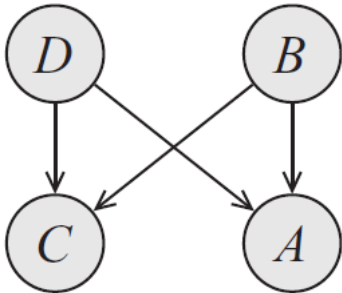
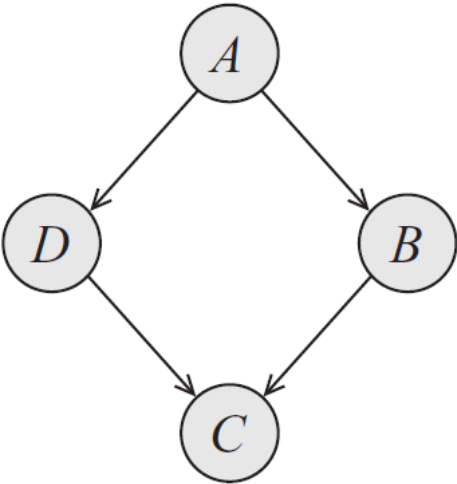
已保存

For four random variables, there exists a Markov Network to represent it as:



Please choose the Bayesian Network that can precisely (no more, no less) represent the distribution of this Markov Network from the two models:

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。

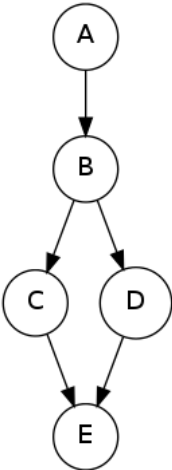


- ☐ the first model
- ☐ the second model
- ☐ both of them
- ☒ neither of them

问题 8

30 分 已保存

Assume the following Bayes Net and corresponding CPTs. In this exercise, we are given the query  $P(C|e = 1)$ , and we will complete the tables for each factor generated during the elimination process.



After introducing evidence, we have the following probability tables.

<table><tr><th>A</th><th>P(A)</th></tr><tr><td>0</td><td>0.900</td></tr><tr><td>1</td><td>0.100</td></tr></table>		A	P(A)	0	0.900	1	0.100	<table><tr><th>B</th><th>A</th><th>P(B A)</th></tr><tr><td>0</td><td>0</td><td>0.700</td></tr><tr><td>1</td><td>0</td><td>0.300</td></tr><tr><td>0</td><td>1</td><td>0.500</td></tr><tr><td>1</td><td>1</td><td>0.500</td></tr></table>	B	A	P(B A)	0	0	0.700	1	0	0.300	0	1	0.500	1	1	0.500	<table><tr><th>C</th><th>B</th><th>P(C B)</th></tr><tr><td>0</td><td>0</td><td>0.400</td></tr><tr><td>1</td><td>0</td><td>0.600</td></tr><tr><td>0</td><td>1</td><td>0.400</td></tr><tr><td>1</td><td>1</td><td>0.600</td></tr></table>	C	B	P(C B)	0	0	0.400	1	0	0.600	0	1	0.400	1	1	0.600	<table><tr><th>D</th><th>B</th><th>P(D B)</th></tr><tr><td>0</td><td>0</td><td>0.300</td></tr><tr><td>1</td><td>0</td><td>0.700</td></tr><tr><td>0</td><td>1</td><td>0.100</td></tr><tr><td>1</td><td>1</td><td>0.900</td></tr></table>	D	B	P(D B)	0	0	0.300	1	0	0.700	0	1	0.100	1	1	0.900	<table><tr><th>C</th><th>D</th><th>P(e = 1 C, D)</th></tr><tr><td>0</td><td>0</td><td>0.400</td></tr><tr><td>1</td><td>0</td><td>0.600</td></tr><tr><td>0</td><td>1</td><td>0.400</td></tr><tr><td>1</td><td>1</td><td>0.200</td></tr></table>	C	D	P(e = 1 C, D)	0	0	0.400	1	0	0.600	0	1	0.400	1	1	0.200
A	P(A)																																																																						
0	0.900																																																																						
1	0.100																																																																						
B	A	P(B A)																																																																					
0	0	0.700																																																																					
1	0	0.300																																																																					
0	1	0.500																																																																					
1	1	0.500																																																																					
C	B	P(C B)																																																																					
0	0	0.400																																																																					
1	0	0.600																																																																					
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1	0	0.600																																																																					
0	1	0.400																																																																					
1	1	0.200																																																																					

Three steps are required for elimination. with the resulting factors listed below:

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。

b

3. Eliminate  $D$ . We get the factor  $f_3(C, e = 1) = \sum_d P(e = 1 | C, d) f_2(C, d)$ .

Complete the tables below for the factors generated during elimination. Some values have been evaluated for you, note that these values are precise and feel free to use them. You should also fill precise values in the blanks, and round to a fixed number of decimal places (the same or potentially more digits than actually required and have trailing zeros).

$B$	$f_1 : P(B)$	$C$	$D$	$f_2 : P(C, D)$	$C$	$f_3 : P(C, e = 1)$
0	Blank 1	0	0	Blank 3	0	Blank 5
1	Blank 2	1	0	Blank 4	1	0.17664
		0	1	0.3056		
		1	1	0.4584		

For the following 2 blanks, fill in the **precise values** and round to **2 decimal places**.

Blank 1 =

Blank 2 =

For the following 2 blanks, fill in the **precise values** and round to **4 decimal places**.

Blank 3 =

Blank 4 =

For the following blank, fill in the **precise value** and round to **5 decimal places**.

Blank 5 =

After getting the final factor  $P(C, e = 1)$ , a final renormalization step needs be carried out to obtain the conditional probability  $P(C | e = 1)$ . Please fill into the table below. These values are not necessarily precise.

$C$	$P(C   e = 1)$
0	Blank 6
1	Blank 7

Round your answers to **3 decimal places**.

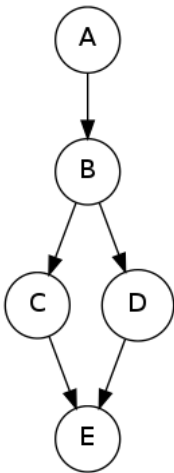
Blank 6 =

Blank 7 =

问题 9

10分 已保存

We will work with a Bayes' net of the following structure.



In this question, we will perform rejection sampling to estimate  $P(D | B = 0, E = 1)$ . Perform one round of rejection sampling, using the random samples given in the table below. Variables are sampled in the order A, B, C, D, E. In the boxes below, choose the value (0 or 1) that each variable gets assigned to.

**Note that the sampling attempt should stop as soon as you discover that the sample will be rejected.** In that case, mark the assignment of that variable and leave the boxes corresponding to the rest of the variables blank.

To generate random samples, use as many values as needed from the table below, which we generated independently and uniformly at random from 0 to 1. Use numbers from left to right. To sample a binary variable  $W$  with probability  $P(W = 0) = p$ , select a value  $a$  from the table, and choose  $W = 1$  if  $a \geq p$  and  $W = 0$  otherwise.

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。

1	0.7
---	-----

B	A	P(B A)
0	0	0.2
1	0	0.8
0	1	0.4
1	1	0.6

C	B	P(C B)
0	0	0.5
1	0	0.5
0	1	0.1
1	1	0.9

D	B	P(D B)
0	0	0.6
1	0	0.4
0	1	0.3
1	1	0.7

E	C	D	P(E C,D)
0	0	0	0.7
1	0	0	0.3
0	1	0	0.6
1	1	0	0.4
0	0	1	0.5
1	0	1	0.5
0	1	1	0.9
1	1	1	0.1

Enter either a 0 or 1 for each variable that you assign a value to. Upon rejecting a sample, enter its assigned value, and leave the fields for the remaining variables blank. For example, if C gets rejected, do not fill in any values for D and E.

A =

B =

C =

D =

E =

Which variable will get rejected? If no variables will get rejected, leave the field below blank.

E

问题 10

10 分

已保存

Below are a set of samples obtained by running rejection sampling for the Bayes' net from the previous question. Use them to estimate  $P(D = 1 | B = 0, E = 1)$  and round to 3 decimal places. If the estimation cannot be made, input -1.

Sample 1

Sample 2

Sample 3

Sample 4

Sample 5

	0	1	reje cted
A		x	
B	x		
C		x	
D		x	
E	x		x

	0	1	reje cted
A		x	
B	x		
C		x	
D	x		
E		x	

	0	1	reje cted
A		x	
B	x		
C	x		
D		x	
E		x	

	0	1	reje cted
A	x		
B		x	x
C			
D			
E			

	0	1	rejec ted
A	x		
B	x		
C	x		
D		x	
E		x	

0.667

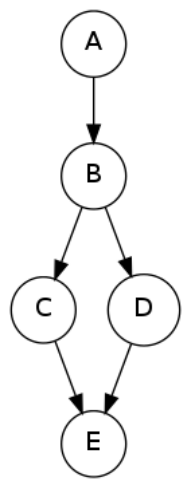
问题 11

30 分

已保存

We will work with a Bayes' net of the following structure.

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。



In this question, we will perform likelihood weighting to estimate  $P(D|B=0,E=1)$ . Generate a sample and its weight, using the random samples given in the table below. Variables are sampled in the order A, B, C, D, E. In the table below, select the assignments to the variables you sampled.

To generate random samples, use as many values as needed from the table below, which we generated independently and uniformly at random from 0 to 1. Use numbers from left to right. To sample a binary variable  $W$  with probability  $P(W=0)=p$ , select a value  $a$  from the table, and choose  $W=1$  if  $a \geq p$  and  $W=0$  otherwise.

0.123	0.822	0.170	0.626	0.593	0.261	0.558	0.064	0.796	0.178
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

A	P(A)
0	0.3
1	0.7

B	A	P(B A)
0	0	0.2
1	0	0.8
0	1	0.4
1	1	0.6

C	B	P(C B)
0	0	0.5
1	0	0.5
0	1	0.1
1	1	0.9

D	B	P(D B)
0	0	0.6
1	0	0.4
0	1	0.3
1	1	0.7

E	C	D	P(E C,D)
0	0	0	0.7
1	0	0	0.3
0	1	0	0.6
1	1	0	0.4
0	0	1	0.5
1	0	1	0.5
0	1	1	0.9
1	1	1	0.1

Enter either a 0 or 1 for each variable assigned by a pass of likelihood weighting with the generated samples above.

A=0

B=0

C=1

D=0

E=1

What is the weight for the sample you obtained above? Round your answer to 2 decimal places.

0.08

Calculation cannot be made.

Sample 1

	0	1
A	x	
B	x	
C		x
D		x
E		x

Weight = 0.16

0.833

Sample 2

	0	1
A		x
B	x	
C		x
D	x	
E		x

Weight = 0.04

Sample 3

	0	1
A		x
B	x	
C		x
D		x
E		x

Weight = 0.08

Sample 4

	0	1
A	x	
B	x	
C		x
D		x
E		x

Weight = 0.16

Sample 5

	0	1
A		x
B	x	
C		x
D	x	
E		x

Weight = 0.04

单击“保存并提交”以保存并提交。单击“保存所有答案”以保存所有答案。