复查测验提交: Homework 3

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课程	人工智能I
测试	Homework 3
已开始	23-11-10 下午8:07
已提交	23-11-17 下午3:06
截止日期	23-11-17 下午11:59
状态	已完成
尝试分数	得 235 分，满分 235 分
已用时间	162 小时 59 分钟
说明	注意：本作业不会自动提交。请在完成作业检查无误后，单击右下角“保存并提交”按钮提交作业。逾期未提交的作业不会被保存或计分。
显示的结果	所有答案, 已提交的答案, 正确答案

问题 1

得 20 分，满分 20 分

副本

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. Your answers will be evaluated to 4 decimal places. The grader will evaluate these expressions maintaining full floating point precision.

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:

$P(X_0 = 1, X_1 = 0, X_2 = 1)$ =**[q1.1]**

$P(X_0 = 1, X_1 = 0)$ =**[q1.2]**

$P(X_2 = 0)$ =**[q1.3]**

$P(X_0 = 0, X_1 = 0 | X_2 = 1)$ =**[q1.4]**

$P(X_0 = 0 | X_1 = 1, X_2 = 1)$ =**[q1.5]**

q1.1 的指定答案: 0.1000

q1.2 的指定答案: 0.3200

q1.3 的指定答案: 0.5000

q1.4 的指定答案: 0.3200

q1.5 的指定答案: 0.3333

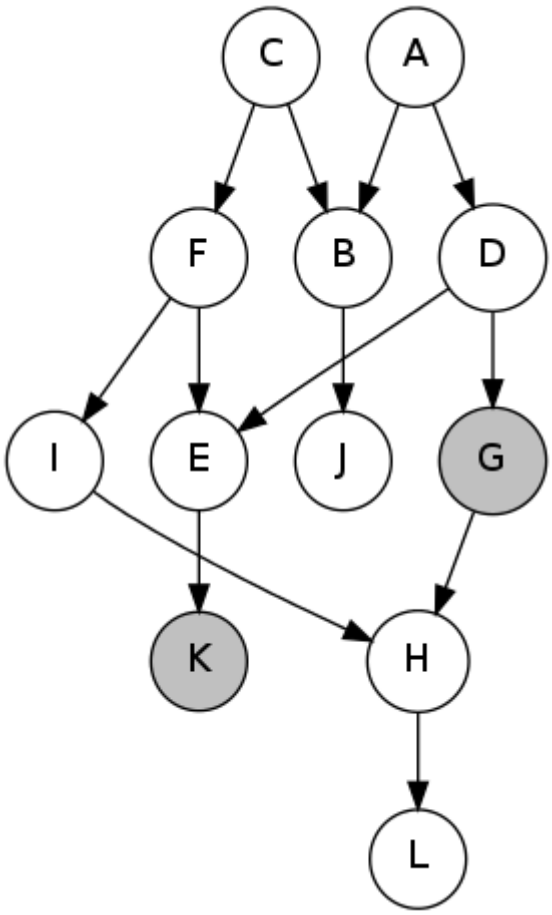
q1.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.1	
q1.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.32	
q1.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.5	
q1.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.32	

q1.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.33	

问题 2

得 10 分，满分 10 分

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**.

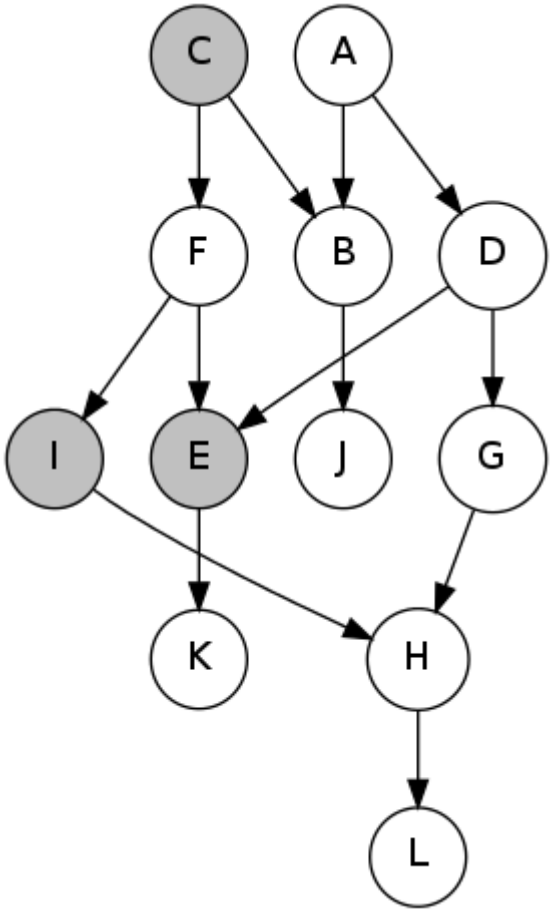


It is guaranteed that J is independent of H given G,K.

所选答案: 错
答案: 对
错

问题 3

得 10 分，满分 10 分



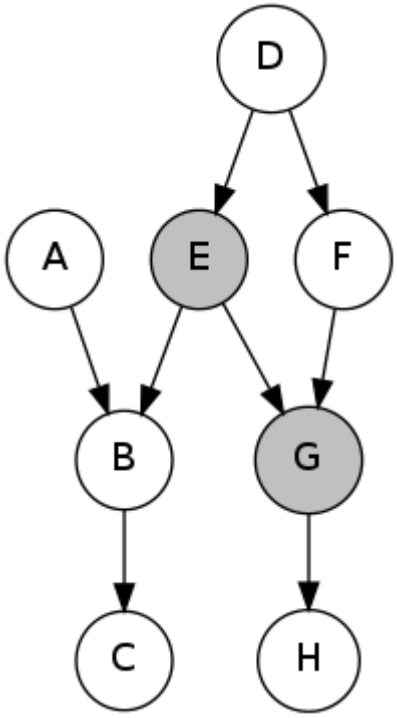
It is guaranteed that H is independent of D given I,C,E

所选答案: 错
答案: 对
错

问题 4

得 10 分，满分 10 分

副本



It is guaranteed that C is independent of A given E,G

所选答案: 错
答案: 对
错

问题 5

得 10 分，满分 10 分

副本

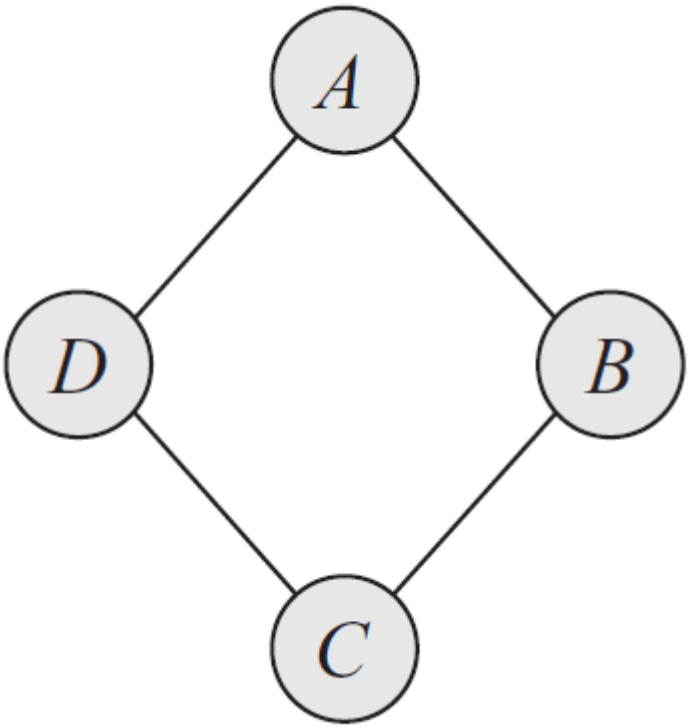
Given the factors P(A|C) and P(B|A,C) what is the resulting factor after joining over C?

所选答案: P(A,B|C)
答案: P(A,B,C)
P(A,B|C)
P(A|B,C)
None of the above.

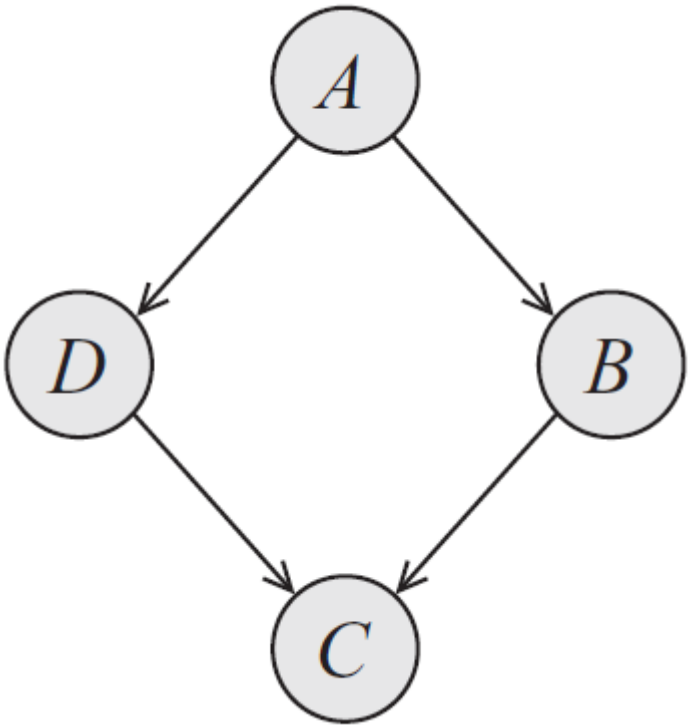
问题 6

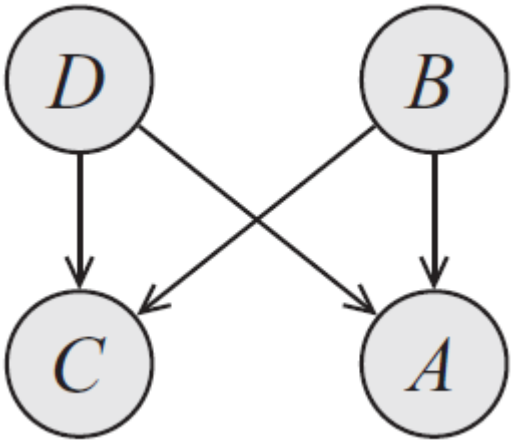
得 10 分，满分 10 分

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:





所选答案: neither the left model nor the right model

答案: the left model

the right model

both the left and the right model

neither the left model nor the right model

问题 7

得 10 分，满分 10 分

副本

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?

所选答案: P(A)

答案: P(A)

P(B)

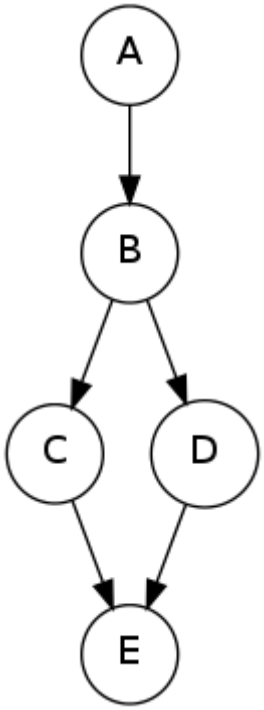
P(C)

P(B,C)

问题 8

得 30 分，满分 30 分

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.

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
0	1	0.400
1	1	0.600

D	B	$P(D\|B)$
0	0	0.300
1	0	0.700
0	1	0.100
1	1	0.900

C	D	$P(e=1\|C,D)$
0	0	0.400
1	0	0.600
0	1	0.400
1	1	0.200

Three steps are required for elimination, with the resulting factors listed below:
Step 1: eliminate A.We get the factor $f_1(B)$ = $\sum_a$P(a)P(B|a).
Step 2: eliminate B.We get the factor $f_2(C,D)$ = $\sum_b$P(C|b)P(D|b)$f_1(b)$.
Step 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.

B	$f_1 : P(B)$
0	Blank 1
1	Blank 2

C	D	$f_2 : P(C, D)$
0	0	Blank 3
1	0	Blank 4
0	1	0.306
1	1	0.458

C	$f_3 : P(C, e = 1)$
0	Blank 5
1	0.177

Blank 1 = **[q9.1]**

Blank 2 = **[q9.2]**

Blank 3 = **[q9.3]**

Blank 4 = **[q9.4]**

Blank 5 = **[q9.5]**

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 the final conditional probability.

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

Blank 6 = **[q9.6]**

Blank 7 = **[q9.7]**

q9.1 的指定答案: 0.680

q9.2 的指定答案: 0.320

q9.3 的指定答案: 0.094

q9.4 的指定答案: 0.142

q9.5 的指定答案: 0.160

q9.6 的指定答案: 0.475

q9.7 的指定答案: 0.525

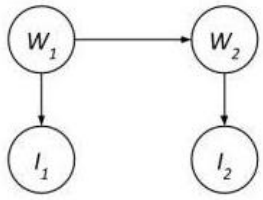
q9.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.68	
q9.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.32	
q9.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.094	

q9.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.142	
包含	0.1416	
q9.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.16	
q9.6 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.47	
q9.7 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.52	

问题 9

得 25 分，满分 25 分

We would like to analyze people's ice cream eating habits on sunny and rainy days. Suppose we consider the weather, along with a person's ice cream eating, over the span of 2 days. We'll have 4 random variables: W1 and W2 stand for the weather on days 1 and 2, which can either be rainy R or sunny S, and the variables I1 and I2 represent whether or not the person ate ice cream on days 1 and 2, and take values T (for truly eating ice cream) or F. We can model this as the following Bayes Net with these probabilities.



W_1	$P(W_1)$
S	0.6
R	0.4

W_1	W_2	$P(W_2\|W_1)$
S	S	0.7
S	R	0.3
R	S	0.5
R	R	0.5

W	I	$P(I\|W)$
S	T	0.9
S	F	0.1
R	T	0.2
R	F	0.8

Suppose we produce the following samples of (W1,I1,W2,I2) from the ice cream model:

R, F, R, F R, F, R, F S, F, S, T S, T, S, T S, T, R, F
R, F, R, T S, T, S, T S, T, S, T S, T, R, F R, F, S, T

What is P(W2 = R), the probability that sampling assigns to the event W2 = R.

所选答案: 0.500

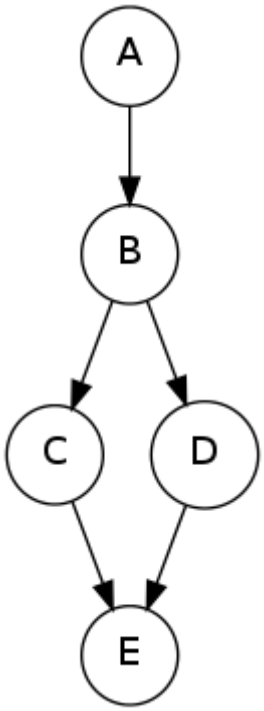
正确答案:

评估方式	正确答案	区分大小写
包含	0.5	

问题 10

得 10 分，满分 10 分

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



In this question, we will perform rejection sampling to estimate P(C=1|B=1, 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.**

When generating 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. Once you use a number, you can click on it to mark it as used. To sample a binary variable W with probability P(W=0)=p and P(W=1)=1-p using a value a from the table, choose W=0 if a<p and W=1 if a>= p.

0.960	0.569	0.526	0.214	0.235	0.582	0.600	0.088	0.389	0.195

A	$P(A)$
0	0.800
1	0.200

B	A	$P(B\|A)$
0	0	0.600
1	0	0.400
0	1	0.400
1	1	0.600

C	B	$P(C\|B)$
0	0	0.200
1	0	0.800
0	1	0.200
1	1	0.800

D	B	$P(D\|B)$
0	0	0.400
1	0	0.600
0	1	0.400
1	1	0.600

E	C	D	$P(E\|C,D)$
0	0	0	0.400
1	0	0	0.600
0	1	0	0.400
1	1	0	0.600
0	0	1	0.600
1	0	1	0.400
0	1	1	0.600
1	1	1	0.400

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 = **[q9.1]**

B = **[q9.2]**

C = **[q9.3]**

D = **[q9.4]**

E = **[q9.5]**

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

[q9.6]

In rejection sampling, you reject any sample for which the variables' values do not match the values of the evidence variables in what you are trying to estimate. In this case, any sample where $B \neq 1$ or $E \neq 1$ is rejected.

Only B and E can ever be rejected, in this case E was rejected because its sampled value was 0.

q9.1 的指定答案: ✓ 1

q9.2 的指定答案: ✓ 1

q9.3 的指定答案: ✓ 1

q9.4 的指定答案: ✓ 0

q9.5 的指定答案: ✓ 0

q9.6 的指定答案: ✓ E

q9.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
✓ *完全匹配*	1	
q9.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
✓ *完全匹配*	1	
q9.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
✓ *完全匹配*	1	
q9.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
✓ *完全匹配*	0	
q9.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
✓ *完全匹配*	0	
q9.6 的正确答案:		

评估方式	正确答案	区分大小写
完全匹配	E	

问题 11

得 10 分，满分 10 分

Below are a set of samples obtained by running rejection sampling for the Bayes' net from the previous question. Use them to estimate P(C=1|B=1, E=1). The estimation cannot be made whenever all samples were rejected. In this case, input -1 into the box below.

Sample 1

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

Sample 2

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

Sample 3

	0	1	rejected
A		x	
B	x		x
C			
D			
E			

Sample 4

	0	1	rejected
A	x		
B	x		x
C			
D			
E			

Sample 5

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

[q11]

q11 的指定答案： -1

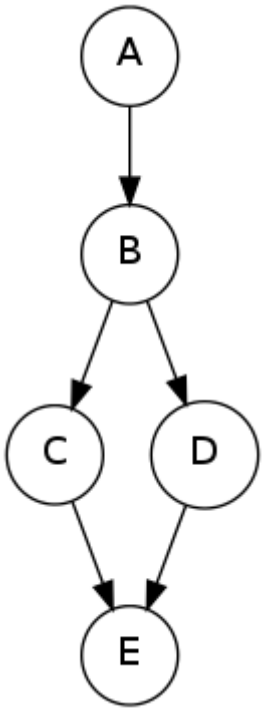
q11 的正确答案:

评估方式	正确答案	区分大小写
包含	-1	

问题 12

得 30 分，满分 30 分

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



In this question, we will perform likelihood weighting to estimate P(C=1|B=1, 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.

When generating 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. Once you use a number, you can click on it to mark it as used. To sample a binary variable W with probability P(W=0)=p and P(W=1)=1-p using a value a from the table, choose W = 0 if a < p and W = 1 if a >= p.

0.624	0.603	0.420	0.708	0.088	0.904	0.554	0.259	0.061	0.553

A	$P(A)$
0	0.600
1	0.400

B	A	$P(B\|A)$
0	0	0.200
1	0	0.800
0	1	0.200
1	1	0.800

C	B	$P(C\|B)$
0	0	0.800
1	0	0.200
0	1	0.800
1	1	0.200

D	B	$P(D\|B)$
0	0	0.600
1	0	0.400
0	1	0.400
1	1	0.600

E	C	D	$P(E\|C,D)$
0	0	0	0.800
1	0	0	0.200
0	1	0	0.600
1	1	0	0.400
0	0	1	0.400
1	0	1	0.600
0	1	1	0.200
1	1	1	0.800

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

A=**[q12.1]**

B=**[q12.2]**

C=**[q12.3]**

D=**[q12.4]**

E=**[q12.5]**

What is the weight for the sample you obtained above?

[q12.6]

q12.1 的指定答案: 1

q12.2 的指定答案: 1

q12.3 的指定答案: 0

q12.4 的指定答案: 1

q12.5 的指定答案: 1

q12.6 的指定答案: 0.480

q12.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	1	
q12.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	1	
q12.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0	
q12.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	1	
q12.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	1	
q12.6 的正确答案:		
评估方式	**正确答案**	**区分大小写**
包含	0.48	

问题 13

得 10 分，满分 10 分

副本

Below are a set of weighted samples obtained by running likelihood weighting for the Bayes' net from the previous question. Use them to estimate P(C=0|B=1, E=1). Input -1 in the box below if the estimation cannot be made.

Sample 1

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

Weight = 0.16

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

[q13]

q13 的指定答案: ✔ 0

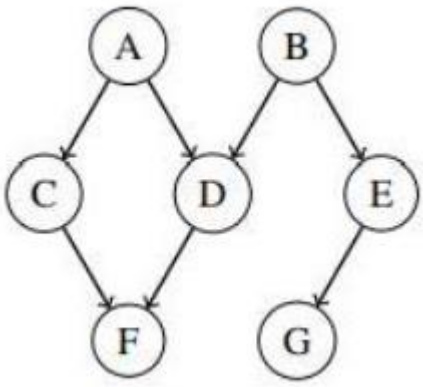
q13 的正确答案:

评估方式	正确答案	区分大小写
✔ *完全匹配*	0	
✔ *包含*	0.0	

问题 14

得 20 分，满分 20 分

Suppose the variables are binary and A=1,B=0,F=0 according to observation. We will be using Gibbs sampling to estimate P(D|A=1,B=0,F=0) .The initial value for non-evidence variables are C=D=E=G=1. 4 sets of the first 3 updates performed by Gibbs sampling are given. X,P(X|Y),X=x means that in this update step, X is chosen and sampled from a distribution of P(X|Y), the realized value of variable X is x. Which of these updates listed below can't be resulted from correct Gibbs sampling.



所选答案:
C,P(C|A=1,F=0),C=1
G,P(G|E=1),G=1
✔ B. C,P(C|A=1,F=0),C=1
E,P(E|B=0,G=1),E=1
G,P(G|E=1),G=0
✔ C. E,P(E|B=0,G=1),E=0

答案:
E,P(E|B=0,G=1),E=1
E,P(E|B=0,G=1),E=0
A. E,P(E|B=0,G=1),E=0
C,P(C|A=1,F=0),C=1
G,P(G|E=1),G=1
✔ B. C,P(C|A=1,F=0),C=1

E,P(E|B=0,G=1),E=1
G,P(G|E=1),G=0

C. E,P(E|B=0,G=1),E=0
C,P(C|A=1,D=1,F=0),C=1

G,P(G|E=1),G=0

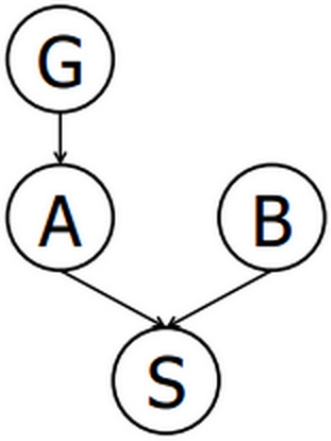
E,P(E|B=0,G=0),E=1

D.

问题 15

得 10 分，满分 10 分

Suppose that a patient can have a symptom (S) that can be caused by two different diseases (A and B). It is known that the variation of gene G plays a big role in the manifestation of disease A. The Bayes' Net and corresponding probability tables for this situation are shown below.



G	$P(G)$
g	0.10
$\neg g$	0.90

B	$P(B)$
b	0.40
$\neg b$	0.60

G	A	$P(A \mid G)$
g	a	1.00
g	$\neg a$	0.00
$\neg g$	a	0.10
$\neg g$	$\neg a$	0.90

A	B	S	$P(S \mid A, B)$
a	b	s	1.00
a	b	$\neg s$	0.00
a	$\neg b$	s	0.90
a	$\neg b$	$\neg s$	0.10
$\neg a$	b	s	0.80
$\neg a$	b	$\neg s$	0.20
$\neg a$	$\neg b$	s	0.10
$\neg a$	$\neg b$	$\neg s$	0.90

Questions:

a. Compute $P(g,a,b,s)$ ***Round your answers to 2 decimal places.***

[a]

b. What is the probability that a patient has disease A? ***Round your answers to 2 decimal places.***

[b]

c. What is the probability that a patient has disease A given that they have disease B? ***Round your answers to 2 decimal places.***

[c]

d. What is the probability that a patient has disease A given that they have symptom S and disease B? ***Round your answers to 4 decimal places.***

[d]

e. What is the probability that a patient has the disease carrying gene variation G given that they have disease A? ***Round your answers to 3 decimal places.***

[e]

f. What is the probability that a patient has the disease carrying gene variation G given that they have disease B? ***Round your answers to 1 decimal places.***

[f]

a 的指定答案: 0.04

b 的指定答案: 0.19

c 的指定答案: 0.19

d 的指定答案: 0.2267

e 的指定答案: 0.526

f 的指定答案: 0.1

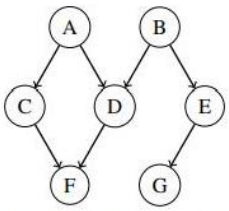
a 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.04	
b 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.19	
c 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.19	
d 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.2267	
e 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.526	
f 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.1	

问题 16

得 10 分，满分 10 分

In large networks exact inference can become intractable. For this reason we frequently employ sampling methods for inference.

(i) [1 pt]



Consider the seven-node Bayesian network above. Which set of variables comprise the Markov blanket of variable D?

所选答案: D. A,B,F,C

答案: A. F

B. A,B,F

C. A,B

D. A,B,F,C

2023年11月18日 星期六 下午02时40分37秒 CST

← 确定