CSPB 3202 - Truong - Artificial Intelligence

Started on	Thursday, 18 July 2024, 9:38 PM
State	Finished
Completed on	Thursday, 18 July 2024, 9:39 PM
Time taken	1 min 33 secs
Marks	15.00/15.00
Grade	**20.00** out of 20.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Below is a table listing the probabilities of three binary random variables. Fill in the correct values for the marginal or conditional probability below.

X_0	X_1	X_2	$P(X_0, X_1, X_2)$
0	0	0	0.160
1	0	0	0.100
0	1	0	0.120
1	1	0	0.040
0	0	1	0.180
1	0	1	0.200
0	1	1	0.120
1	1	1	0.080

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

Answer: 0.200 ✔

Question **2**

Correct

Mark 1.00 out of 1.00

Below is a table listing the probabilities of three binary random variables. Fill in the correct values for the marginal or conditional probability below.

X_0	X_1	X_2	$P(X_0, X_1, X_2)$
0	0	0	0.160
1	0	0	0.100
0	1	0	0.120
1	1	0	0.040
0	0	1	0.180
1	0	1	0.200
0	1	1	0.120
1	1	1	0.080

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

Answer: 0.240 ✔

Question **3**

Correct

Mark 1.00 out of 1.00

Below is a table listing the probabilities of three binary random variables. Fill in the correct values for the marginal or conditional probability below.

X_0	X_1	X_2	$P(X_0, X_1, X_2)$
0	0	0	0.160
1	0	0	0.100
0	1	0	0.120
1	1	0	0.040
0	0	1	0.180
1	0	1	0.200
0	1	1	0.120
1	1	1	0.080

$P(X_2 = 0)$

Answer: 0.420 ✔

Question **4**

Correct

Mark 1.00 out of 1.00

You are given the prior distribution $P(X)$, and two conditional distributions $P(Y|X)$ and $P(Z|Y)$. as below (you are also given the fact that **Z** is independent from **X** given **Y**). All variables are binary variables.

Compute the following joint distribution based on the chain rule (reduced to a decimal value).

X	$P(X)$
0	0.500
1	0.500

Y	X	$P(Y\|X)$
0	0	0.600
1	0	0.400
0	1	0.900
1	1	0.100

Z	Y	$P(Z\|Y)$
0	0	0.100
1	0	0.900
0	1	0.700
1	1	0.300

$P(X = 0, Y = 0)$:

Answer: 0.300 ✔

Question **5**

Correct

Mark 1.00 out of 1.00

You are given the prior distribution $P(X)$, and two conditional distributions $P(Y|X)$ and $P(Z|Y)$. as below (you are also given the fact that **Z** is independent from **X** given **Y**). All variables are binary variables.

Compute the following joint distribution based on the chain rule (reduced to a decimal value).

X	$P(X)$
0	0.500
1	0.500

Y	X	$P(Y\|X)$
0	0	0.600
1	0	0.400
0	1	0.900
1	1	0.100

Z	Y	$P(Z\|Y)$
0	0	0.100
1	0	0.900
0	1	0.700
1	1	0.300

$P(X = 1, Y = 0)$:

Answer: 0.450 ✔

Question **6**

Correct

Mark 1.00 out of 1.00

You are given the prior distribution $P(X)$, and two conditional distributions $P(Y|X)$ and $P(Z|Y)$. as below (you are also given the fact that **Z** is independent from **X** given **Y**). All variables are binary variables.

Compute the following joint distribution based on the chain rule (reduced to a decimal value).

X	$P(X)$
0	0.500
1	0.500

Y	X	$P(Y\|X)$
0	0	0.600
1	0	0.400
0	1	0.900
1	1	0.100

Z	Y	$P(Z\|Y)$
0	0	0.100
1	0	0.900
0	1	0.700
1	1	0.300

$P(X = 0, Y = 1)$:

Answer: 0.200 ✔

Question **7**

Correct

Mark 1.00 out of 1.00

You are given the prior distribution $P(X)$, and two conditional distributions $P(Y|X)$ and $P(Z|Y)$. as below (you are also given the fact that **Z** is independent from **X** given **Y**). All variables are binary variables.

Compute the following joint distribution based on the chain rule (reduced to a decimal value).

X	$P(X)$
0	0.500
1	0.500

Y	X	$P(Y\|X)$
0	0	0.600
1	0	0.400
0	1	0.900
1	1	0.100

Z	Y	$P(Z\|Y)$
0	0	0.100
1	0	0.900
0	1	0.700
1	1	0.300

$P(X = 1, Y = 1)$:

Answer: 0.050 ✔

Question **8**

Correct

Mark 1.00 out of 1.00

For the given distribution, please identify if the given independence / conditional independence assumption is true or false.

For your convenience, we have also provided some marginal and conditional probability distribution tables that could assist you in solving this problem.

X	Y	$P(X,Y)$
0	0	0.240
1	0	0.160
0	1	0.360
1	1	0.240

X	$P(X)$
0	0.600
1	0.400

Y	$P(Y)$
0	0.400
1	0.600

X is independent from **Y**.

Select one:

- True ✔
- False

Question **9**

Correct

Mark 1.00 out of 1.00

For the given distribution, please identify if the given independence / conditional independence assumption is true or false.

For your convenience, we have also provided some marginal and conditional probability distribution tables that could assist you in solving this problem.

X	Y	Z	$P(X,Y,Z)$
0	0	0	0.280
1	0	0	0.070
0	1	0	0.210
1	1	0	0.140
0	0	1	0.060
1	0	1	0.060
0	1	1	0.030
1	1	1	0.150

X	Z	$P(X\|Z)$
0	0	0.700
1	0	0.300
0	1	0.300
1	1	0.700

Y	Z	$P(Y\|Z)$
0	0	0.500
1	0	0.500
0	1	0.400
1	1	0.600

X	Y	Z	$P(X,Y\|Z)$
0	0	0	0.400
1	0	0	0.100
0	1	0	0.300
1	1	0	0.200
0	0	1	0.200
1	0	1	0.200
0	1	1	0.100
1	1	1	0.500

X is independent from **Y** given **Z**.

Select one:

- True
- False ✔

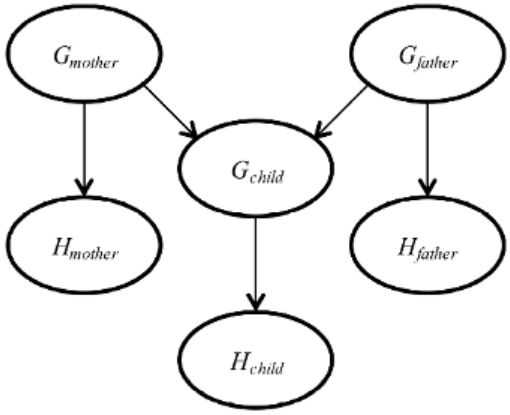
Question **10**

Correct

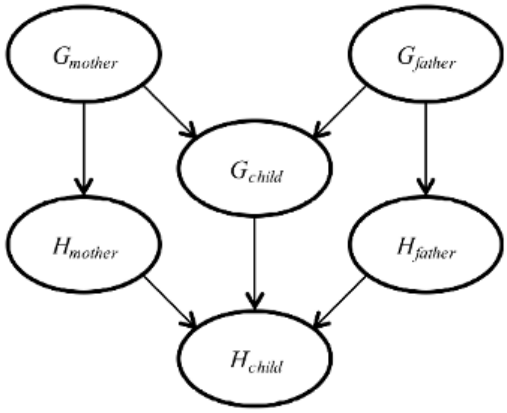
Mark 1.00 out of 1.00

Let H_x be a random variable denoting the handedness of an individual x, with possible values l or r. A common hypothesis is that left- or right-handedness is inherited by a simple mechanism; that is, perhaps there is a gene G_x also with values l or r, and perhaps actual handedness turns out mostly the same (with some probability s) as the gene an individual possesses. Furthermore, perhaps the gene itself is equally likely to be inherited from either of an individual's parents, with a small nonzero probability $m$of a random mutation flipping the handedness.

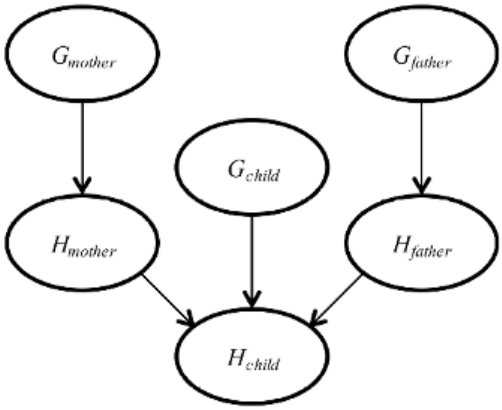
The following three images are possible models involving the genes G and handednesses H.



(a)



(b)



(c)

Which of the three networks above claim that

$P(G_{father}, G_{mother}, G_{child}) = P(G_{father})P(G_{mother})P(G_{child})$?

Select one or more:

- [ ] (a)
- [ ] (b)
- [x] (c) ✔

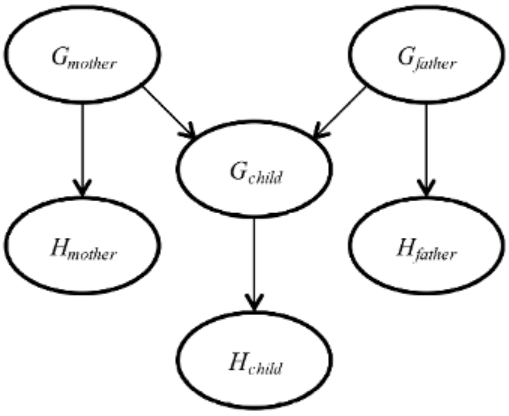
Question **11**

Correct

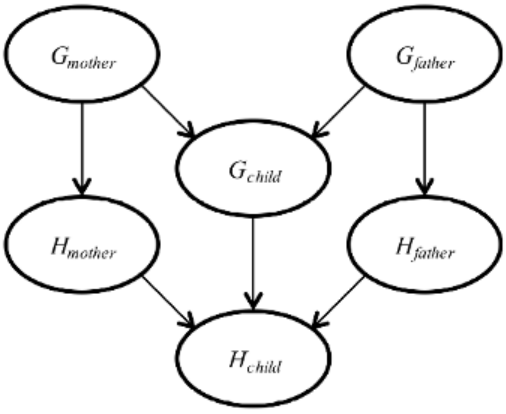
Mark 1.00 out of 1.00

Let H_x be a random variable denoting the handedness of an individual x, with possible values l or r. A common hypothesis is that left- or right-handedness is inherited by a simple mechanism; that is, perhaps there is a gene G_x also with values l or r, and perhaps actual handedness turns out mostly the same (with some probability s) as the gene an individual possesses. Furthermore, perhaps the gene itself is equally likely to be inherited from either of an individual's parents, with a small nonzero probability $m$mof a random mutation flipping the handedness.

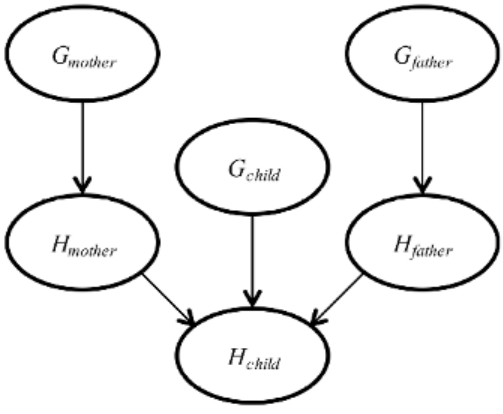
The following three images are possible models involving the genes G and handednesses H.



(a)



(b)



(c)

Which of the three networks make independence claims that are consistent with the hypothesis about the inheritance of handedness?

Select one or more:

- [x] a. (a)
- [x] b. (b)
- [ ] c. (c)

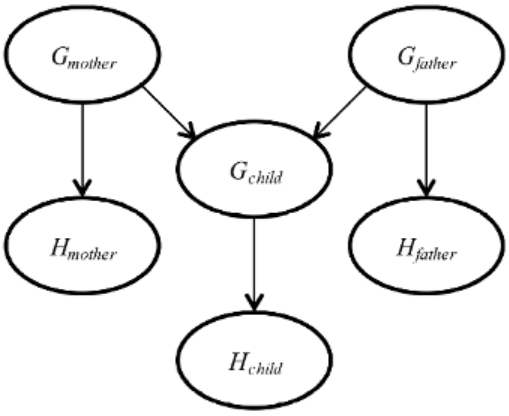
Question **12**

Correct

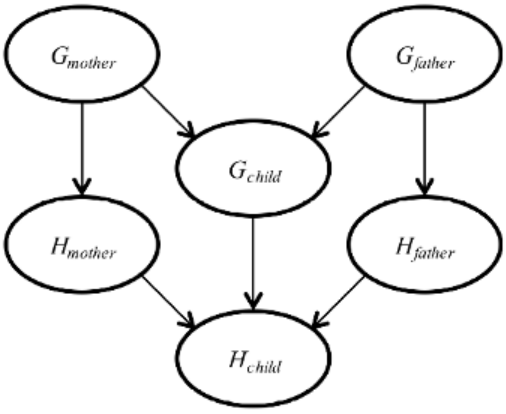
Mark 1.00 out of 1.00

Let H_x be a random variable denoting the handedness of an individual x, with possible values l or r. A common hypothesis is that left- or right-handedness is inherited by a simple mechanism; that is, perhaps there is a gene G_x also with values l or r, and perhaps actual handedness turns out mostly the same (with some probability s) as the gene an individual possesses. Furthermore, perhaps the gene itself is equally likely to be inherited from either of an individual's parents, with a small nonzero probability $m$mof a random mutation flipping the handedness.

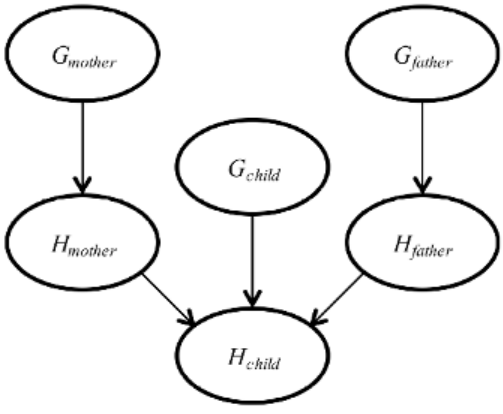
The following three images are possible models involving the genes G and handednesses H.



(a)



(b)



(c)

Which of the three networks is the best description of the hypothesis?

Select one:

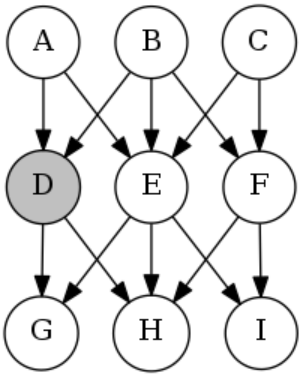
- a. (a) ✔
- b. (b)
- c. (c)

Question **13**

Correct

Mark 1.00 out of 1.00

You are given 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 G is independent of H given D

Select one:

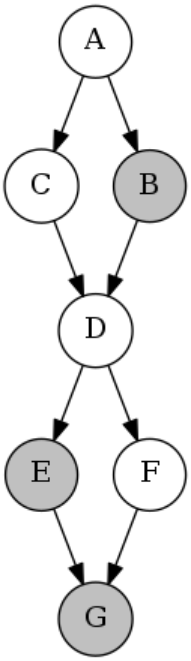
- True
- False ✔

Question **14**

Correct

Mark 1.00 out of 1.00

You are given 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 A is independent of D given E, B, G

Select one:

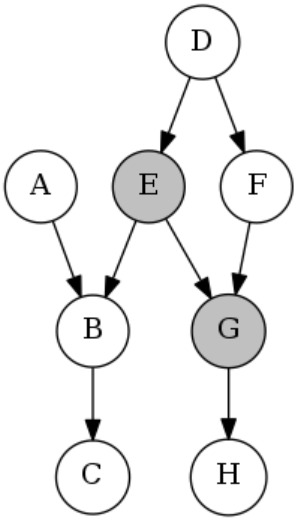
- True
- False ✔

Question **15**

Correct

Mark 1.00 out of 1.00

You are given 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 H is independent of B given G, E.

Select one:

- (•) True ✔
- ( ) False