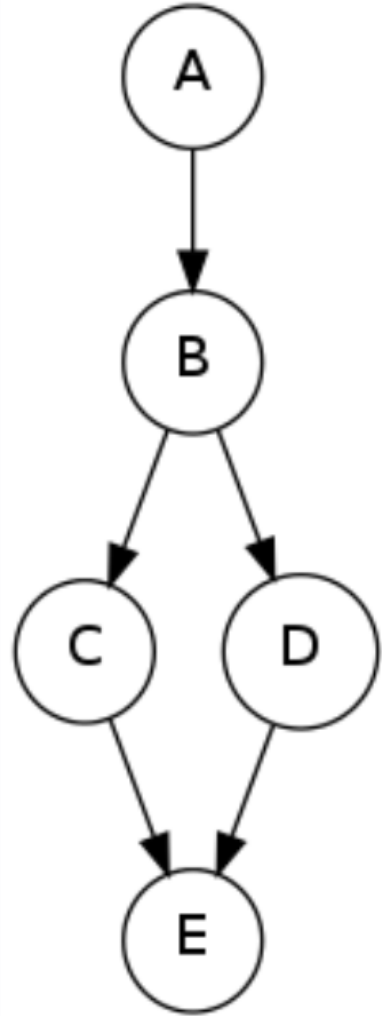


Sampling Examples



0.249 0.052 0.299 0.773 0.715 0.550 0.703 0.105 0.236 0.153

A	$P(A)$
0	0.200
1	0.800

B	A	$P(B A)$
0	0	0.400
1	0	0.600
0	1	0.200
1	1	0.800

C	B	$P(C B)$
0	0	0.600
1	0	0.400
0	1	0.600
1	1	0.400

D	B	$P(D B)$
0	0	0.800
1	0	0.200
0	1	0.600
1	1	0.400

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

What are:

A:

B:

C:

D:

E:

What is the weight for the sample above?

In this question, we will perform likelihood weighting to estimate $P(C = 1 \mid B = 1, E = 1)$.

Below are a set of weighted samples obtained by running likelihood weighting for the Bayes' net from the previous question. Use them to estimate $P(C = 1 \mid B = 1, E = 1)$. 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 = 0.64

Sample 2

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

Weight = 0.64

Sample 3

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

Weight = 0.32

Sample 4

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

Weight = 0.16

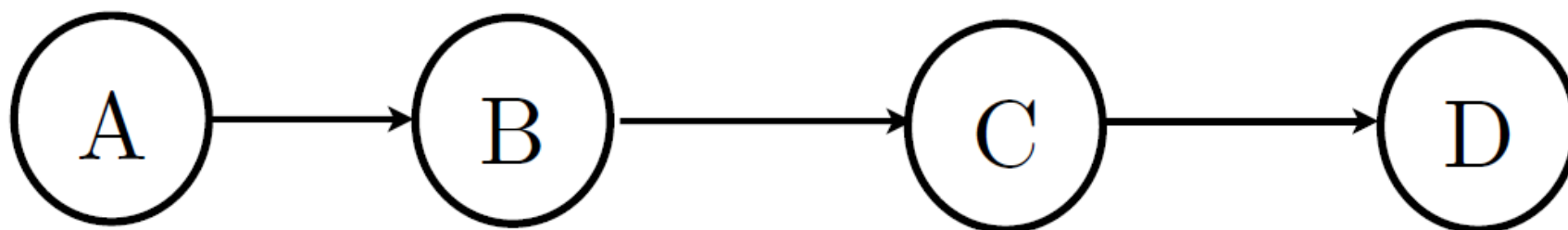
Sample 5

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

Weight = 0.48

Estimation:

Enter your answer here



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

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

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

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

(a) You are given the following samples:

$+a$	$+b$	$-c$	$-d$	$+a$	$-b$	$-c$	$+d$
$+a$	$-b$	$+c$	$-d$	$+a$	$+b$	$+c$	$-d$
$-a$	$+b$	$+c$	$-d$	$-a$	$+b$	$-c$	$+d$
$-a$	$-b$	$+c$	$-d$	$-a$	$-b$	$+c$	$-d$

- (i) Assume that these samples came from performing Prior Sampling, and calculate the sample estimate of $P(+c)$.
- (ii) Now we will estimate $P(+c \mid +a, -d)$. Above, clearly cross out the samples that would **not** be used when doing Rejection Sampling for this task, and write down the sample estimate of $P(+c \mid +a, -d)$ below.

(b) Using Likelihood Weighting Sampling to estimate $P(-a \mid +b, -d)$, the following samples were obtained. Fill in the weight of each sample in the corresponding row.

Sample	Weight
$-a \quad +b \quad +c \quad -d$	_____
$+a \quad +b \quad +c \quad -d$	_____
$+a \quad +b \quad -c \quad -d$	_____
$-a \quad +b \quad -c \quad -d$	_____

(c) From the weighted samples in the previous question, estimate $P(-a \mid +b, -d)$.

(e) Recall that during Gibbs Sampling, samples are generated through an iterative process.

Assume that the only evidence that is available is $A = +a$. Clearly fill in the circle(s) of the sequence(s) below that could have been generated by Gibbs Sampling.

Sequence 1

1 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sequence 2

1 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sequence 3

1 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sequence 4

1 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 :	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>