

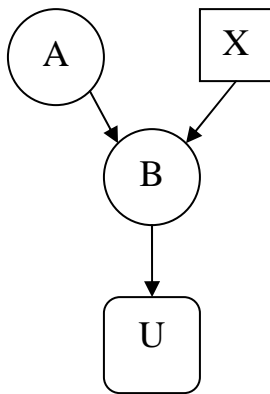
Eliminating chance nodes in Shachter's algorithm

The following is the process to update the utility node when eliminating a chance node C . Let O = the old parents of the utility node except C , and N = the old parents of C .

1. The new parents of the utility node are all the old parents except C plus all the parents of C , that is $O \cup N$.
2. Create a new utility node indexed by all combinations of values of the new parents.
3. The utility for each entry in the table (indexed by $O=o$ & $N=n$) is the sum over all values c of C of $U(O=o \ \& \ C=c) \times \Pr(C=c \mid N=n)$.

The following example illustrates this process.

Initial network



Both chance nodes A and B and decision node X all have two values each, 0 or 1.

Conditional probability table for A

$\Pr(A = 0)$	$\Pr(A = 1)$
0.9	0.1

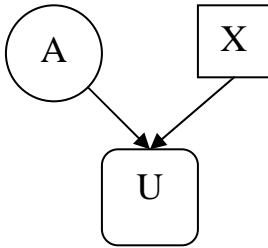
Conditional probability table for B

A	X	$\Pr(B = 0)$	$\Pr(B = 1)$
0	0	1.0	0.0
0	1	0.2	0.8
1	0	0.0	1.0
1	1	0.2	0.8

Utility matrix for U .

B	U
0	0.00
1	1.00

First eliminate B

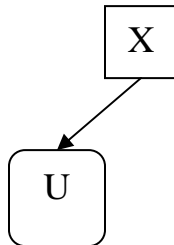


The new utility node inherits all of the parents of B. Its new utility matrix has a row for each combination of values of its parents.

New utility matrix for U.

A	X	Calculate U	U
0	0	$U(B=0)Pr(B=0 A=0 \& X=0) + U(B=1)Pr(B=1 A=0 \& X=0)$	0.00
0	1	$U(B=0)Pr(B=0 A=0 \& X=1) + U(B=1)Pr(B=1 A=0 \& X=1)$	0.80
1	0	$U(B=0)Pr(B=0 A=1 \& X=0) + U(B=1)Pr(B=1 A=1 \& X=0)$	1.00
1	1	$U(B=0)Pr(B=0 A=1 \& X=1) + U(B=1)Pr(B=1 A=1 \& X=1)$	0.80

Next eliminate A



New utility matrix for U

X	Calculate U	U
0	$U(A=0, X=0)Pr(A=0 X=0) + U(A=1, X=0)Pr(A=1 X=0)$	0.10
1	$U(A=0, X=1)Pr(A=0 X=1) + U(A=1, X=1)Pr(A=1 X=1)$	0.80

You can now eliminate X by maximising the expected utility.