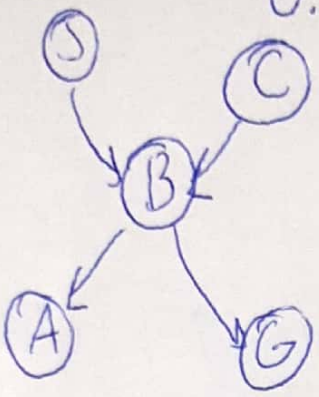
Retele Bayesiene

1)



P(S)
0.3

P(C)
0.4

S	C	P(B)
t	t	0.8
t	f	0.6
f	t	0.5
f	f	0.25

B	P(A)
t	0.20
f	0.75

B	P(G)
t	0.8
f	0.3

a) $P(A, \neg B, G)$ și $P(\neg G, A, B, S, \neg C)$

$$P(A, \neg B, G) = \sum_{S} \sum_{C} P(A, \neg B, G, S, C) \quad (S, C \text{ var ascunse})$$

Prezumerea unei rețele bayesiene - o var. depinde doar de părinții ei cu

$$P(A, \neg B, G, S, C) = P(A|\neg B) \cdot P(\neg B|S, C) \cdot P(G|B) \cdot P(S) \cdot P(C) =$$
$$= 0.75 \cdot (1-0.8) \cdot 0.3 \cdot 0.3 \cdot 0.4 = \underline{0.0054}$$

$$P(A, \neg B, G, \neg S, \neg C) = P(A|\neg B) \cdot P(\neg B|\neg S, \neg C) \cdot P(G|B) \cdot P(\neg S) \cdot P(\neg C) =$$
$$= 0.75 \cdot (1-0.25) \cdot 0.3 \cdot 0.7 \cdot 0.6 = \underline{0.070875}$$

$$P(A, \neg B, G, S, \neg C) = P(A|\neg B) \cdot P(\neg B|S, \neg C) \cdot P(G|B) \cdot P(S) \cdot P(\neg C) =$$
$$= 0.75 \cdot (1-0.6) \cdot 0.3 \cdot 0.3 \cdot 0.6 = \underline{0.0162}$$

$$P(A|\neg B, G, \neg S, C) = P(A|\neg B) \cdot P(\neg B|\neg S \cap C) \cdot P(G|\neg B) \cdot P(\neg S) \cdot P(C) =$$
$$= 0.75 \cdot (1-0.5) \cdot 0.3 \cdot 0.7 \cdot 0.4 = \underline{0.0315}$$

Le adunăm și rezultă $\boxed{P(A, \neg B, G) = 0.12407}$

$P(\neg G, A, B, \Delta, \neg C) = P(\neg G | B) \cdot P(A | \Delta) \cdot P(B | \Delta \wedge \neg C) \cdot P(\Delta) \cdot P(\neg C)$

$= (1 - 0.8) \cdot 0.2 \cdot 0.6 \cdot 0.3 \cdot 0.6 = 0.00432$

b) $P(A | \neg C)$ folosind inferență prin enumerare

$$P(A | \neg C) = \sum_{g \in \{T,F\}} \sum_{b \in \{T,F\}} \sum_{\Delta \in \{T,F\}} P(g, b, \Delta, A, \neg C) =$$

$$= \sum_{g \in \{T,F\}} \sum_{b \in \{T,F\}} \sum_{g \in \{T,F\}} P(\Delta) \cdot P(\neg C) \cdot P(b | \Delta, \neg C) \cdot P(A | b) \cdot P(g | b)$$

Δ	b	g	rez	formula
0	0	0	0.165375	$P(\neg\Delta) \cdot P(\neg C) \cdot P(\neg b \mid \neg\Delta, \neg C) \cdot P(A \mid \neg b) \cdot P(g \mid b)$
0	0	1	0.070875	$P(\neg\Delta) \cdot P(\neg C) \cdot P(\neg b \mid \neg\Delta, \neg C) \cdot P(A \mid \neg b) \cdot P(\neg g \mid b)$
0	1	0	0.0042	$P(\neg\Delta) \cdot P(\neg C) \cdot P(b \mid \neg\Delta, \neg C) \cdot P(A \mid b) \cdot P(\neg g \mid b)$
0	1	1	0.0168	$P(\neg\Delta) \cdot P(\neg C) \cdot P(b \mid \neg\Delta, \neg C) \cdot P(A \mid b) \cdot P(g \mid b)$
1	0	0	0.0378	$P(\Delta) \cdot P(\neg C) \cdot P(\neg b \mid \Delta, \neg C) \cdot P(A \mid \neg b) \cdot P(\neg g \mid \neg b)$
1	0	1	0.0162	$P(\Delta) \cdot P(\neg C) \cdot P(\neg b \mid \Delta, \neg C) \cdot P(A \mid \neg b) \cdot P(g \mid \neg b)$
1	1	0	0.00648	$P(\Delta) \cdot P(\neg C) \cdot P(b \mid \Delta, \neg C) \cdot P(A \mid b) \cdot P(\neg g \mid b)$
1	1	1	0.01728	$P(\Delta) \cdot P(\neg C) \cdot P(b \mid \Delta, \neg C) \cdot P(A \mid b) \cdot P(g \mid b)$

$\oplus$

0.82101