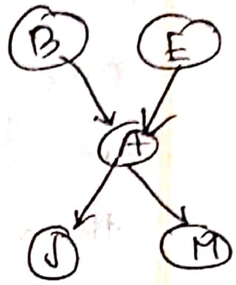
Iftekhar Hakim Kaowsar
1705045



1

$$P(E \mid -b, +m) \propto P(E, -b, +m)$$

$$P(E, -b, +m) = \sum_a \sum_j P(E, -b, +m, a, j)$$

$$= \sum_a \sum_j P(E)\, P(-b)\, P(+m \mid a)\, P(a \mid -b, E)\, P(j \mid a)$$

$$= P(E)\, P(-b)\, P(+m \mid +a)\, P(+a \mid -b, E)\, P(+j \mid +a) +$$
$$P(E)\, P(-b)\, P(+m \mid +a)\, P(+a \mid -b, E)\, P(-j \mid +a) +$$
$$P(E)\, P(-b)\, P(+m \mid -a)\, P(-a \mid -b, E)\, P(\cancel{-}\, +j \mid -a) +$$
$$P(E)\, P(-b)\, P(+m \mid -a)\, P(-a \mid -b, E)\, P(-j \mid -a)$$

So, $P(+e, -b, +m) = 0.002 \times 0.999 \times 0.7 \times 0.29 \times 0.9 +$
$0.002 \times 0.999 \times 0.7 \times 0.29 \times 0.1 +$
$0.002 \times 0.999 \times 0.01 \times 0.71 \times 0.05 +$
$0.002 \times 0.999 \times 0.01 \times 0.71 \times 0.95$

$$= 4.19 \times 10^{-4}$$

$P(-e, -b, +m) = 1 \cancel{- P(+e, -b, +m)}$ $0.998 \times 0.999 \times 0.7 \times 0.001 \times 0.9 +$
$0.998 \times 0.999 \times 0.7 \times 0.001 \times 0.1$
$+ 0.998 \times 0.999 \times 0.01 \times 0.999 \times 0.05$
$+ 0.998 \times 0.999 \times 0.01 \times 0.999 \times 0.95$

$= \cancel{0.999580}$

$= 0.021315$

So, $P(E \mid -b, +m)$

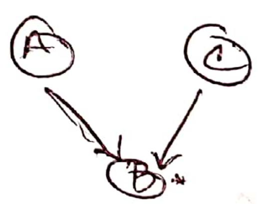
E	P
+e	0.01927
-e	0.9807

② One is finding hidden variables. Then we ~~do join~~ pick each one (hidden variables) then join it, then eliminate with. The choice we made is the picking order. Different picking order results in same, but their efficiency may not be same.

Another way is, for all combination of hidden variables, we sum them to find one specific probability.

The difference is second one always requires big memory and time. First one is still exponential, but it is usually fast and efficient.

③ Intuition:



If the common effect is observed, the causes becomes dependent. If B is observed here, A and C have some observed influence too. Because A-B and B-C are directly dependent. As both A and C has some observed influence, ~~there~~ because of same observed B, they become dependent.

$P(A)$ is a function of $P(B)$.
$P(C)$ is a function $P(B)$

So,
$P(A)$ is a function of $P(C)$.