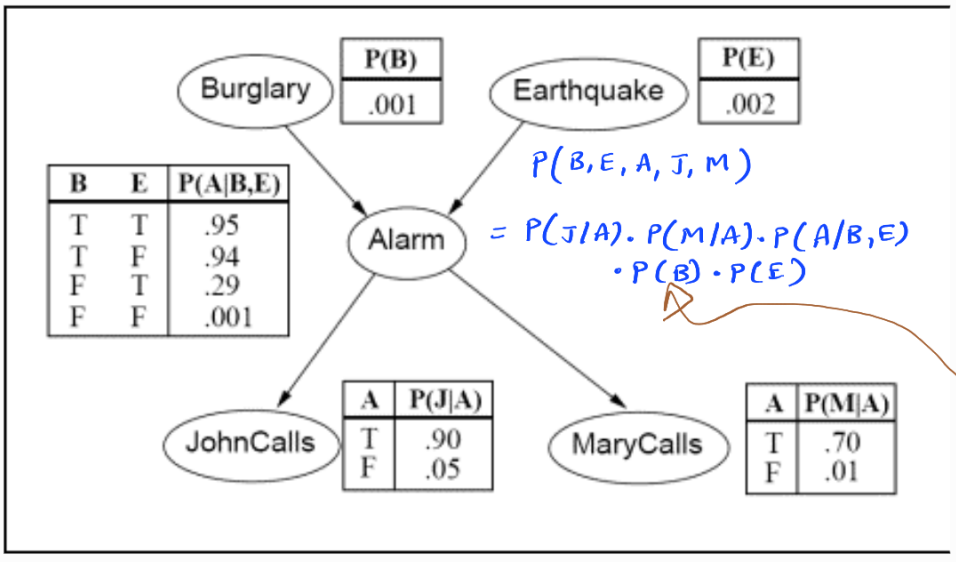

$P(B, E, A, J, M)$

$= P(J|A) \cdot P(M|A) \cdot P(A|B,E) \cdot P(B) \cdot P(E)$

John called, Mary didn't, is it Earthquake?

$P(E=1 / J=1, M=0)$?

$= \frac{P(E=1, J=1, M=0)}{P(J=1, M=0)}$ | $P(A|B) = \frac{P(A,B)}{P(B)}$

Convenient Notation

$P(e/j, \sim m) = \frac{P(e, j, \sim m)}{P(j, \sim m)}$

$= \frac{\text{(A)} \sum_{b \in [0,1]} \sum_{a \in [0,1]} P(e, j, \sim m, b, a)}{\text{(B)} \sum_{e} \sum_{b} \sum_{a} P(j, \sim m, e, b, a)}$ | marginalize missing variables

(A) $= P(e, j, \sim m, \sim b, \sim a) + P(e, j, \sim m, \sim b, a) + P(e, j, \sim m, b, \sim a) + P(e, j, \sim m, b, a)$

(B) $= P(e, j, \sim m, \sim b, \sim a) + P(e, j, \sim m, \sim b, a) + P(e, j, \sim m, b, \sim a) + P(e, j, \sim m, b, a) + P(\sim e, j, \sim m, \sim b, \sim a) + P(\sim e, j, \sim m, \sim b, a) + P(\sim e, j, \sim m, b, \sim a) + P(\sim e, j, \sim m, b, a)$

A

$P(e, j, \sim m, \sim b, \sim a) = 0.00007021 = P(j|\sim a) \cdot P(\sim m|\sim a) \cdot P(\sim a|\sim b, e) \cdot P(\sim b) \cdot P(e)$ (0.05; 1 − P(m|¬a) = 0.99; 0.71; 0.999; 0.002)

$P(e, j, \sim m, \sim b, a) = 0.0001564 = P(j|a) \cdot P(\sim m|a) \cdot P(a|\sim b, e) \cdot P(\sim b) \cdot P(e)$

$P(e, j, \sim m, b, \sim a) = 4.95 \times 10^{-9} = P(j|\sim a) \cdot P(\sim m|\sim a) \cdot P(\sim a|b, e) \cdot P(b) \cdot P(e)$

$P(e, j, \sim m, b, a) = 5.13 \times 10^{-7} = P(j|a) \cdot P(\sim m|a) \cdot P(a|b, e) \cdot P(b) \cdot P(e)$

B

$P(\sim e, j, \sim m, \sim b, \sim a) = 0.0493 = P(j|\sim a) \cdot P(\sim m|\sim a) \cdot P(\sim a|\sim b, \sim e) \cdot P(\sim b) \cdot P(\sim e)$

$P(\sim e, j, \sim m, \sim b, a) = 0.00026919 \quad P(j|a) \cdot P(\sim m|a) \cdot P(a|\sim b, \sim e) \cdot P(\sim b) \cdot P(\sim e)$

$P(\sim e, j, \sim m, b, \sim a) = 2.9641 \times 10^{-6} \quad P(j|\sim a) \cdot P(\sim m|\sim a) \cdot P(\sim a|b, \sim e) \cdot P(b) \cdot P(\sim e)$

$P(\sim e, j, \sim m, b, a) = 0.00025329 \quad P(j|a) \cdot P(\sim m|a) \cdot P(a|b, \sim e) \cdot P(b) \cdot P(\sim e)$

$P(e/j, \sim m) = \frac{P(e, j, \sim m)}{P(j, \sim m)}$

$= \frac{\text{(A)} \sum_{b \in [0,1]} \sum_{a \in [0,1]} P(e, j, \sim m, b, a)}{\text{(B)} \sum_{e} \sum_{b} \sum_{a} P(j, \sim m, e, b, a)}$ | marginalize missing variables

$$= \frac{(A)}{(B)}$$

$$= \frac{\left(0.0000702 + .0001564 + 4.95 \times 10^{-9} + 5.13 \times 10^{-7} \right.}{\left[0.0000702 + .0001564 + 4.95 \times 10^{-9} + 5.13 \times 10^{-7} \right.}$$
$$\left. + 0.0493 + 0.00026919 + 2.9641 \times 10^{-6} + 0.000253 \right]$$

$$= \frac{0.00022718}{0.0501}$$

$$= 0.0045345$$

$$P(\nu e / j; \nu m) =$$