



**Query: Inference from Bayes Net**

$$P(B \mid J = T, M = T)$$

Hidden Variables: Earthquake & Alarm.

$$P(B \mid J = T, M = T) = \alpha \sum_e \sum_a P(B, J = T, M = T, e, a)$$

$$P(b \mid j, m) = \alpha \sum_e \sum_a P(b)P(e)P(a \mid b, e)P(j \mid a)P(m \mid a)$$

$$P(b \mid j, m) = \alpha P(b) \sum_e P(e) \sum_a P(a \mid b, e)P(j \mid a)P(m \mid a)$$

$$P(b \mid j, m) = \alpha \cdot 0.000059224$$

$$P(b \mid j, m) = \alpha P(b) \sum_e P(e) \sum_a P(a \mid b, e)P(j \mid a)P(m \mid a)$$

$$P(b) = 0.001$$

$$P(b \mid j, m) = \alpha \cdot 0.001 \left( \sum_e P(e) \sum_a P(a \mid b, e)P(j \mid a)P(m \mid a) \right) \\ + P(\neg a \mid b, e)P(j \mid \neg a)P(m \mid \neg a)$$

$$\begin{aligned}
& \sum_e P(e) \sum_a P(a \mid b, e) P(j \mid a) P(m \mid a) \\
= & \sum_{e \in \{\text{true}, \text{false}\}} P(e) (P(a = \text{true} \mid b, e) P(j = \text{true} \mid a = \text{true}) P(m = \text{true} \mid a = \text{true})) \\
& + P(a = \text{false} \mid b, e) P(j = \text{true} \mid a = \text{false}) P(m = \text{true} \mid a = \text{false})
\end{aligned}$$