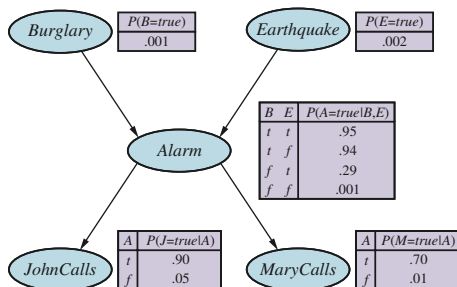


# Probabilistic Inference Review (AIMA 13.3-13.4)

## Artificial Intelligence

- Given the network:



$$Pr(b | j, m) = \alpha Pr(b) \sum_e Pr(e) \sum_a Pr(a | b, e) Pr(j | a) Pr(m | a) \quad (13.5)$$

Annotate the factors in the expression for the network.

**Solution:**

$$Pr(B | j, m) = \alpha \underbrace{Pr(B)}_{f_1(B)} \sum_e \underbrace{Pr(e)}_{f_2(E)} \sum_a \underbrace{Pr(a | B, e)}_{f_3(A, B, E)} \underbrace{Pr(j | a)}_{f_4(A)} \underbrace{Pr(m | a)}_{f_5(A)}$$

- What is the difference between direct sampling and Markov chain Monte Carlo sampling?

**Solution:** Direct sampling methods generate events based on the probabilities in the Bayes net by sampling all the nodes in the network.

Markov chain Monte Carlo methods generate one sample, then generates each additional sample by making a random change to the preceding sample.

- What is the idea behind importance sampling?

**Solution:** The general statistical technique of importance sampling aims to emulate the effect of sampling from a distribution  $P$  using samples from another distribution  $Q$  whose samples are easier to obtain.

- The Metropolis-Hastings sampling algorithm is similar in structure to which local search algorithm?

**Solution:** Simulated annealing.