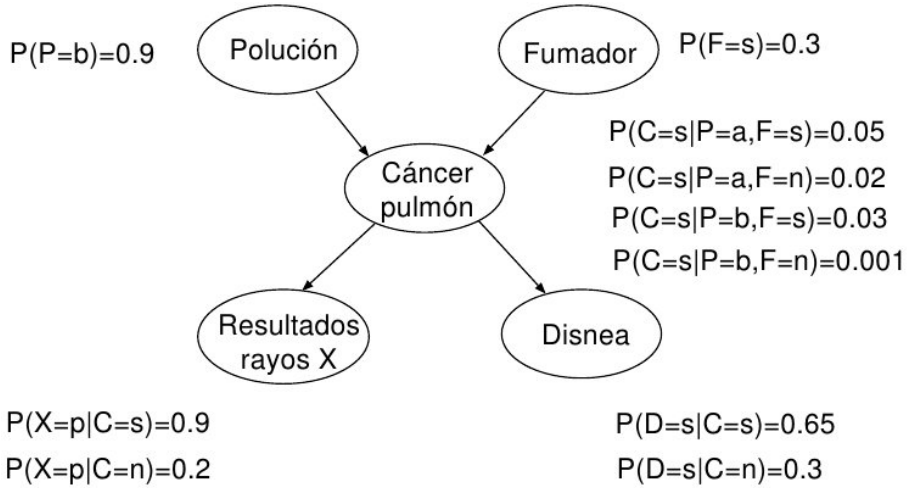
REDES BAYESIANAS



Calcular la probabilidad de que el paciente sea fumador sabiendo que padece disnea y que los resultados de rayos X han salido negativos

$$P(F, D, X, P, C) = P(P)\,P(F)\,P(C \mid P, F)\,P(X \mid C)\,P(D \mid C)$$

$$P(F = s \mid D = s, X = n) = \frac{P(F = s, D = s, X = n)}{P(D = s, X = n)}$$

$$= \frac{\sum_{p\in\{b,a\},c\in\{s,n\}} P(F = s, D = s, X = n, P = p, C = c)}{\sum_{f\in\{s,n\},p\in\{b,a\},c\in\{s,n\}} P(F = f, D = s, X = n, P = p, C = c)}$$

$$= \frac{\sum_{p\in\{b,a\},c\in\{s,n\}} P(P = p)P(F = s)P(C = c \mid P = p, F = s)P(X = n \mid C = c)P(D = s \mid C = c)}{\sum_{f\in\{s,n\},p\in\{b,a\},c\in\{s,n\}} P(P = p)P(F = f)P(C = c \mid P = p, F = f)P(X = n \mid C = c)P(D = s \mid C = c)}$$

$$= \frac{P(F = s)\sum_{p\in\{b,a\}} P(P = p)\sum_{c\in\{s,n\}} P(C = c \mid P = p, F = s)P(X = n \mid C = c)P(D = s \mid C = c)}{\sum_{f\in\{s,n\}} P(F = f)\sum_{p\in\{b,a\}} P(P = p)\sum_{c\in\{s,n\}} P(C = c \mid P = p, F = f)P(X = n \mid C = c)P(D = s \mid C = c)}$$

$$= 0.29551$$

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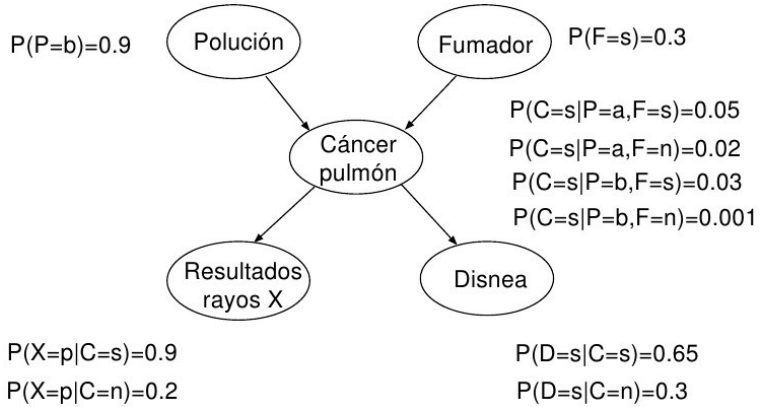

Calcular la probabilidad de que un paciente sufra disnea sabiendo que es fumador y que los resultados de rayos X han salido positivos.

$$P(F, D, X, P, C) = P(P)\, P(F)\, P(C \mid P, F)\, P(X \mid C)\, P(D \mid C)$$

$$P(D = s \mid F = s, X = p) = \frac{P(D = s, F = s, X = p)}{P(F = s, X = p)}$$

$$= \frac{\sum_{q \in \{b,a\}, c \in \{s,n\}} P(F = s, D = s, X = p, P = q, C = c)}{\sum_{d \in \{s,n\}, q \in \{b,a\}, c \in \{s,n\}} P(F = f, D = d, X = p, P = q, C = c)}$$

$$= \frac{\sum_{q \in \{b,a\}, c \in \{s,n\}} P(P = q)\, P(F = s)\, P(C = c \mid P = q, F = s)\, P(X = p \mid C = c)\, P(D = s \mid C = c)}{\sum_{d \in \{s,n\}, q \in \{b,a\}, c \in \{s,n\}} P(P = q)\, P(F = s)\, P(C = c \mid P = q, F = s)\, P(X = p \mid C = c)\, P(D = d \mid C = c)}$$

$$= \frac{P(F = s) \sum_{q \in \{b,a\}} P(P = q) \sum_{c \in \{s,n\}} P(C = c \mid P = q, F = s)\, P(X = p \mid C = c)\, P(D = s \mid C = c)}{P(F = s) \sum_{q \in \{b,a\}} P(P = q) \sum_{c \in \{s,n\}} P(C = c \mid P = q, F = s) P(X = p \mid C = c) \sum_{d \in \{s,n\}} P(D = d \mid C = c)}$$

$$= \frac{\sum_{q \in \{b,a\}} P(P = q) \sum_{c \in \{s,n\}} P(C = c \mid P = q, F = s)\, P(X = p \mid C = c)\, P(D = s \mid C = c)}{\sum_{q \in \{b,a\}} P(P = q) \sum_{c \in \{s,n\}} P(C = c \mid P = q, F = s) P(X = p \mid C = c) \sum_{d \in \{s,n\}} P(D = d \mid C = c)}$$

$$= 0.34532$$

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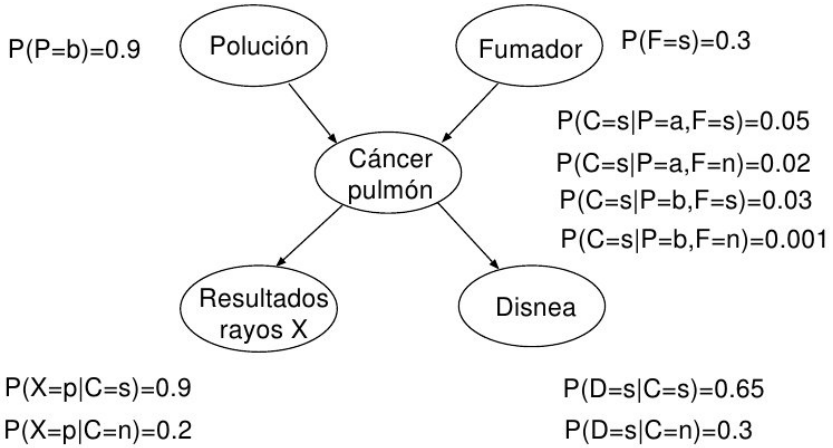

Calcular a probabilidad de que un paciente sufra cáncer y padezca disnea sabiendo que es fumador, que la polución que sufre el paciente es alta y que los resultados de rayos X han salido positivos.

$$P(F, D, X, P, C) = P(P)\, P(F)\, P(C \mid P, F)\, P(X \mid C)\, P(D \mid C)$$

$$P(C = s, D = s \mid F = s, X = p, P = a) = \frac{P(C = s, F = s, D = s, X = p, P = a)}{P(F = s, X = p, P = a)}$$

$$= \frac{P(C = s, F = s, D = s, X = p, P = a)}{\sum_{c \in \{s,n\}, d \in \{s,n\}} P(C = c, F = s, D = d, X = p, P = a)}$$

$$= \frac{P(P = a)\, P(F = s)\, P(C = s \mid P = a, F = s)\, P(X = p \mid C = s)\, P(D = s \mid C = s)}{\sum_{c \in \{s,n\}, d \in \{s,n\}} P(P = a)\, P(F = s)\, P(C = c \mid P = a, F = s)\, P(X = p \mid C = c)\, P(D = d \mid C = c)}$$

$$= \frac{\cancel{P(P = a)}\, , \cancel{P(F = s)}\, P(X = p \mid C = s)\, P(D = s \mid C = s)\, P(C = s \mid P = a, F = s)}{\cancel{P(P = a)}\, , \cancel{P(F = s)}\, \sum_{c \in \{s,n\}} P(X = p \mid C = c) \left(\cancel{\sum_{d \in \{s,n\}} P(D = d \mid C = c)} \right) P(C = c \mid P = a, F = s)}$$

$$= \frac{P(X = p \mid C = s)\, P(D = s \mid C = s)\, P(C = s \mid P = a, F = s)}{\sum_{c \in \{s,n\}} P(X = p \mid C = c)\, P(C = c \mid P = a, F = s)}$$

$$= 0.124$$