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Trabajo T6

La red Bayesiana presenta la siguiente probabilidad conjunta:

$$P(P) * P(F) * P(C|P,F) * P(X|C) * P(D|C)$$

Ejercicio 1

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

$$\frac{0.3*(0.9*0.03*0.1*0.65+0.9*0.97*0.8*0.3+0.1*0.05*0.1*0.65+0.1*0.95*0.8*0.3)}{0.9*0.7*0.01*0.1*0.65+0.9*0.7*0.99*0.8*0.3+0.1*0.7*0.02*0.1*0.65+0.1*0.7*0.98*0.8*0.3+0.07032} = \frac{0.07032}{0.2369725} = 0.297$$

Ejercicio 2

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

$$= \frac{\sum_{P,C} P(P = p) * P(F = s) * P(C = c\,|P = p, F = s) * P(X = p\,|C = c) * P(D = s|C = c)}{\sum_{P,C,D} P(P = p) * P(F = s) * P(C = c\,|P = p, F = s) * P(X = p\,|C = c) * P(D = d|C = c)}$$

$$= \frac{0.9 * 0.3 * 0.03 * 0.65 * 0.9 + 0.9 * 0.3 * 0.97 * 0.3 * 0.2 + 0.1 * 0.3 * 0.05 * 0.65 * 0.9 + 0.1 * 0.3 * 0.95 * 0.3 * 0.2}{9 * 0.3 * 0.03 * 0.35 * 0.9 + 0.9 * 0.3 * 0.97 * 0.7 * 0.2 + 0.1 * 0.3 * 0.02 * 0.35 * 0.9 + 0.1 * 0.3 * 0.98 * 0.7 * 0.2}$$

$$= \frac{0.023}{0.064} = 0.35$$

Ejercicio 3

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

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

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

$$=\frac{0.05*0.9*0.65}{0.05*0.9*0.65+0.05*0.9*0.35+0.95*0.2*0.3+0.95*0.2*0.7}=\frac{0.029}{0.235}=0.123$$