Machine Learning Lab Class IV

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Exercise 2.a

We have to calculate priory probabilities of D_1, D_2, D_3, D_4, D_5 which can simply be achieved by counting how many times each variable has appeared in Diagnosis column and dividing by total elements in same column

$$\mathrm{P}(D_1) = \frac{1}{8}$$
$$\mathrm{P}(D_2) = \frac{2}{8} = \frac{1}{4}$$
$$\mathrm{P}(D_3) = \frac{3}{8}$$
$$\mathrm{P}(D_4) = \frac{1}{8}$$
$$\mathrm{P}(D_5) = \frac{1}{8}$$

Exercise 2.b

To calculate : $\mathrm{P}(D_i/S_4)$
We have formula:

$$\mathrm{P}(D_i/S_4) = \frac{P(D_i)*P(S_4/D_i)}{\sum_{i=1}^{k} P(D_i)*P(S_4/D_i)}$$

We already have priory probabilities from 2.a and now we need to calculate individual probabilities i.e. $P(S_4/D_i)$ for each D_1.....D_5

$$P(S_4/D_1) = 0$$
$$P(S_4/D_2) = \frac{1}{2}$$
$$P(S_4/D_3) = 0$$
$$P(S_4/D_4) = 1$$
$$P(S_4/D_5) = 0$$

Calculating denominator i.e. $\sum_{i=1}^{k} P(D_i) * P(S_4/D_i)$

$$\sum_{i=1}^{5} P(D_i) * P(S_4/D_i) = \frac{1}{8} * 0 + \frac{1}{4} * \frac{1}{2} + \frac{3}{8} * 0 + \frac{1}{8} * 1 + \frac{1}{8} * 0$$

$$\sum_{i=1}^{5} P(D_i) * P(S_4/D_i) = \frac{1}{4}$$

Now, finally we calculate posterior probabilities by substituting all the values calculated above

$$\mathrm{P}(D_1/S_4) = \frac{\frac{1}{8}*0}{\frac{1}{4}} = 0$$

$$\mathrm{P}(D_2/S_4) = \frac{\frac{1}{4}*\frac{1}{2}}{\frac{1}{4}} = \frac{1}{2}$$

$$\mathrm{P}(D_3/S_4) = \frac{\frac{3}{8}*0}{\frac{1}{4}} = 0$$

$$\mathrm{P}(D_4/S_4) = \frac{\frac{1}{8}*1}{\frac{1}{4}} = \frac{1}{2}$$

$$\mathrm{P}(D_5/S_4) = \frac{\frac{1}{8}*0}{\frac{1}{4}} = 0$$