Определите класс D_4

$D_1 = (X_1, X_2, X_3)$ – класс C_1

$D_2 = (X_1, X_2, X_4)$ – класс C_1

$D_3 = (X_4, X_5, X_6)$ – класс C_2

$D_4 = (X_1, X_4, X_5)$ – ? без использования log

$P(C_1) = \frac{2}{3}$ $P(C_2) = \frac{1}{3}$

Vocabulary $X_1, \ldots, X_6$

Multinomial:

$text_{c_1} = \{X_1^2, X_2^2, X_3, X_4\}$ $|text_{c_1}| = 6$

$text_{c_2} = \{X_4, X_5, X_6\}$ $|text_{c_2}| = 3$

$P(X_1|C_1) = \frac{2+1}{6+6} = P(X_2|C_1)$

$P(X_3|C_1) = \frac{1+1}{6+6} = P(X_4|C_1)$

$P(X_5|C_1) = \frac{1}{6+6} = P(X_6|C_1)$

$P(X_1|C_2) = \frac{1}{3+6} = P(X_2|C_2) = P(X_3|C_2)$

$P(X_4|C_2) = \frac{1+1}{3+6} = P(X_5|C_2) = P(X_6|C_2)$

$C_{NB} = \text{argmax}\left[P(C_i) P(X_1|C_i) P(X_4|C_i) P(X_5|C_i)\right] =$

$= \text{argmax} \begin{cases} i=1: \frac{2}{3} \cdot \frac{3}{12} \cdot \frac{2}{12} \cdot \frac{1}{12} = \frac{1}{4^2 \cdot 3^3} \approx 0,0023 \\ i=2: \frac{1}{3} \cdot \frac{1}{9} \cdot \frac{2}{9} \cdot \frac{2}{9} = \frac{4}{3^7} \approx 0,0018 \end{cases} \Rightarrow D_4$ класс C_1

Bernulli:

$$P(X_1|C_1) = \frac{2+1}{2+2} = P(X_2|C_1)$$

$$P(X_3|C_1) = \frac{1+1}{2+2} = P(X_4|C_1)$$

$$P(X_5|C_1) = \frac{1}{2+2} = P(X_6|C_1)$$

$$P(X_1|C_2) = \frac{1}{1+2} = P(X_2|C_2) = P(X_3|C_3)$$

$$P(X_4|C_2) = \frac{1+1}{1+2} = P(X_5|C_2) = P(X_6|C_2)$$

$$C_B = \arg\max \Big[P(C_i) P(X_1|C_i) P(X_4|C_i) P(X_5|C_i) (1-P(X_2|C_i))(1+P(X_3|C_i))(1-P(X_6|C_i)$$

$$C_B = \arg\max \begin{cases} i=1: \frac{2}{3}\cdot\frac{3}{4}\cdot\frac{1}{4}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{4}\cdot\frac{3}{4} = \frac{3}{2^9} \approx 0,0059 \\ i=2: \frac{1}{3}\cdot\frac{1}{3}\cdot\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{1}{3} = \frac{2}{37} \approx 0,0073 \end{cases}$$

$\Rightarrow$ A_4 - класс C_2.