Bayes decisions – coins A

$l(s,d) = |hd - hs|$

- hd: our decision about value of the coin
- hs: value of the coin

- How many strategies?
  All of them can take all of the values of weight (0.0 at 25g for 1czk might as well be 0.04), so since we have 3 attributes and 5 decisions we get $d^x = 5^3 = 125$ strategies

- Weight of new coin is 10 g. Put it into which category?

$$P(\text{coin} \mid 10g) = \frac{P(\text{coin}, 10g)}{P(10g)}$$

$$P(10g) = 0.16 + 2 \cdot 0.04 = 0.24$$

$$\Downarrow$$

$$P(1\text{czk} \mid 10g) = \frac{0.16}{0.24} = 2/3$$

$$P(2\text{czk} \mid 10g) = P(5\text{czk} \mid 10g) = \frac{0.04}{0.24} = 1/6$$

Loss functions:

$$\begin{cases} l(1\text{czk}, 1\text{czk}) = l(2\text{czk}, 2\text{czk}) = l(5\text{czk}, 5\text{czk}) = 0 \\ l(1\text{czk}, 2\text{czk}) = l(2\text{czk}, 1\text{czk}) = 1 \\ l(1\text{czk}, 5\text{czk}) = l(5\text{czk}, 1\text{czk}) = 4 \\ l(2\text{czk}, 5\text{czk}) = l(5\text{czk}, 2\text{czk}) = 3 \end{cases}$$

Now we can use the formula for optimal classifica to get:

$$\delta^*(x=10g) = \begin{cases} d=1\text{czk}: 0 \cdot 2/3 + 1 \cdot 1/6 + 4 \cdot 1/6 = 5/6 \\ d=2\text{czk}: 0 \cdot 1/6 + 1 \cdot 2/3 + 3 \cdot 1/6 = 7/6 \\ d=5\text{czk}: 0 \cdot 1/6 + 4 \cdot 2/3 + 3 \cdot 1/6 = 19/6 \end{cases}$$

$d = 1\text{czk}$!

Will put this coin in class 1 czk