Assignment 9

Exercise 2

$$\mathcal{G} = \{1, 2\}$$

$$\mathcal{T}_{train} = \{(0.3, 1), (1.8, 1), (1.5, 1), (4.8, 2), (2.6, 2)\}$$

$$\mathcal{T}_{val} = \{(1.6, 1), (1.9, 2), (2.5, 2)\}$$

Following

$$\hat{P}(1) = \frac{3}{5} \qquad \hat{P}(2) = \frac{2}{5}$$

$$\hat{\mu}_1 = \frac{1}{3}(0.3 + 1.8 + 1.5) = 1.2 \qquad \hat{\mu}_2 = \frac{1}{2}(4.8 + 2.6) = 3.7$$

$$\hat{\sigma} = \frac{1}{3}\left(\sum_{\substack{i=1 \\ y_i \in 1}}^{N} (x_i - \mu_1)^2 + \sum_{\substack{i=1 \\ y_i \in 2}}^{N} (x_i - \mu_2)^2 \right)$$

$$= \frac{1}{3}\left((-0.9)^2 + (0.6)^2 + (-0.3)^2 + (1.1)^2 + (1.1)^2 \right) = 1.23$$

Now the classifier is built:

$$f_g(x) = \log \hat{P}_G(g) + x \frac{\hat{\mu}_g}{\hat{\sigma}} - \frac{1}{2} \frac{\hat{\mu}_g^2}{\sigma}$$

b)

$$f_1(1.6) = 0.76 \qquad f_2(1.6) = -1.15$$

$$f_1(1.9) = 1.05 \qquad f_2(-0.25) = -0.25$$

$$f_1(2.5) = 1.64 \qquad f_2(1.56) = 1.56$$

} incorrect prediction

$$\hat{f}(x) = \underset{g \in \{1,2\}}{\operatorname{argmax}} \left(f_g(x) \right)$$

$$GE = \frac{1}{|\mathcal{T}_{val}|} \sum^{|\mathcal{T}_{val}|} \mathcal{L}_{0-1}\left(\hat{f}(x_i), y_i \right)$$

$|\tau_{val}|$ $\sum_{i=1}$

$= \frac{1}{3} \cdot 2 = \boxed{\frac{2}{3}}$