CS412 - Machine Learning

Assignment # 1

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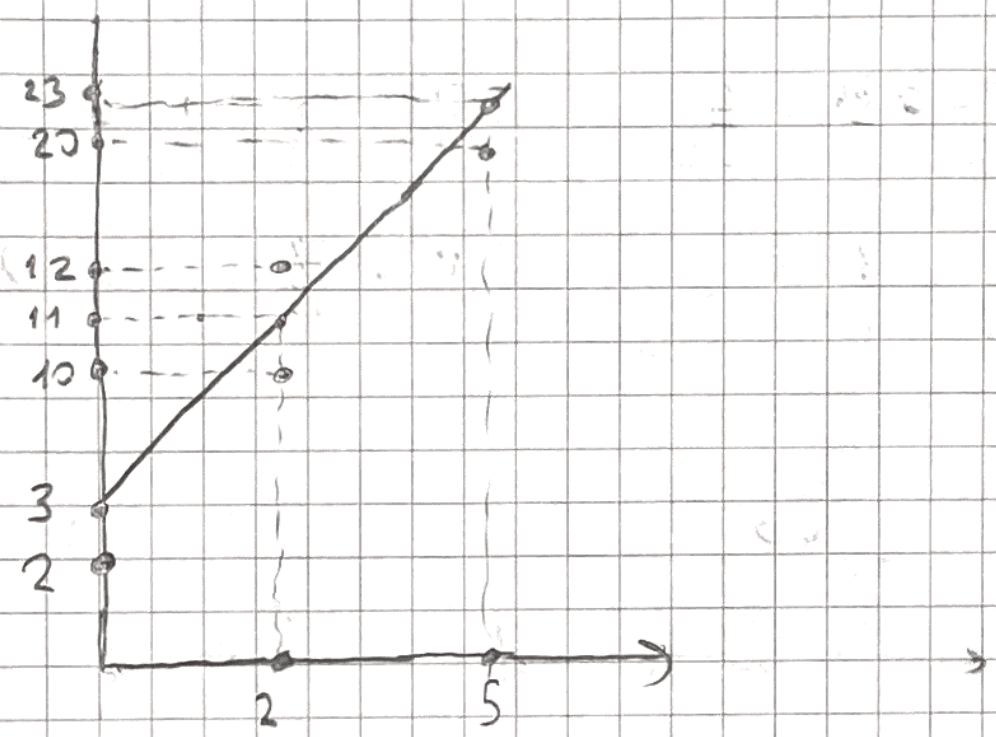
Q2)



① $MSE = \frac{1}{n} \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$

$(y_1 - \hat{y}_1)^2 = (3-2)^2 = 1$, $(y_2 - \hat{y}_2)^2 = (10-11)^2 = 1$

$(y_3 - \hat{y}_3)^2 = (12-11)^2 = 1$, $(y_4 - \hat{y}_4)^2 = (20-23)^2 = 9$

$\Rightarrow MSE_{\text{for } n=4} = \frac{1}{4} \sum_{i=1}^{4} (y_i - \hat{y}_i)^2 = \frac{1}{4} \cdot (1+1+1+9) = 3$

Next Page $\Rightarrow$ Q3 $\Longrightarrow$

(Q3)

① $\text{Accuracy} = \frac{TP + TN}{TP + FP + TN + FN}$

$\Rightarrow TP = \frac{7}{10} \cdot \frac{3}{4} = \frac{21}{40}$ $\quad TN = \frac{3}{10} \cdot \frac{1}{4} = \frac{3}{40}$

$FP = \frac{3}{10} \cdot \frac{3}{4} = \frac{9}{40}$ $\quad FN = \frac{7}{10} \cdot \frac{1}{4} = \frac{7}{40}$

$\Rightarrow \text{Accuracy} = \frac{\frac{21}{40} + \frac{3}{40}}{\frac{21}{40} + \frac{9}{40} + \frac{3}{40} + \frac{7}{40}} = \frac{\frac{24}{40}}{\frac{40}{40}} = \frac{6}{10} = 0.6$

② $\text{Entropy} = -\sum p(x) \cdot \log(p(x))$

$\Rightarrow = -\left(\frac{3}{4} \cdot \log_2\left(\frac{3}{4}\right) + \frac{1}{4} \cdot \log_2\left(\frac{1}{4}\right) \right)$

$= -\left(\frac{3}{4} \cdot \log_2\left(\frac{3}{4}\right) + \frac{1}{4} \cdot (-2) \right)$

$= -\left(-\frac{1}{2} + \frac{3}{4} \log_2\left(\frac{3}{4}\right) \right)$

$\approx 0.81127 \approx 0.81$