

1.

i) Para $y_1 \geq 0,3$:

$$H(y_2) = H(y_2=0) + H(y_2=1) + H(y_2=2)$$

$$H(y_2=0) =$$

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

$$= -\left(\frac{2}{4} \log \frac{1}{4} + \frac{2}{4} \log \frac{2}{4}\right) = -\frac{2}{4} \left(\log \frac{2}{16}\right)$$

$$= -\frac{2}{4} \left(\log \frac{1}{8}\right) = \frac{2}{4} \log 8 = \frac{2}{4} \cdot 3 = \frac{6}{4} = \frac{3}{2} = 1,5$$

$$H(y_2=1) = -\left(\frac{2}{3} \log \frac{2}{3} + \frac{1}{3} \log \frac{1}{3}\right)$$

$$= 0,918$$

$$H(y_2=2) = 0$$

Para $y_1 \geq 0,3$:

$$IG(y_1 \geq 0,3; y_2) =$$

$$H(y_1 \geq 0,3) =$$

$$-\left(\frac{3}{7} \log \frac{3}{7} + \frac{2}{7} \log \frac{2}{7} + \frac{2}{7} \log \frac{2}{7}\right) =$$

$$= -\left(\frac{3}{7} \log \frac{3}{7} + \frac{4}{7} \log \frac{2}{7}\right) =$$

$$= -\left(\frac{3}{7} \log_2 \frac{3}{7} + \frac{4}{7} \log_2 \frac{2}{7}\right) = 1,557$$

$$IG = 1,557 - \left(\frac{4}{7}\right) \cdot 1,5 - \left(\frac{3}{7} \cdot 0,918\right) - 0$$

$$= 0,306$$

$$H(y_3=0) = 0$$

$$H(y_3=1) = -\left(\frac{1}{4} \log \frac{1}{4} + \frac{1}{4} \log \frac{1}{4} + \frac{2}{4} \log \frac{2}{4}\right)$$

$$= 1,5$$

$$H(y_3=2) = 0$$

$$IG = 1,557 - 0 - \frac{4}{7} \cdot 1,5 - 0 \approx 0,7$$

$$H(y_4=0) = -\left(\frac{1}{2} \log \frac{1}{2} + \frac{1}{2} \log \frac{1}{2}\right)$$

$$= -\left(\log \frac{1}{2}\right) = -(-1) = 1$$

$$H(y_4=1) = -\left(\frac{1}{3} \log \frac{1}{3} + \frac{2}{3} \log \frac{2}{3}\right)$$

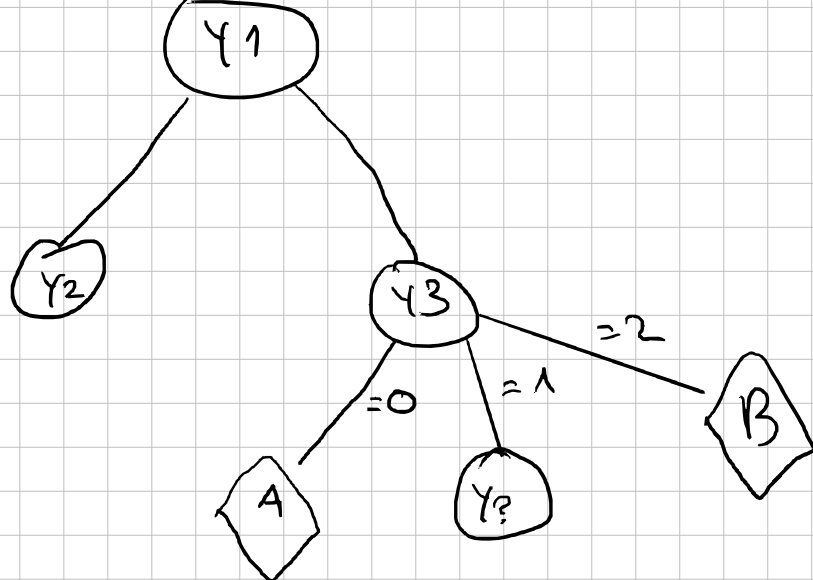
$$= 0,918$$

$$H(y_4=2) = 0$$

$$IG = 1,557 - \frac{4}{7} \cdot 1 - \left(\frac{3}{7} \cdot 0,918\right)$$

$$= 0,592$$

$$IG_{y_3} = 0,7 \quad IG_{y_2} = 0,306 \quad IG_{y_4} = 0,592$$



Para $y_1 \geq 0,3$ e $y_3 = 1$:

$$H(y_2=0) = -\left(\frac{1}{4} \log \frac{1}{4} + \frac{1}{4} \log \frac{1}{4} + \frac{2}{4} \log \frac{2}{4}\right)$$

$$= 1,5$$

$$H(y_2=1) = 0$$

$$H(y_2=2) = 0$$

$$H(y_4 \geq 0,3; y_3=1) = 1,5$$

$$IG_{y_2} = 1,5 - 1 \cdot 1,5 - 0 - 0 = 0$$

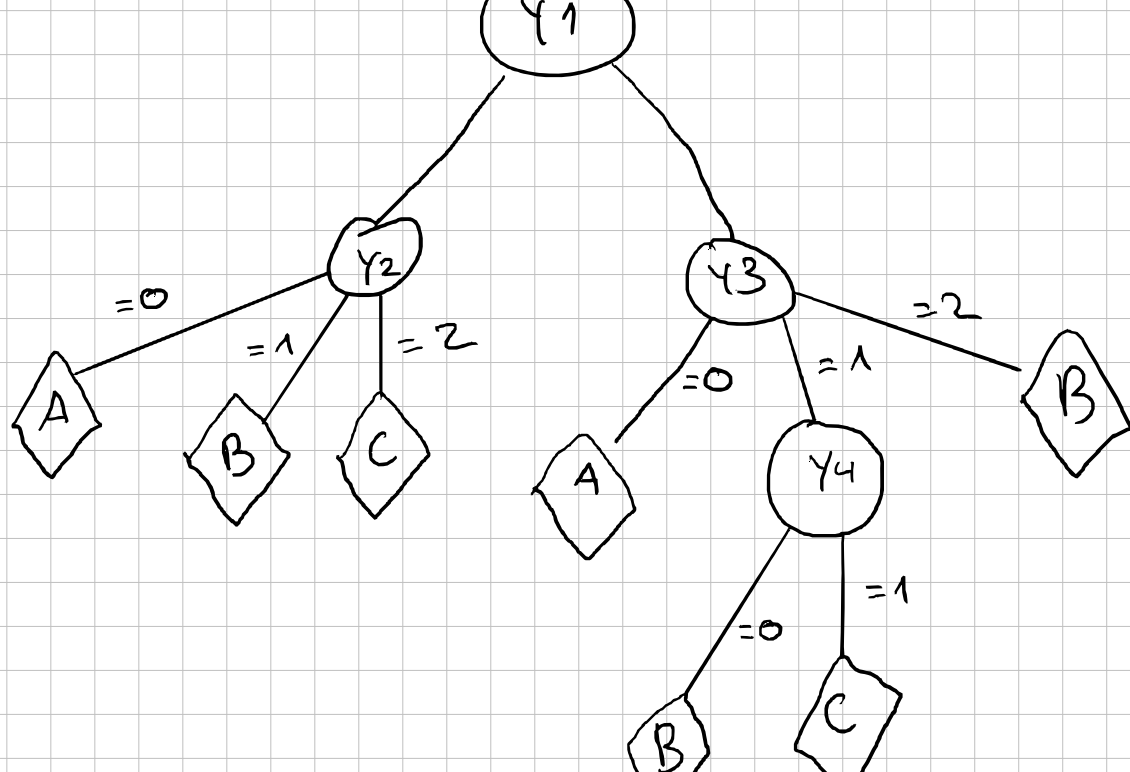
$$H(y_4=0) = -(1 \log 1) = 0$$

$$H(y_4=1) = -\left(\frac{1}{3} \log \frac{1}{3} + 0 + \frac{2}{3} \log \frac{2}{3}\right)$$

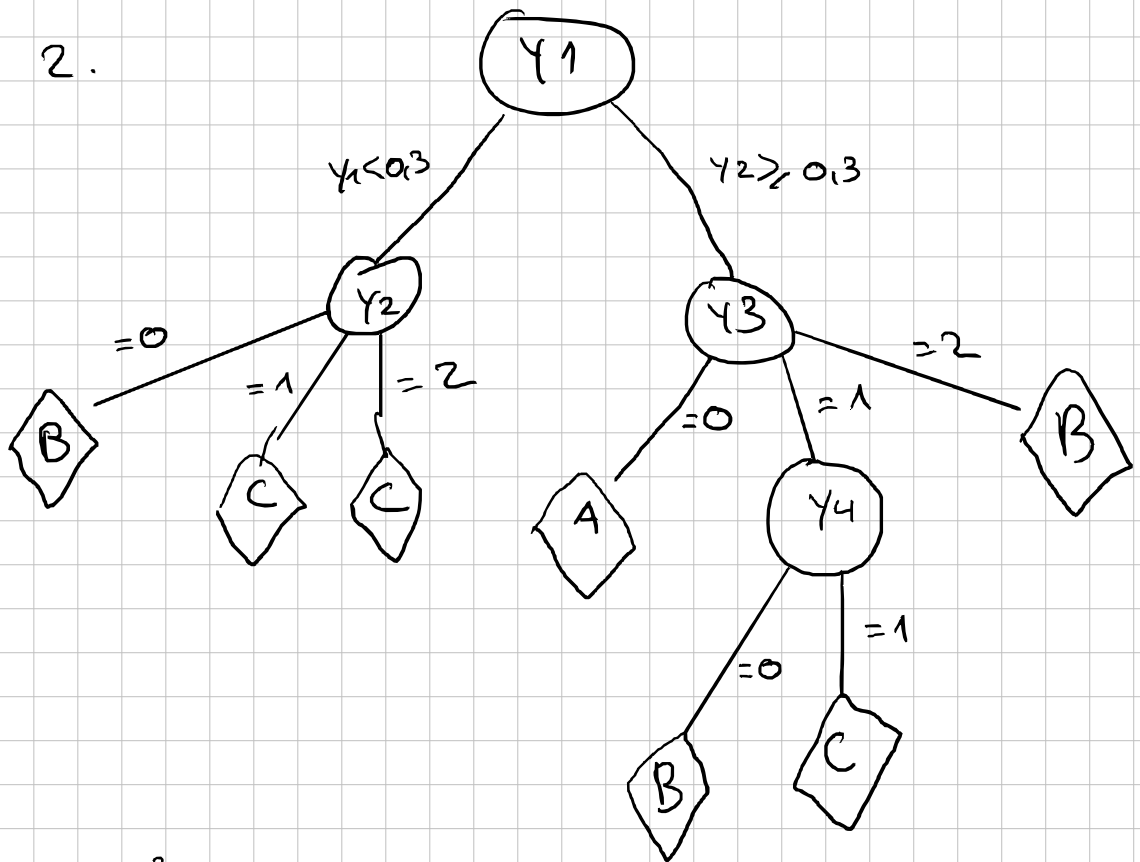
$$= 0,918$$

$$H(y_4=2) = 0$$

$$IG_{y_4} = 1,5 - 0 - \frac{3}{4} \cdot 0,918 - 0 = 0,8115$$



2.



1 2 3 4 5 6 7 8 9 10 11 12
 C B C B C B C A C C A B
 A A A

$Y_{out} = [C B C B C B A A C C A B] \leftarrow$

$= [C B C B C B C A C C A B] \leftarrow$

Real

	A	B	C
A	2	0	0
B	0	4	0
C	1	0	5

$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 1 & 0 & 5 \end{bmatrix}$

3.
$$\text{Sensitivity} = \frac{TP}{TP + FN}$$

$$F_1 = \frac{2}{\frac{1}{P} + \frac{1}{R}}$$

$$\text{Precision} = \frac{TP}{TP + FP}$$

$$\text{sensitivity}_A = \frac{2}{2 + 1} = \frac{2}{3}$$

$$\text{precision}_A = \frac{2}{2 + 0} = 1$$

$$\text{sensitivity}_B = \frac{4}{4 + 0} = 1$$

$$\text{precision}_B = \frac{4}{4 + 0} = 1$$

$$\text{sensitivity}_C = \frac{5}{5 + 0} = 1$$

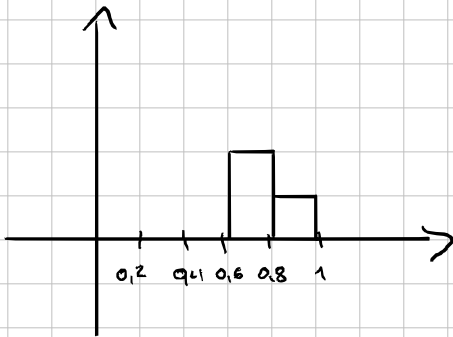
$$\text{precision}_C = \frac{5}{5 + 1} = \frac{5}{6}$$

$$F_{1A} = \frac{2}{3/2 + 1} = \frac{2}{5}$$

$$F_{1B} = \frac{2}{1 + 1} = 1$$

$$F_{1C} = \frac{2}{1 + \frac{6}{5}} = \frac{2}{11/5} = \frac{10}{11}$$

$$Y_{out} = A : x_7, x_8, x_{11}$$



$$[0, 0.2[\rightarrow C$$

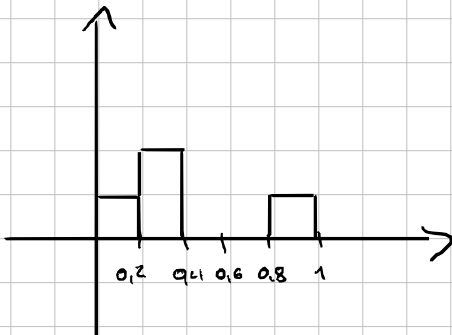
$$[0.2, 0.4[\rightarrow B$$

$$[0.4, 0.6[\rightarrow C$$

$$[0.6, 0.8[\rightarrow A$$

$$[0.8, 1[\rightarrow A$$

$$Y_{out} = B : x_2, x_4, x_6, x_{12}$$



$$Y_{out} = C : x_1, x_3, x_5, x_9, x_{10}$$

