

$$\text{signal} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ \vdots \\ 49998 \end{bmatrix} \begin{bmatrix} -3.438 \cdot 10^{-5} \\ -3.438 \cdot 10^{-5} \\ -0.018 \\ -3.438 \cdot 10^{-5} \\ 0 \\ -0.009 \\ \vdots \end{bmatrix} \text{ V} \quad \text{Seuil}_{\text{HIGH}} = 0.708 \text{ V}$$

1) create a mask vector using a boolean expression (TRUE --> 1, FALSE --> 0)

$$\text{mask} := \text{signal} > \text{Seuil}_{\text{HIGH}} \quad \text{OUT1} := \text{mask} \cdot 5 \text{ V} \quad \text{or shorter:} \quad \text{OUT1} := (\text{signal} > \text{Seuil}_{\text{HIGH}}) \cdot 5 \text{ V}$$

2) Using a range variable and either the if-function or the if programming structure

$$i := \text{ORIGIN} .. \text{last}(\text{signal}) \quad \text{OUT2}_i := \text{if}(\text{signal}_i > \text{Seuil}_{\text{HIGH}}, 5 \text{ V}, 0 \text{ V})$$

Check if we get consistent results using the different methods.

$$\text{OUT3}_i := \left\| \begin{array}{l} \text{if } \text{signal}_i > \text{Seuil}_{\text{HIGH}} \\ \quad \left\| \begin{array}{l} 5 \text{ V} \\ \text{else} \\ \quad \left\| 0 \text{ V} \end{array} \right. \end{array} \right.$$

$$\text{OUT2} = \text{OUT1} = 1$$

$$\text{OUT3} = \text{OUT1} = 1$$

3) Same as 2) but using a for-loop instead of the range variable

$$\text{OUT4} := \text{for } i \in \text{ORIGIN} .. \text{last}(\text{signal}) \\ \left\| \begin{array}{l} \text{temp}_i \leftarrow \text{if}(\text{signal}_i > \text{Seuil}_{\text{HIGH}}, 5 \text{ V}, 0 \text{ V}) \\ \text{temp} \end{array} \right.$$

$$\text{OUT4} = \text{OUT1} = 1$$

$$\text{OUT5} := \left\| \begin{array}{l} \text{for } i \in \text{ORIGIN} .. \text{last}(\text{signal}) \\ \quad \left\| \begin{array}{l} \text{temp}_i \leftarrow \text{if } \text{signal}_i > \text{Seuil}_{\text{HIGH}} \\ \quad \left\| \begin{array}{l} 5 \text{ V} \\ \text{else} \\ \quad \left\| 0 \text{ V} \end{array} \right. \end{array} \right. \\ \text{return } \text{temp} \end{array} \right.$$

$$\text{OUT5} = \text{OUT1} = 1$$

4) Writing a generic utility function

$$\text{filter_vector}(\text{data}, \text{threshold}, \text{lower}, \text{upper}) := \left\| \begin{array}{l} \text{for } i \in \text{ORIGIN} .. \text{last}(\text{data}) \\ \quad \left\| \begin{array}{l} \text{temp}_i \leftarrow \text{if}(\text{data}_i \leq \text{threshold}, \text{lower}, \text{upper}) \end{array} \right. \\ \text{return } \text{temp} \end{array} \right.$$

$$\text{OUT6} := \text{filter_vector}(\text{signal}, \text{Seuil}_{\text{HIGH}}, 0 \text{ V}, 5 \text{ V})$$

$$\text{OUT6} = \text{OUT1} = 1$$