

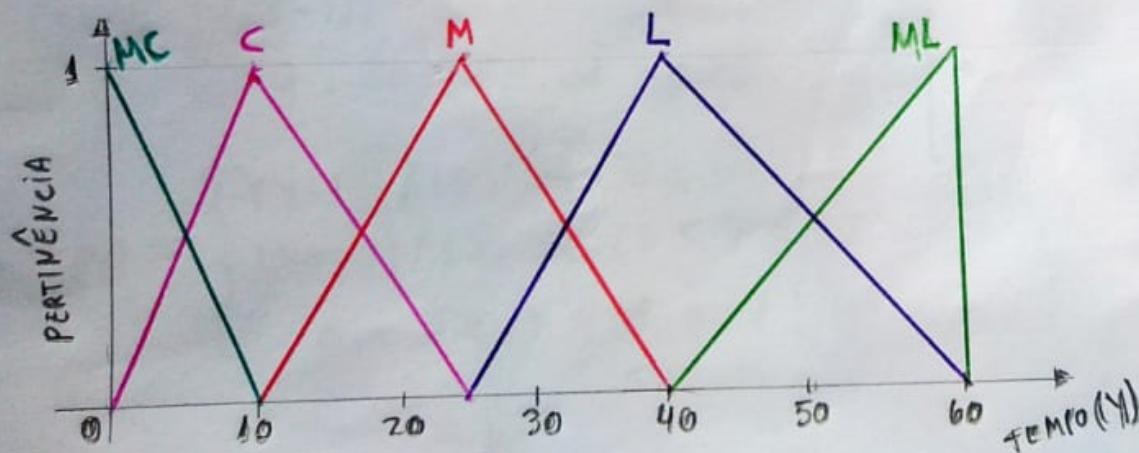
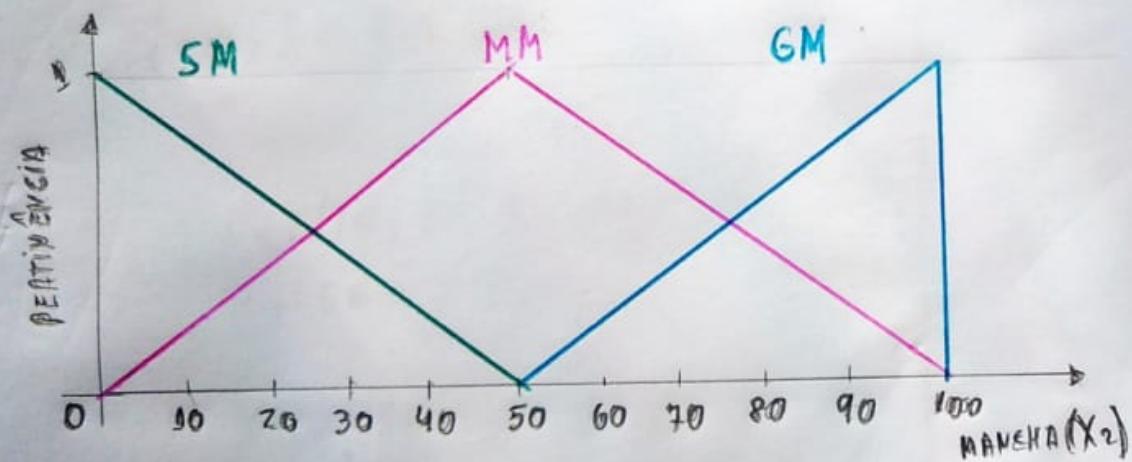
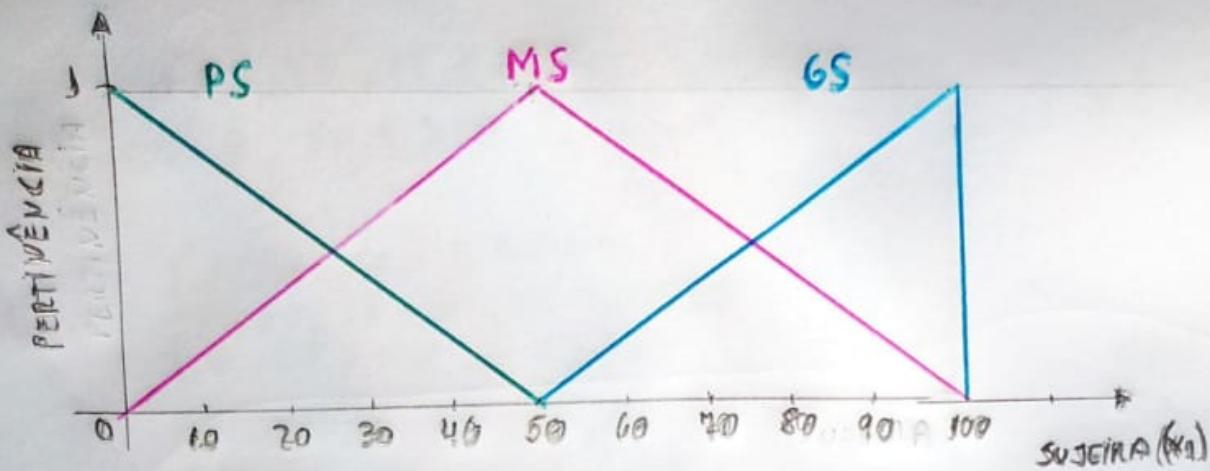
# Sistema de Inferência Nebulosa para Máquina de Lavar



Marcelo Corni Alves

Julho/2024

Disciplina: Computação Inteligente



FAM

$X_1$	PS	MC	M	L
MS	C	M	L	
GS	M	L	ML	
SM	MM	GM	$X_2$	

FUZIFICAÇÃO

$$\mu_{PS}(x) = \begin{cases} 1 - x/50, & \text{se } x \leq 50 \\ 0, & \text{se } x > 50 \end{cases}$$

$$\mu_{MS}(x) = \begin{cases} x/50, & \text{se } 0 \leq x \leq 50 \\ (100-x)/50, & \text{se } 50 < x \leq 100 \\ 0, & \text{se } x < 0 \text{ ou } x > 100 \end{cases}$$

$$\mu_{GS}(x) = \begin{cases} (x-50)/50, & \text{se } x > 50 \\ 0, & \text{se } x < 50 \end{cases}$$

$$\mu_{SM}(x) = \begin{cases} 1-x/50, & \text{se } x \leq 50 \\ 0, & \text{se } x > 50 \end{cases}$$

$$\mu_{MH}(x) = \begin{cases} x/50, & \text{se } 0 \leq x \leq 50 \\ (100-x)/50, & \text{se } 50 < x \leq 100 \\ 0, & \text{se } x < 0 \text{ ou } x > 100 \end{cases}$$

$$\mu_{GM}(x) = \begin{cases} (x-50)/50, & \text{se } x \geq 50 \\ 0, & \text{se } x < 50 \end{cases}$$

$$\mu_{MC}(y) = \begin{cases} 1-y/10, & \text{se } y \leq 10 \\ 0, & \text{se } y > 10 \end{cases}$$

$$\mu_C(y) = \begin{cases} y/10, & \text{se } 0 \leq y \leq 10 \\ (25-y)/15, & \text{se } 10 < y \leq 25 \\ 0, & \text{se } y < 0 \text{ ou } y > 25 \end{cases}$$

$$\mu_M(y) = \begin{cases} (y-10)/15, & \text{se } 10 \leq y \leq 25 \\ (40-y)/15, & \text{se } 25 < y \leq 40 \\ 0, & \text{se } y < 10 \text{ ou } y > 40 \end{cases}$$

$$\mu_L(y) = \begin{cases} (y-25)/25, & \text{se } 25 \leq y \leq 40 \\ (60-y)/20, & \text{se } 40 < y \leq 60 \\ 0, & \text{se } y < 25 \text{ ou } y > 60 \end{cases}$$

$$\mu_{ML}(y) = \begin{cases} (y-40)/20, & \text{se } y \geq 40 \\ (60-y)/10, & \text{se } y \geq 60 \\ 0, & \text{se } y < 40 \end{cases}$$

MÉDIA PONDERADA

$$\frac{\sum_{i=1}^n \mu(x_i) \cdot x_i}{\sum_{i=1}^n \mu(x_i)}$$

CENTRO DE GRAVIDADE

$$\frac{\sum_{i=1}^n x_i \cdot \mu(x_i)}{\sum_{i=1}^n \mu(x_i)}$$

## DEFUZZIFICACIÓN

$$P / X_1 = 25 \rightarrow PS$$

$$PS : \Delta - x/50 \therefore$$

$$\Delta - 25/50 = 0,5$$

$$\therefore \mu_{PS}(25) = 0,5$$

$$MS : x/50 \therefore$$

$$25/50 = 0,5$$

$$\therefore \mu_{MS}(25) = 0,5$$

$$GS : \emptyset \therefore$$

$$\mu_{GS}(25) = 0$$

$$P / X_2 = 75 \rightarrow GM$$

$$SM : \emptyset \therefore$$

$$\mu_{SM}(75) = 0$$

$$MM : (100-x)/50 \therefore$$

$$(100-75)/50 = 0,5$$

$$\therefore \mu_{MM}(75) = 0,5$$

$$GM : (x-50)/50 \therefore$$

$$(75-50)/50 = 0,5$$

$$\therefore \mu_{GM}(75) = 0,5$$

$$P / X_3 = PS \wedge X_2 = GM \rightarrow L$$

$$\therefore N = 0,5 \cdot 0,5 = 0,25$$

$$P / X_1 = MS \wedge X_2 = MM \rightarrow M$$

$$\therefore N = 0,5 \cdot 0,5 = 0,25$$

$$P / X_1 = MS \wedge X_2 = GM \rightarrow L$$

$$\therefore N = 0,5 \cdot 0,5 = 0,25$$

$$P / X_1 = GS \wedge X_2 = MM \rightarrow L$$

$$\therefore N = 0 \cdot 0,5 = 0$$

$$P / X_1 = GS \wedge X_2 = GM \rightarrow ML$$

$$\therefore N = 0 \cdot 0,5 = 0$$

$$NL = 0,25 + 0,25 = 0,5$$

$$NM = 0,25$$

### MÉDIA PONDERADA

$$\text{DEFUZZIFICADO} = \frac{(L \cdot 0,5) + (M \cdot 0,25)}{0,5 + 0,25}$$

$$\therefore P/L = 45 \text{ e } M = 30$$

$$\therefore \frac{(45 \cdot 0,5) + (30 \cdot 0,25)}{0,75} = \underline{\underline{40 \text{ minutos}}}$$

### CENTRO DE GRAVIDADE

$$\text{DEFUZZIFICADO} = \frac{(L \cdot 0,5) + (M \cdot 0,25)}{0,5 + 0,25}$$

$$\therefore P/L = 45 \text{ e } M = 30$$

$$\therefore \frac{(45 \cdot 0,5) + (30 \cdot 0,25)}{0,75} = \underline{\underline{40 \text{ minutos}}}$$