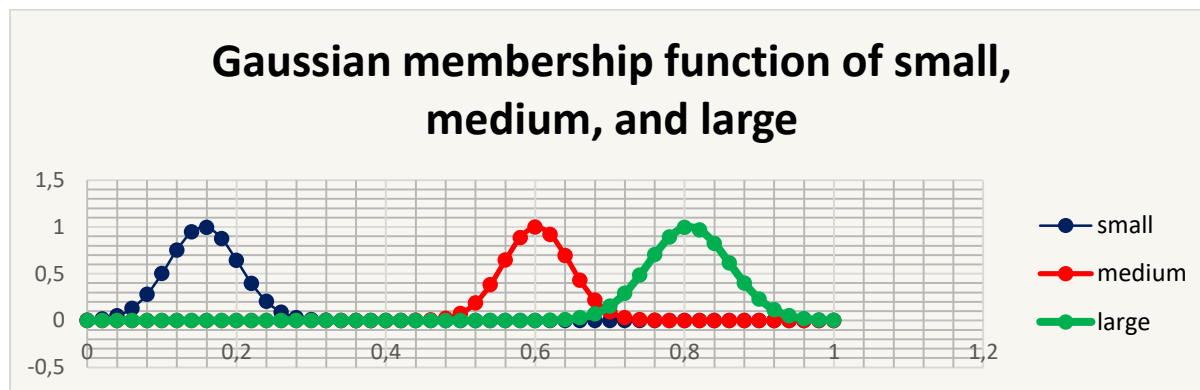


Task №7. A benchmark – Iris database



Rules:

IF $x_1 = \text{medium}$ AND $x_2 = \text{large}$ AND $x_3 = \text{small}$ AND $x_4 = \text{small}$ THEN A. (Setosa)

IF $x_1 = \text{large}$ AND $x_2 = \text{medium}$ AND $x_3 = \text{medium}$ AND $x_4 = \text{medium}$ THEN B. (Versicolor)

IF $x_1 = \text{large}$ AND $x_2 = \text{large}$ AND $x_3 = \text{large}$ AND $x_4 = \text{large}$ THEN C. (Virginica)



	Family A	Family B	Family C	
	Rule-1	Rule-2	Rule-3	
	A or B or C or other	A or B or C or other	A or B or C or other	
1	A	B	C	good
2	A	B	C	good
3	A	B	C	good
4	A	B	C	good
5	A	B	C	good
6	A	B	C	good
7	A	B	B	not good
8	A	B	C	good
success rate	100%	100%	88%	88%

Example:

We have a set of x : 0.58 0.7 0.22 0.08

Step 1: Use Gaussian membership function of small, medium and large calculate for each rule

$$\text{Small: } e^{\left(-\frac{(x-0.1556)^2}{0.00447}\right)}$$

$$\text{Medium: } e^{\left(-\frac{(x-0.6019)^2}{0.004}\right)}$$

$$\text{Large: } e^{\left(-\frac{(x-0.806)^2}{0.006}\right)}$$

IF x_1 = medium AND x_2 = large AND x_3 = small AND x_4 = small THEN A

$$\text{Medium}(0.58) = 0.8870069156755178;$$

$$\text{Large}(0.7) = 0.1537132128920836;$$

$$\text{Small}(0.22) = 0.39541436876606223;$$

$$\text{Small}(0.08) = 0.27842570409799405;$$

IF x_1 = large AND x_2 = medium AND x_3 = medium AND x_4 = medium THEN B.

$$\text{Large}(0.58) = 0.00020090735698757514;$$

$$\text{Medium}(0.7) = 0.09018406774984539;$$

$$\text{Medium}(0.22) = 1.4614936897470534e-16;$$

Medium(0.08)= 2.671527189077588e-30;

IF $x_1 = \text{large}$ AND $x_2 = \text{large}$ AND $x_3 = \text{large}$ AND $x_4 = \text{large}$ THEN C

Large(0.58)= 0.00020090735698757514;

Large(0.7)= 0.1537132128920836;

Large(0.22)= 1.3936980168236399e-25;

Large(0.08)= 7.062637934056824e-39;

Step 2: Calculate M1, M2 and M3

$M1 = \text{Medium}(0.58) * \text{Large}(0.7) * \text{Small}(0.22) * \text{Small}(0.08) = 0.015010666620035121;$

$M2 = \text{Large}(0.58) * \text{Medium}(0.7) * \text{Medium}(0.22) * \text{Medium}(0.08) = 7.074279324147244e-51;$

$M3 = \text{Large}(0.58) * \text{Large}(0.7) * \text{Large}(0.22) * \text{Large}(0.08) = 3.039783584561476e-68;$

Step 3: Calculate y

$$Y = \frac{1 * M1 + 2 * M2 + 3 * M3}{M1 + M2 + M3} = 1$$

If $y=1$ that A.