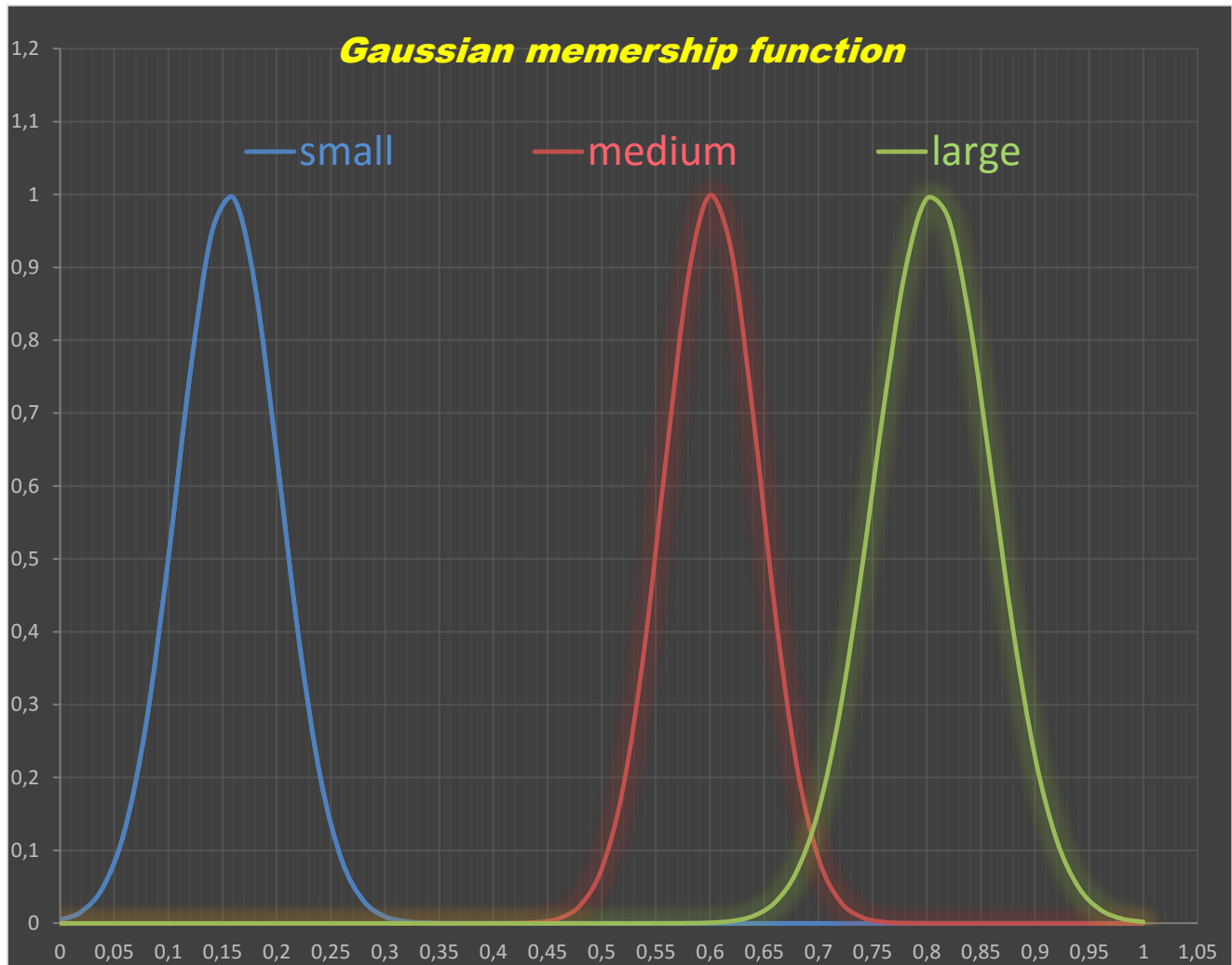


Contemporary Data Processing Technology (CCOD)

Lab 7 (October 13, 2016)

Chekun Roman, AS-36



3 Rules									
Rule 1:	IF	X_1 = large	AND	X_2 = medium	AND	X_3 = medium	AND	X_4 = small	THEN A
Rule 2:	IF	X_1 = large	AND	X_2 = large	AND	X_3 = medium	AND	X_4 = medium	THEN B
Rule 3:	IF	X_1 = large	AND	X_2 = medium	AND	X_3 = large	AND	X_4 = large	THEN C

Iris Flower Database to validate

Setosa				Versicolor				Virginica			
x_1	x_2	x_3	x_4	x_1	x_2	x_3	x_4	x_1	x_2	x_3	x_4
0.65	0.80	0.20	0.08	0.89	0.73	0.68	0.56	0.80	0.75	0.87	1.00
0.62	0.68	0.20	0.08	0.81	0.73	0.65	0.60	0.73	0.61	0.74	0.76
0.59	0.73	0.19	0.08	0.87	0.70	0.71	0.60	0.90	0.68	0.86	0.84
0.58	0.70	0.22	0.08	0.70	0.52	0.58	0.52	0.80	0.66	0.81	0.72
0.63	0.82	0.20	0.08	0.82	0.64	0.67	0.60	0.82	0.68	0.84	0.88
0.68	0.89	0.25	0.16	0.72	0.64	0.65	0.52	0.96	0.68	0.96	0.84
0.58	0.77	0.20	0.12	0.80	0.75	0.68	0.64	0.62	0.57	0.65	0.68
0.63	0.77	0.22	0.08	0.62	0.55	0.48	0.40	0.92	0.66	0.91	0.72

$$y_j = \frac{\sum_{k=1}^H (M_k(\mathbf{x}) \cdot g_k)}{\sum_{k=1}^H M_k(\mathbf{x})}$$

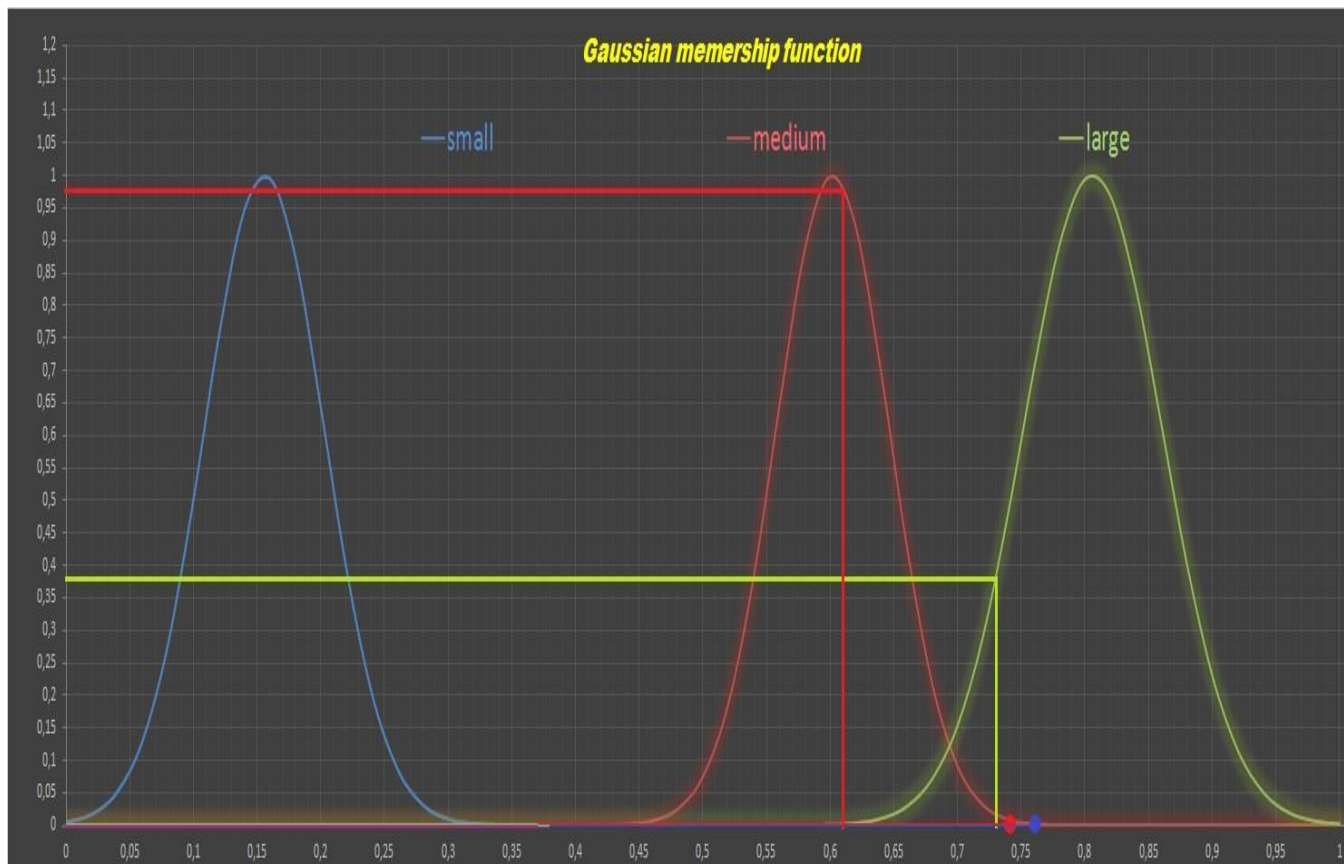
where

$$M_k(\mathbf{x}) = \prod_{i=1}^N \mu_{ik}(x_i)$$

where μ_{ik} is i -th attribute of k -th rule

x_1	x_2	x_3	x_4
0.73	0.61	0.74	0.76

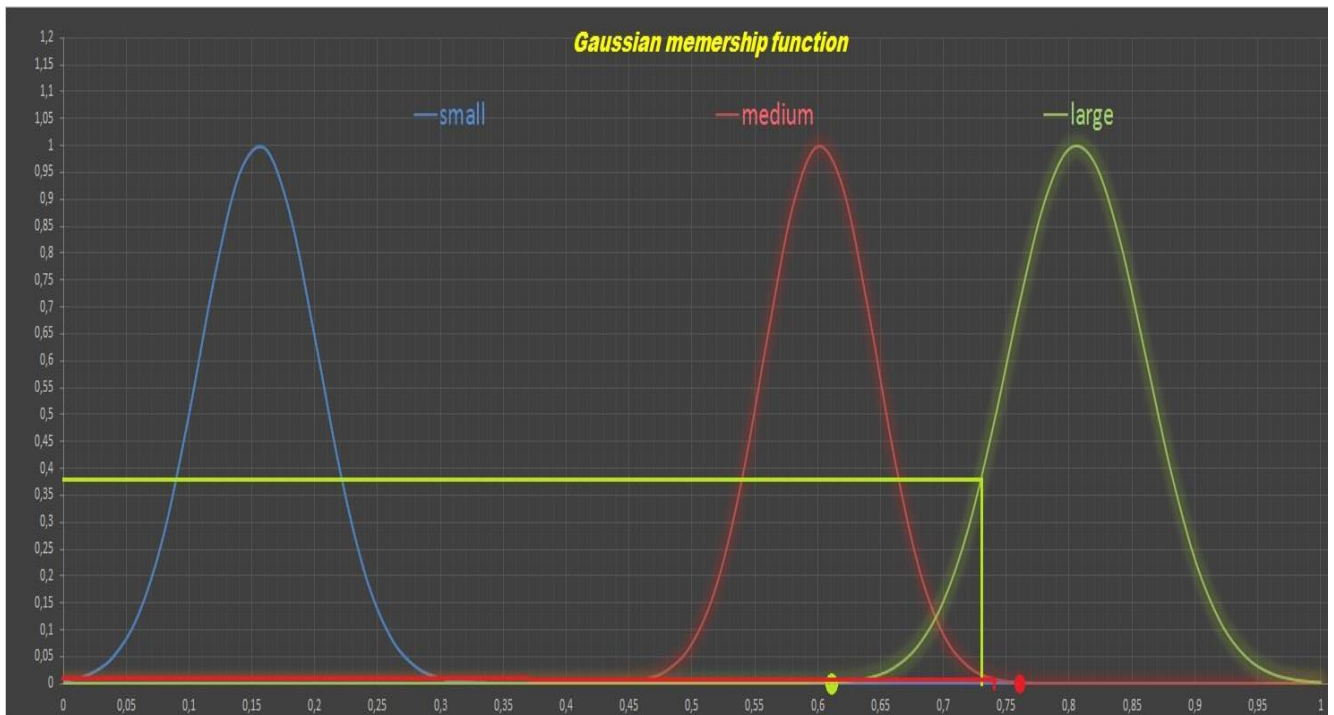
Rule 1:	IF	$x_1 = \text{large}$	AND	$x_2 = \text{medium}$	AND	$x_3 = \text{medium}$	AND	$x_4 = \text{small}$	THEN	A
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$$M_1 = 0.382 \times 0.984 \times 0.0085 \times (3.22 \times 10^{-36}) \approx 0$$

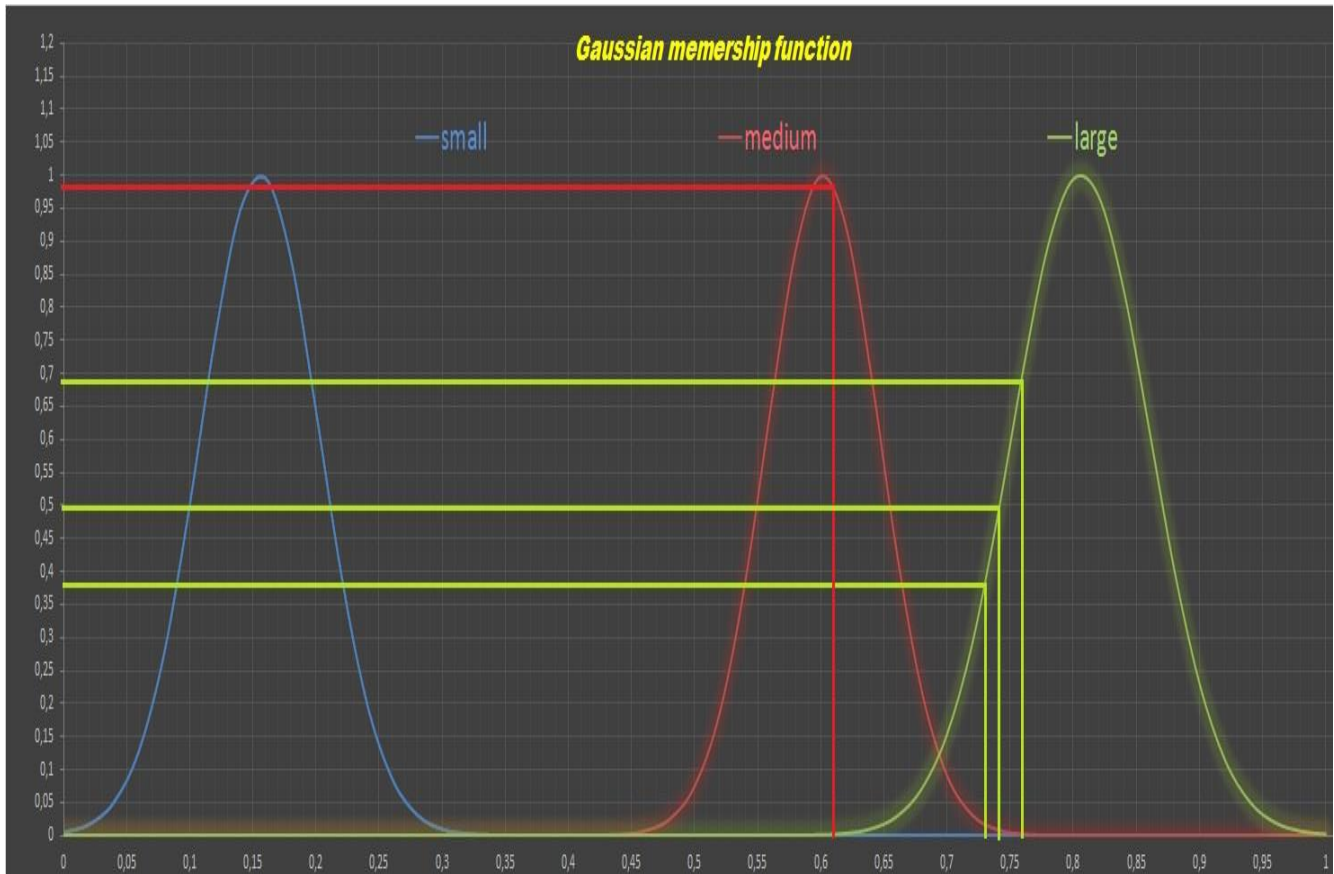
x_1	x_2	x_3	x_4
0.73	0.61	0.74	0.76

Rule 2:	IF	$x_1 = \text{large}$	AND	$x_2 = \text{large}$	AND	$x_3 = \text{medium}$	AND	$x_4 = \text{medium}$	THEN	B
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$$M_2 = 0.382 \times 0.0017 \times 0.0085 \times 0.0019 \approx 1 \times 10^{-9}$$

Rule 3: IF X₁=large AND X₂=medium AND X₃=large AND X₄=large THEN C



$$M_3 = 0.382 \times 0.984 \times 0.484 \times 0.703 = 0.1279$$

$$y_j = \frac{\sum_{k=1}^H (M_k(\mathbf{x}) \cdot g_k)}{\sum_{k=1}^H M_k(\mathbf{x})}$$

$$\hat{y} = \frac{0 \times 1 + (1 \times 10^{-9}) \times 2 + 0.1279 \times 3}{0 + (1 \times 10^{-9}) + 0.1279} = \frac{0.3837}{0.1279} \approx 3$$

R₁: If $x_1 = A_1^1$ and $x_2 = A_2^1$ and $x_3 = A_3^1$ and $x_4 = A_4^1$ then $y = g^1$

$$\mu_{A_1^1}(x_1) \quad \mu_{A_2^1}(x_2) \quad \mu_{A_3^1}(x_3) \quad \mu_{A_4^1}(x_4) \Rightarrow M_1 = \prod_{i=1}^4 \mu_{A_i^1}(x_i)$$

R₂: If $x_1 = A_1^2$ and $x_2 = A_2^2$ and $x_3 = A_3^2$ and $x_4 = A_4^2$ then $y = g^2$

$$\mu_{A_1^2}(x_1) \quad \mu_{A_2^2}(x_2) \quad \mu_{A_3^2}(x_3) \quad \mu_{A_4^2}(x_4) \Rightarrow M_2 = \prod_{i=1}^4 \mu_{A_i^2}(x_i)$$

R₃: If $x_1 = A_1^3$ and $x_2 = A_2^3$ and $x_3 = A_3^3$ and $x_4 = A_4^3$ then $y = g^3$

$$\mu_{A_1^3}(x_1) \quad \mu_{A_2^3}(x_2) \quad \mu_{A_3^3}(x_3) \quad \mu_{A_4^3}(x_4) \Rightarrow M_3 = \prod_{i=1}^4 \mu_{A_i^3}(x_i)$$

|| then

$$\hat{y} = \frac{\sum_{k=1}^3 M_k \cdot g^k}{\sum_{k=1}^3 M_k} \quad \text{while} \quad y = \begin{cases} 1 & \dots \text{ if } \hat{y} < 1.5 \\ 2 & \dots \text{ if } 1.5 \leq \hat{y} < 2.5 \\ 3 & \dots \text{ if } 2.5 \leq \hat{y} \end{cases}$$

$$y = \begin{cases} A & \dots \text{ if } \hat{y} < 1.5 \\ B & \dots \text{ if } 1.5 \leq \hat{y} < 2.5 \\ C & \dots \text{ if } 2.5 \leq \hat{y} \end{cases}$$

$$\hat{y} = 3 > 2.5 = C$$

No.	Family A	Family B	Family C	Evaluation
	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	C	Good
#8	A	A	C	Not Good
Success rate	100,0%	87,5%	100,0%	87,5%