**Contemporary Data Processing Technology (CCOD)**

**Lab 7 (October 13, 2016)**

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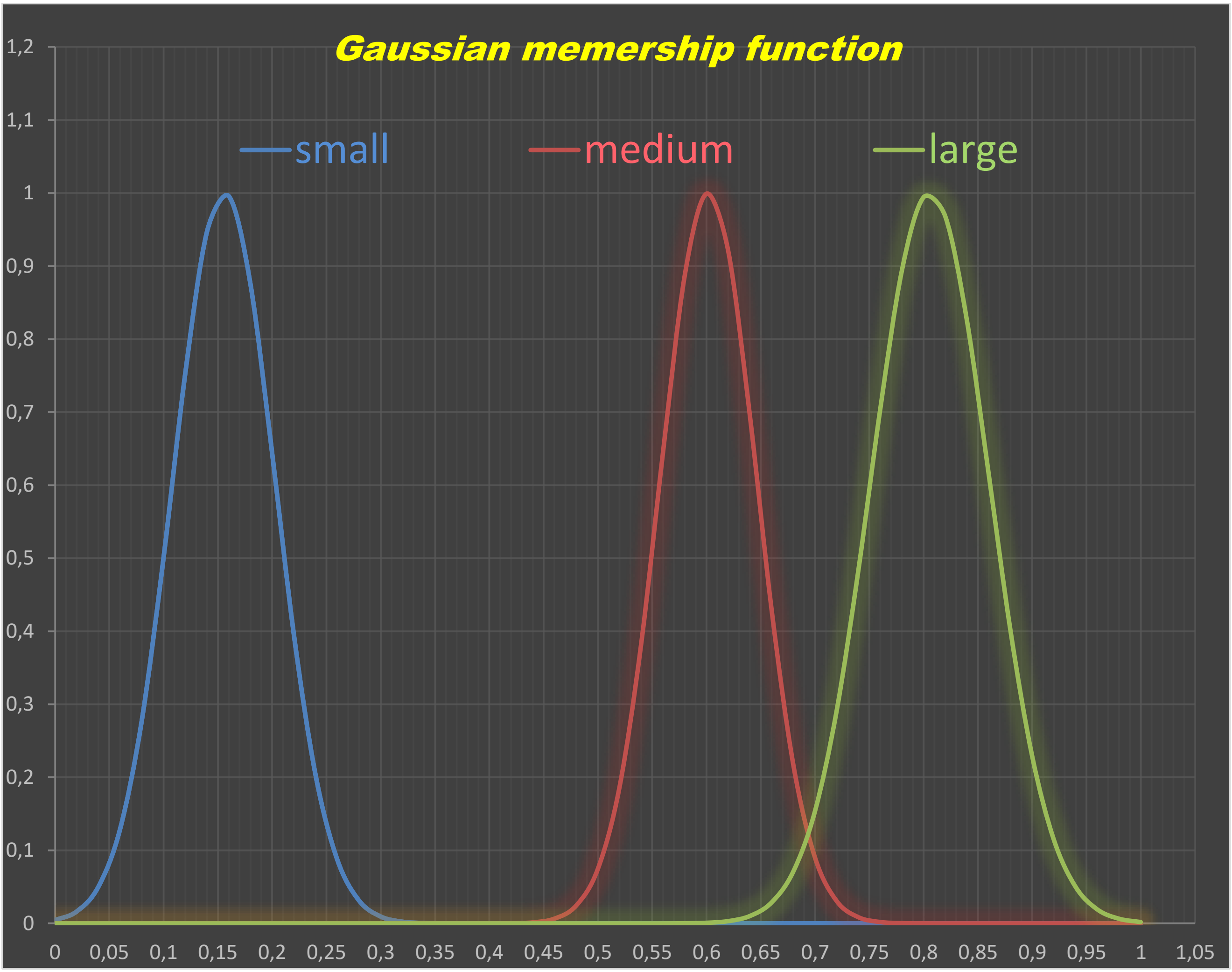



| 3 Rules | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rule 1: | IF | X_1 = large | AND | X_2 = medium | AND | X_3 = medium | AND | X_4 = small | THEN | A |
| Rule 2: | IF | X_1 = large | AND | X_2 = large | AND | X_3 = medium | AND | X_4 = medium | THEN | B |
| Rule 3: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

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

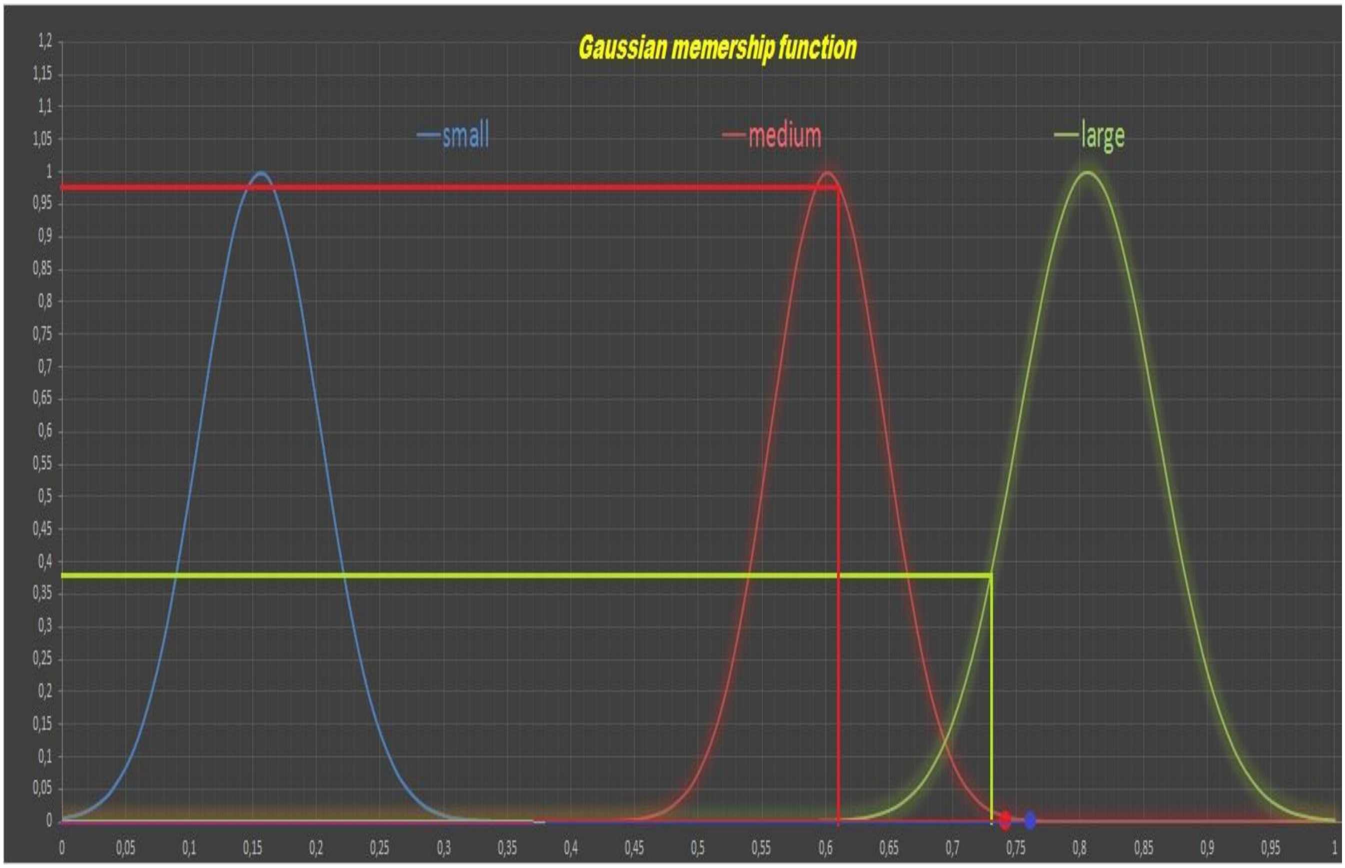
where

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

where $\mu_{ik}$ is $i$-th attribute of $k$-th rule

| $x_1$ | $x_2$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 0.73 | 0.61 | 0.74 | 0.76 |

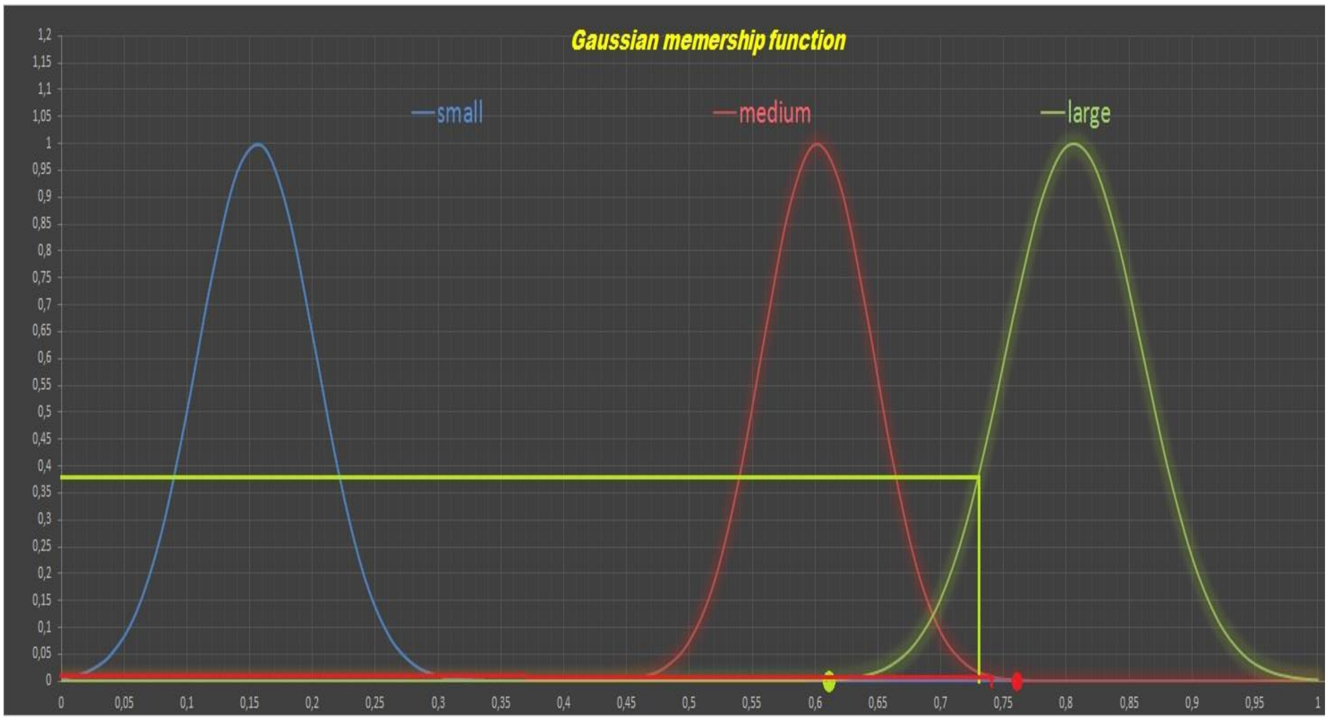
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rule 1: | IF | X_1 = large | AND | X_2 = medium | AND | X_3 = medium | AND | X_4 = small | THEN | A |




$$\mathbf{M_1} = 0.382 \times 0.984 \times 0.0085 \times (3.22 \times 10^{-36}) \approx 0$$

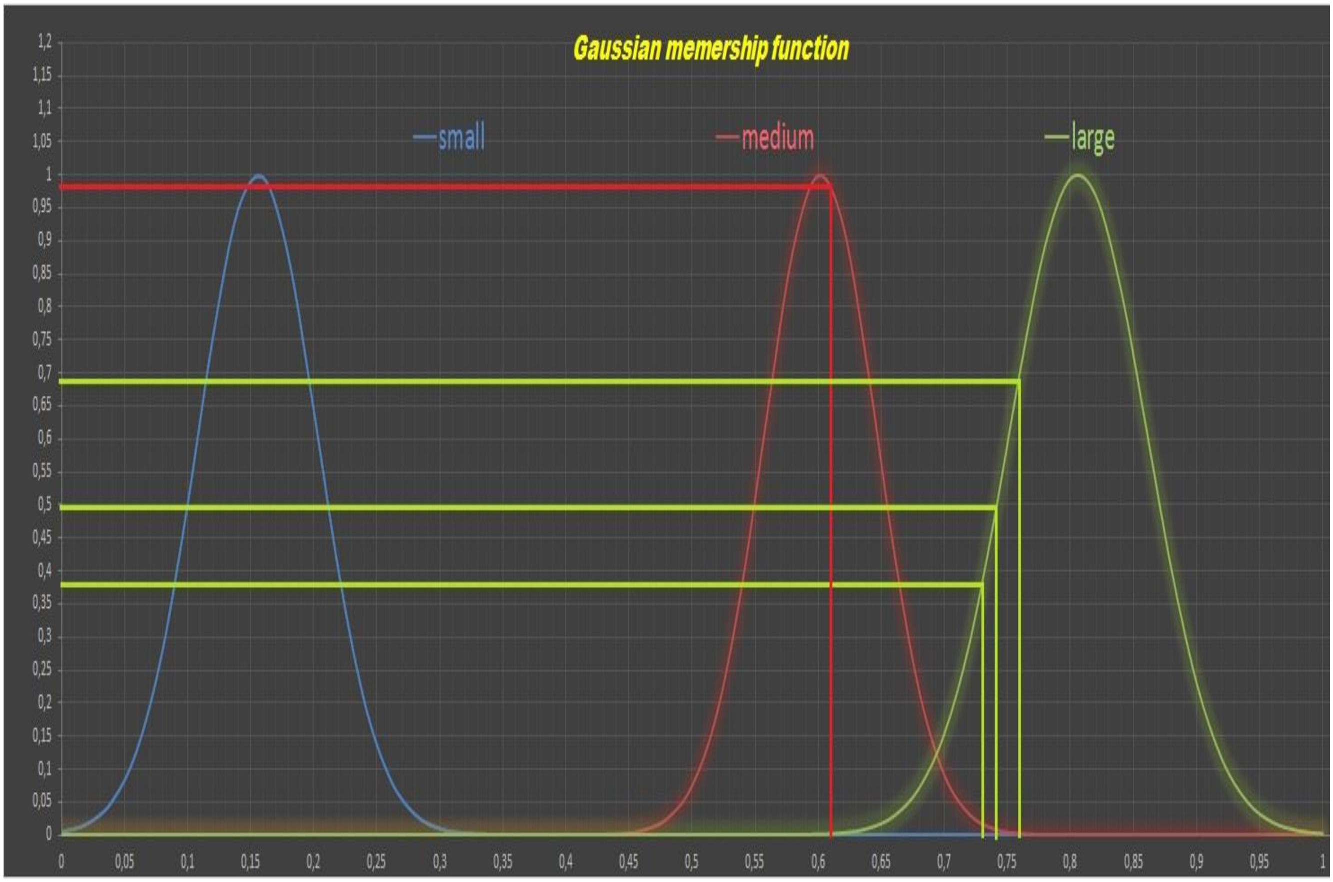
| $x_1$ | $x_2$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 0.73 | 0.61 | 0.74 | 0.76 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rule 2: | IF | X_1 = large | AND | X_2 = large | AND | X_3 = medium | AND | X_4 = medium | THEN | B |




$$M_2 = 0.382 \times 0.0017 \times 0.0085 \times 0.0019 \approx 1 \times 10^{-9}$$

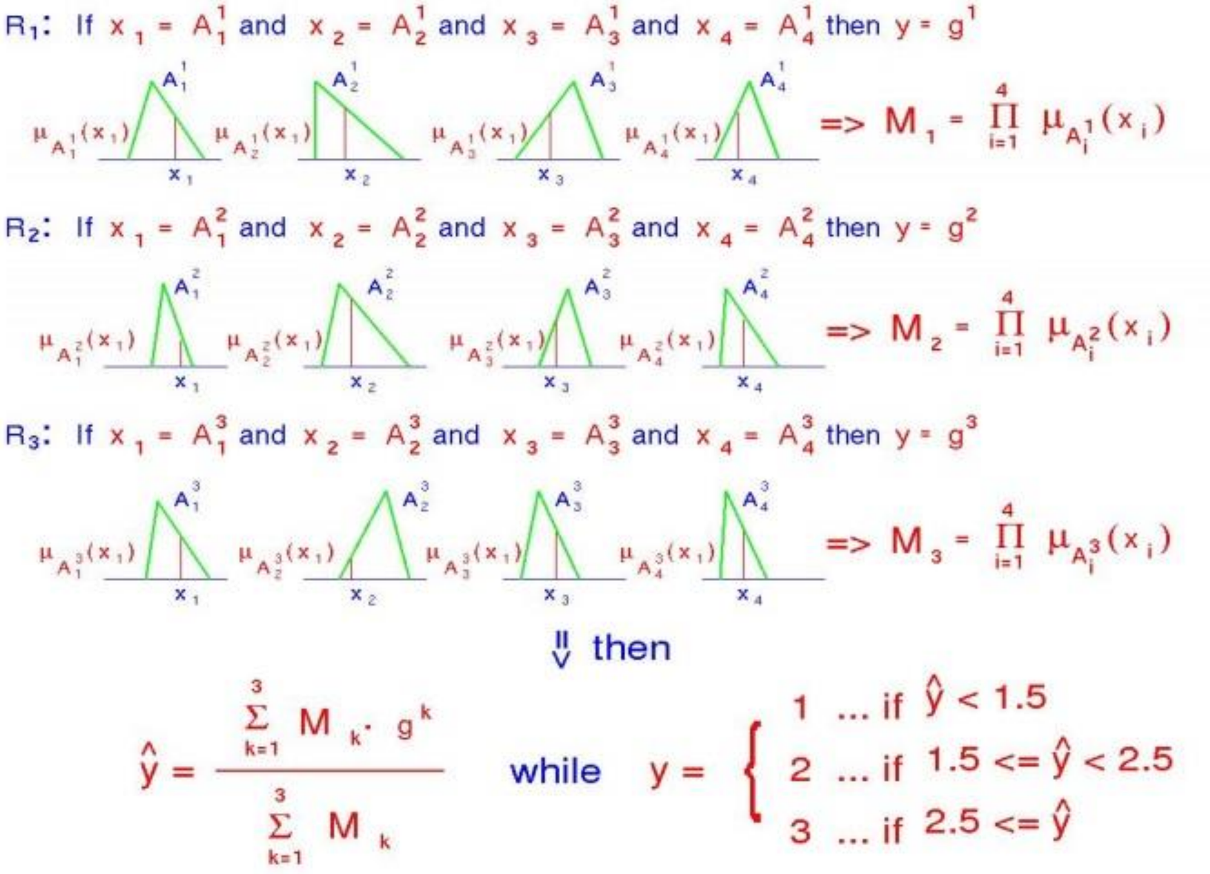
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Rule 3: | IF | X_1 = large | AND | X_2 = medium | AND | X_3 = large | AND | X_4 = large | THEN | C |



$$\mathbf{M_3} = 0.382 \times 0.984 \times 0.484 \times 0.703 = \mathbf{0.1279}$$

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

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




$$y = \begin{cases} A \ldots \ if \ \hat{y} < 1.5 \\ B \ldots if \ 1.5 <= \hat{y} < 2.5 \\ C \ldots if \ 2.5 <= \hat{y} \end{cases}$$

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

| | Family A | Family B | Family C | Evaluation |
|---|---|---|---|---|
| | Rule -1 | Rule - 2 | Rule - 3 | |
| No. | 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% |