

Pengantar Logika dan Himpunan Fuzzy

Farah Zakiyah Rahmanti

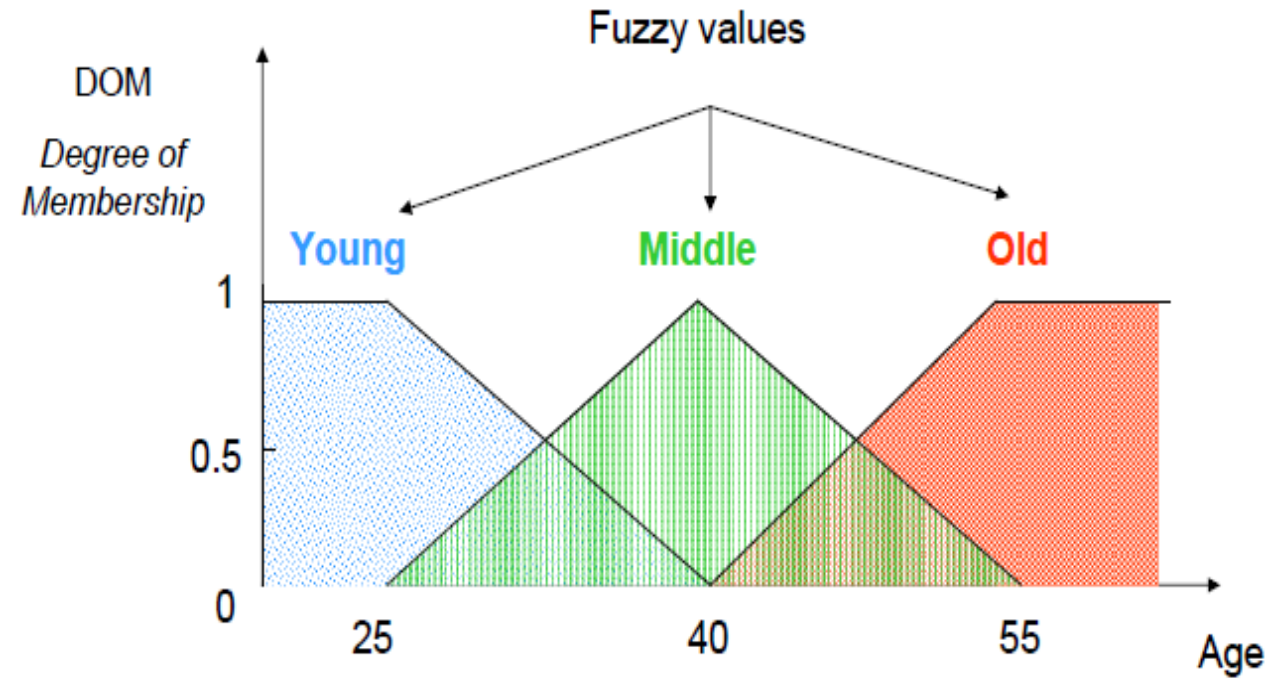
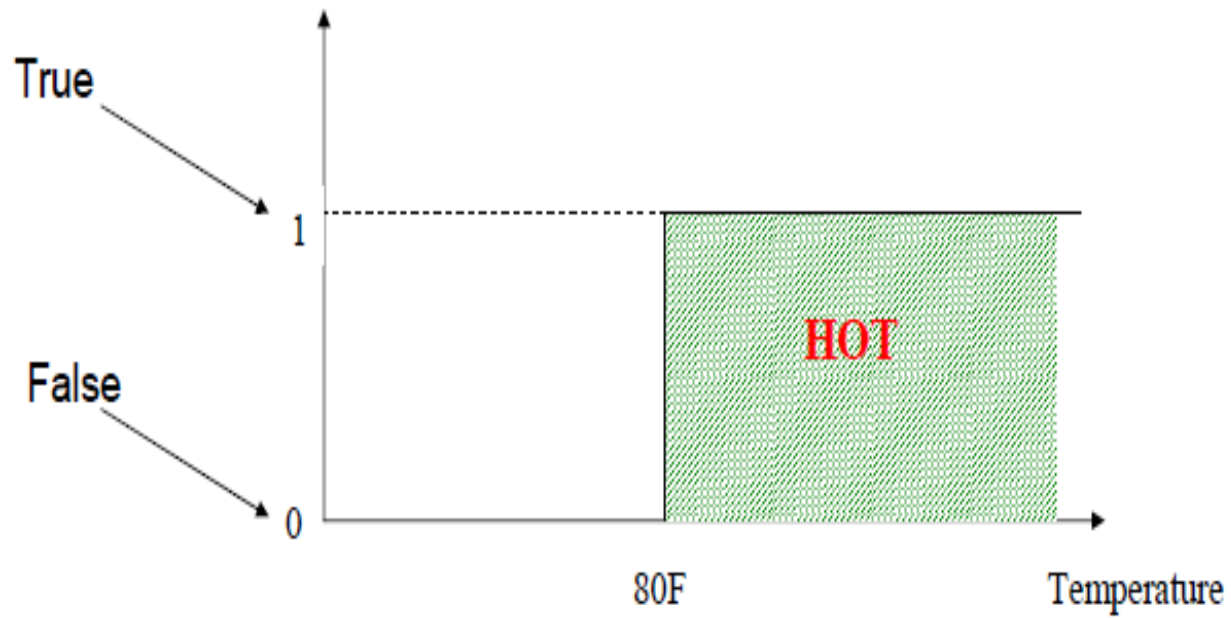
Pokok Bahasan

- Pendahuluan
- Crisp Set VS Fuzzy Set
- Fuzzyfikasi
- Fungsi Keanggotaan :
- Linier, Triangle, Trapezium, Sigmoid, Phi.
- Operasi Fuzzy :
- OR, AND, Complement
- Contoh Soal

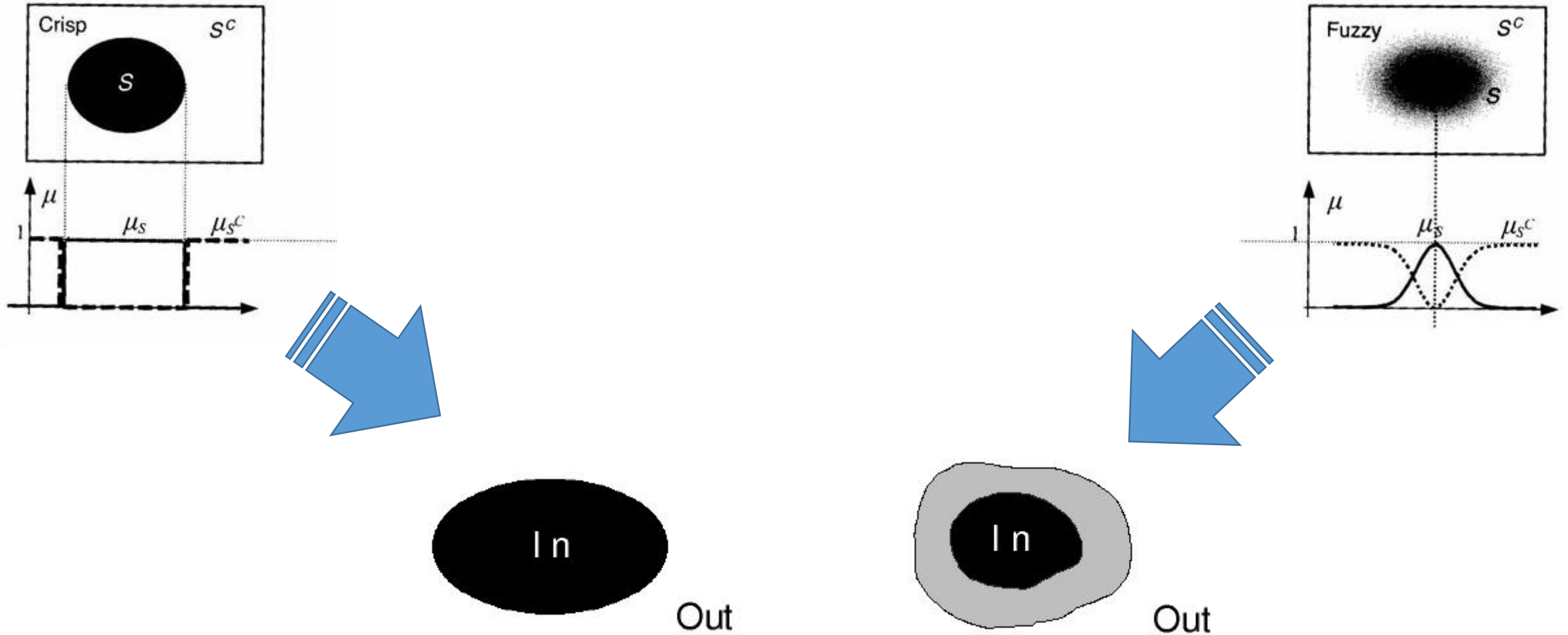
Pendahuluan

- Dikembangkan oleh Lotfi A. Zadeh, ilmuwan asal USA berkebangsaan Iran, 1965.
- Produk yang menerapkan prinsip fuzzy : mesin cuci, AC, dll.

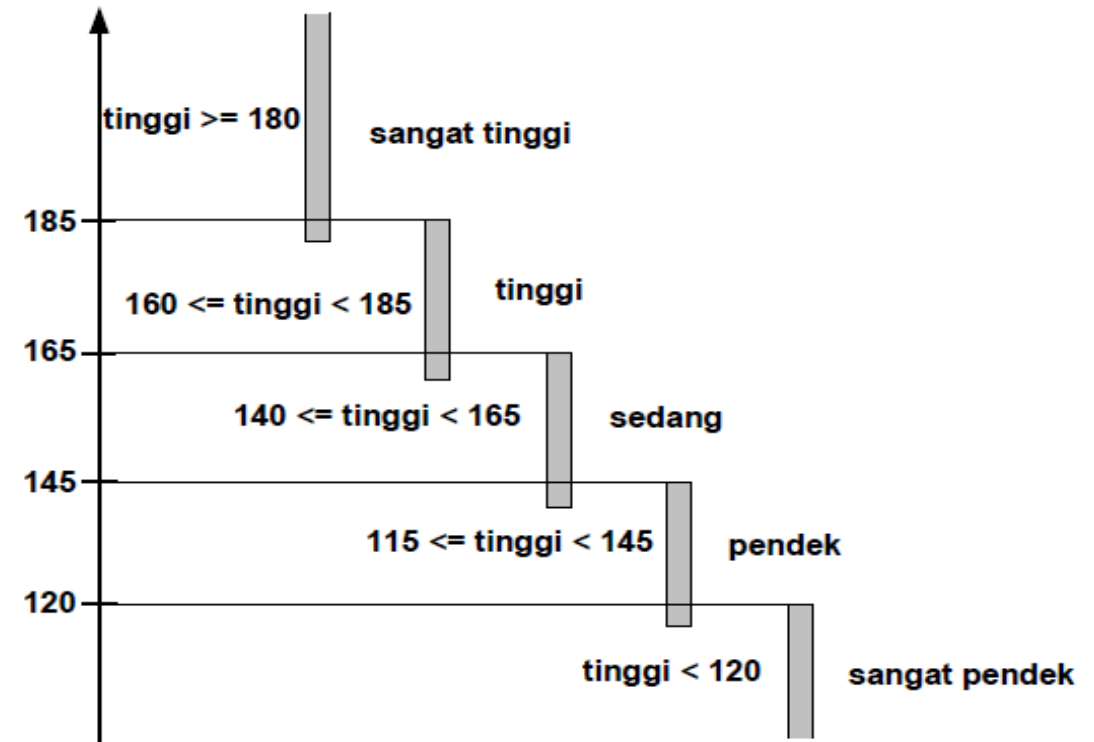
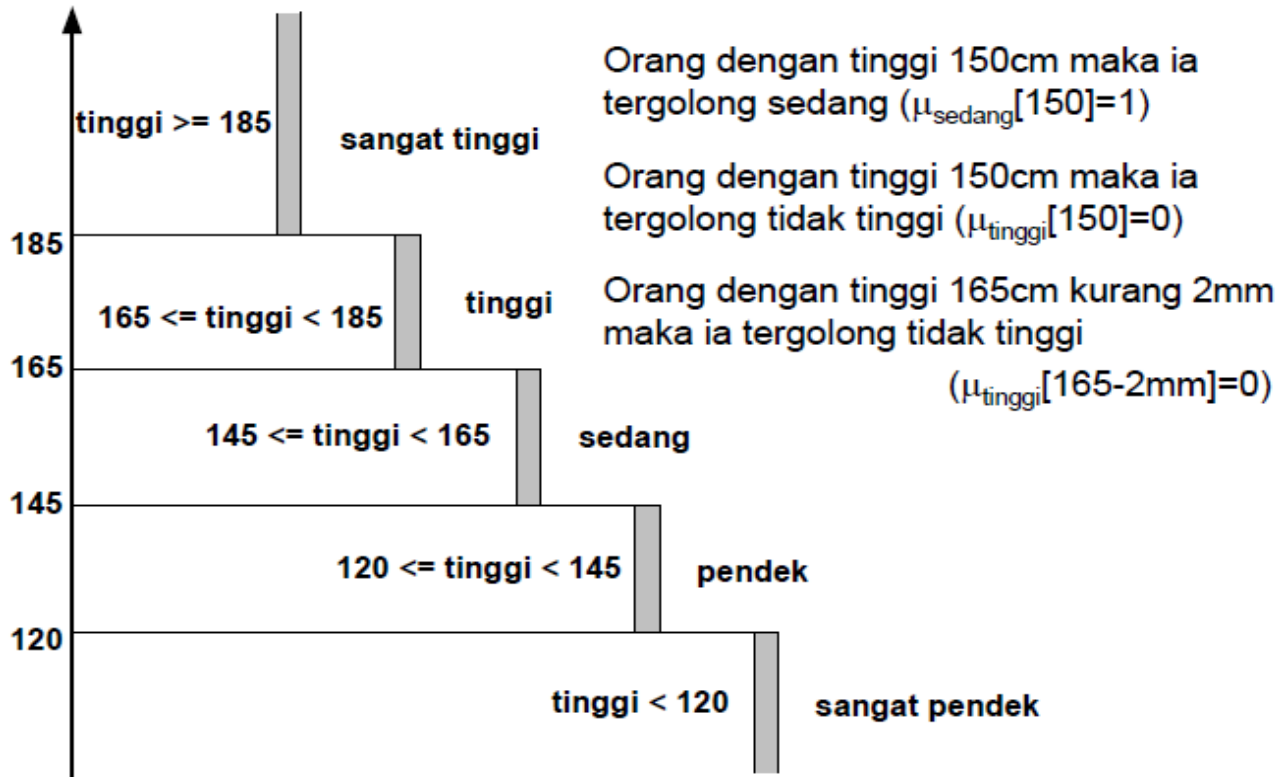
Crisp Set VS Fuzzy Set



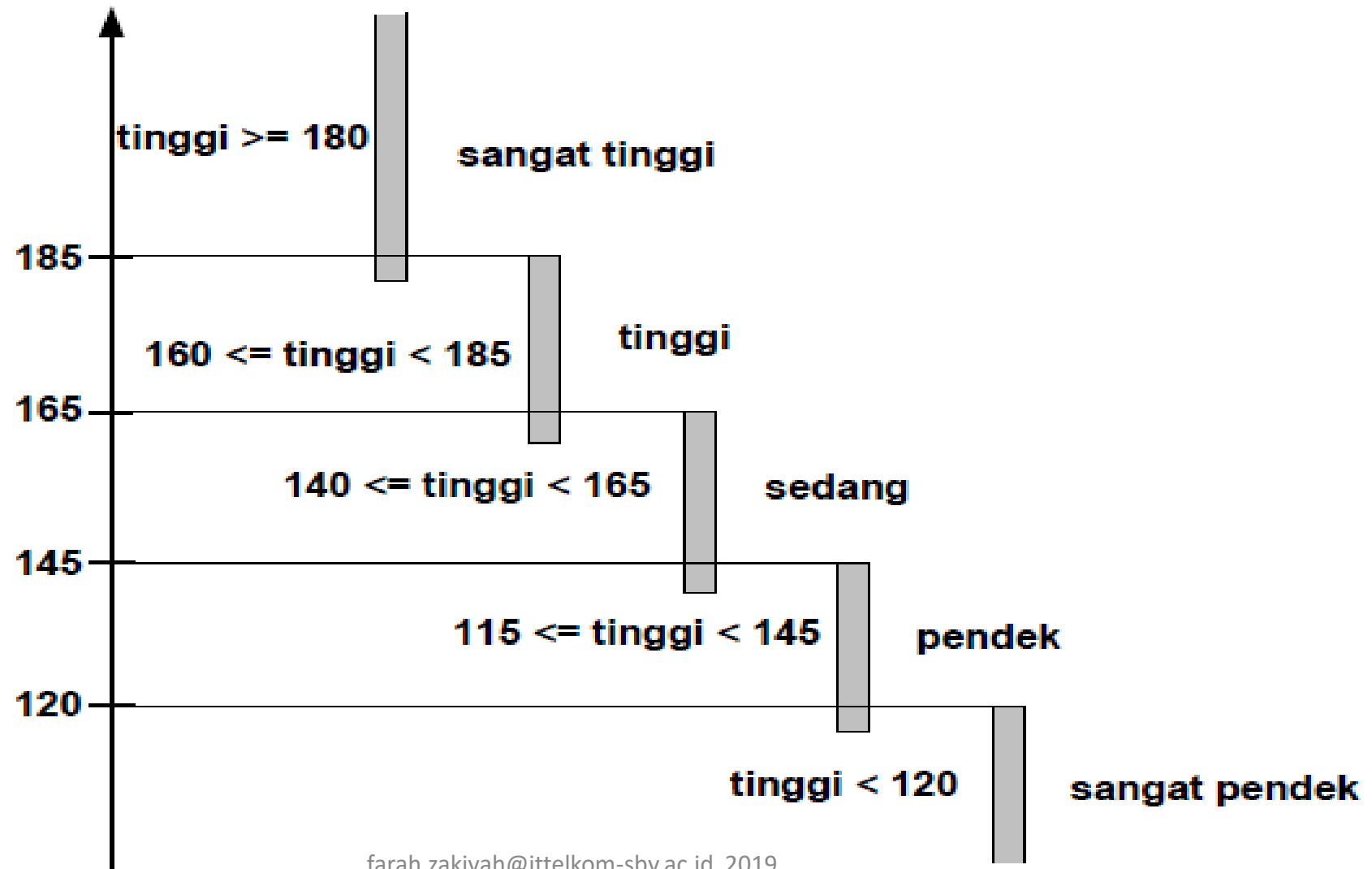
Crisp Set VS Fuzzy Set



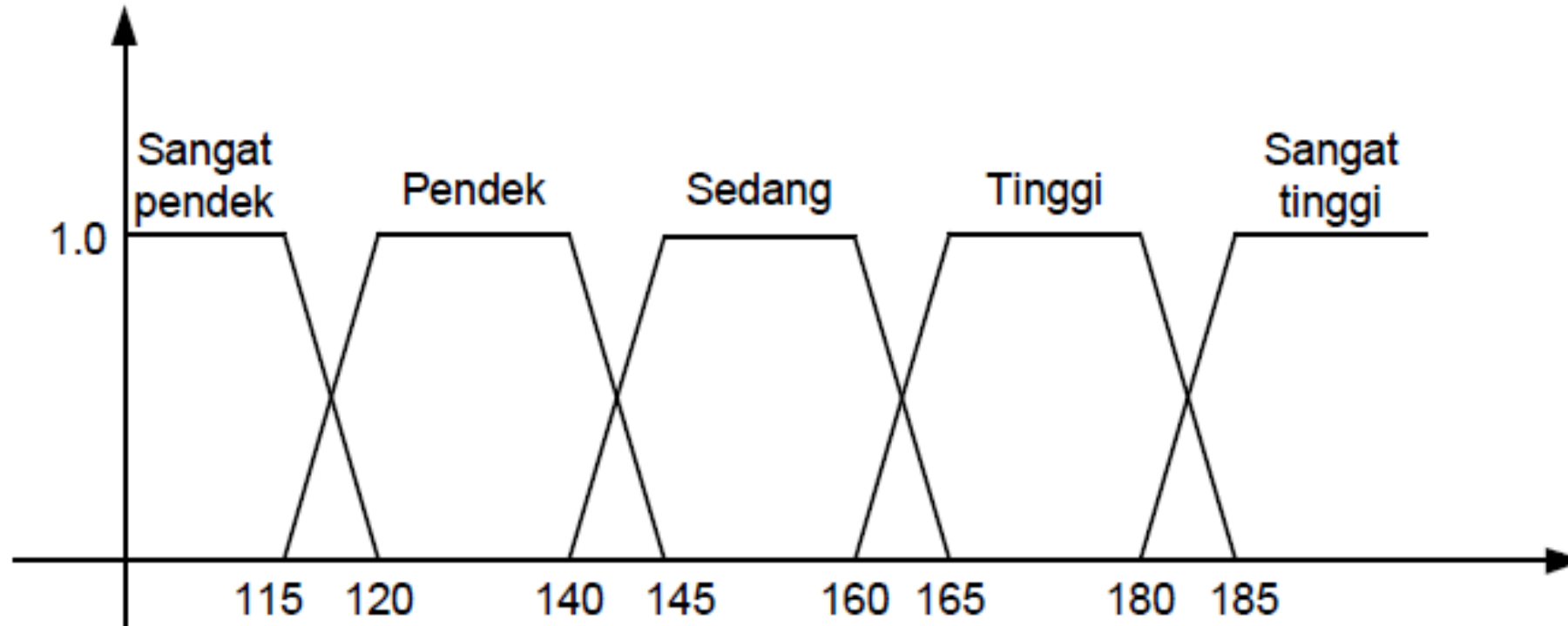
Crisp Set VS Fuzzy Set



Fuzzy Set

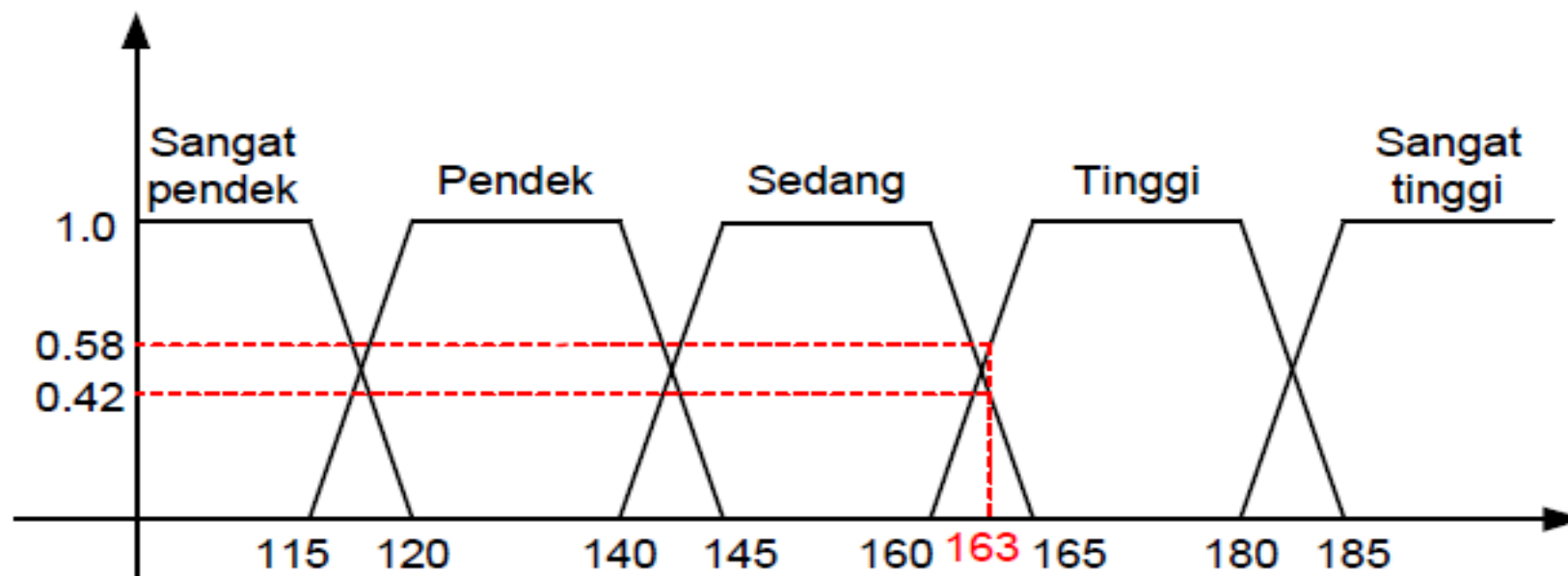


Fuzzyfikasi (1)



$$\mu = [\mu_{sp}, \mu_p, \mu_s, \mu_t, \mu_{st}]$$

Fuzzyfikasi (2)

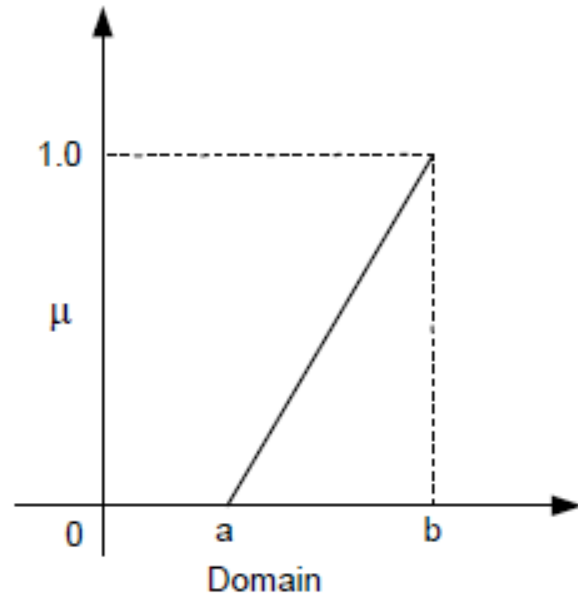


$$\mu[163] = [0, 0, 0.42, 0.58, 0]$$

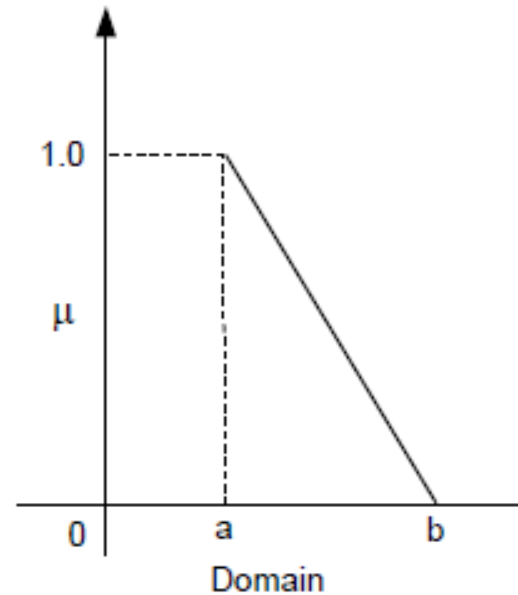
atau

$$\mu_{\text{sedang}}[163] = 0.42, \mu_{\text{tinggi}}[163] = 0.58$$

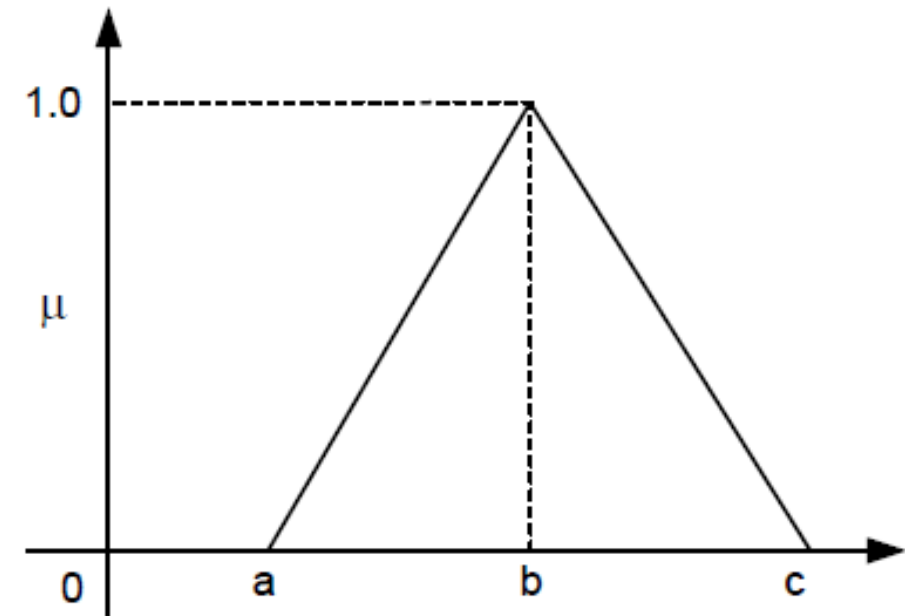
Linier, Triangle



Linier Naik



Linier Turun



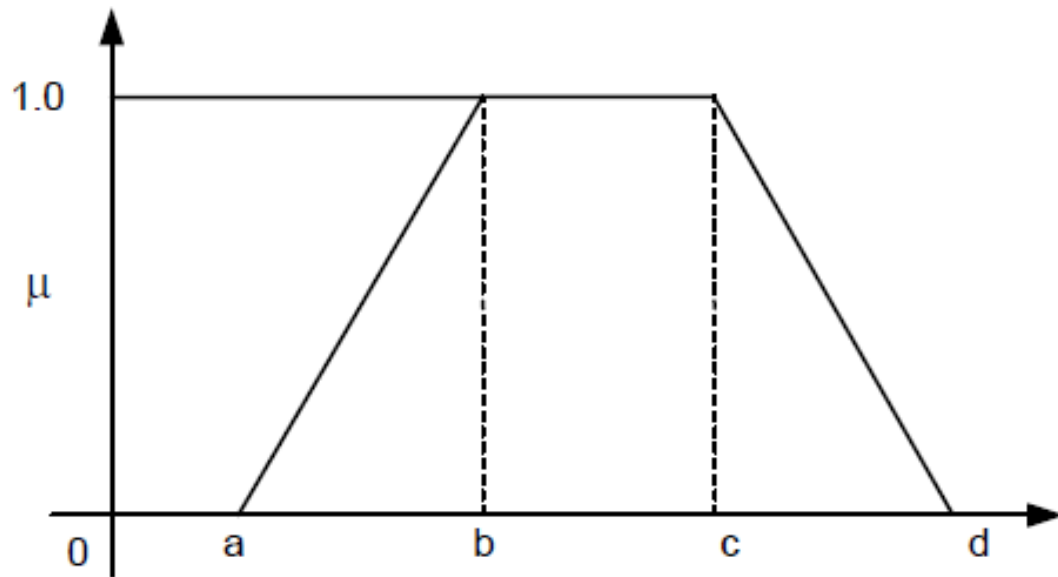
Segitiga

$$\mu[x] = \begin{cases} 0; & x \leq a \\ (x-a)/(b-a); & a < x \leq b \\ 1; & x > b \end{cases}$$

$$\mu[x] = \begin{cases} 1; & x \leq a \\ (b-x)/(b-a); & a < x < b \\ 0; & x \geq b \end{cases}$$

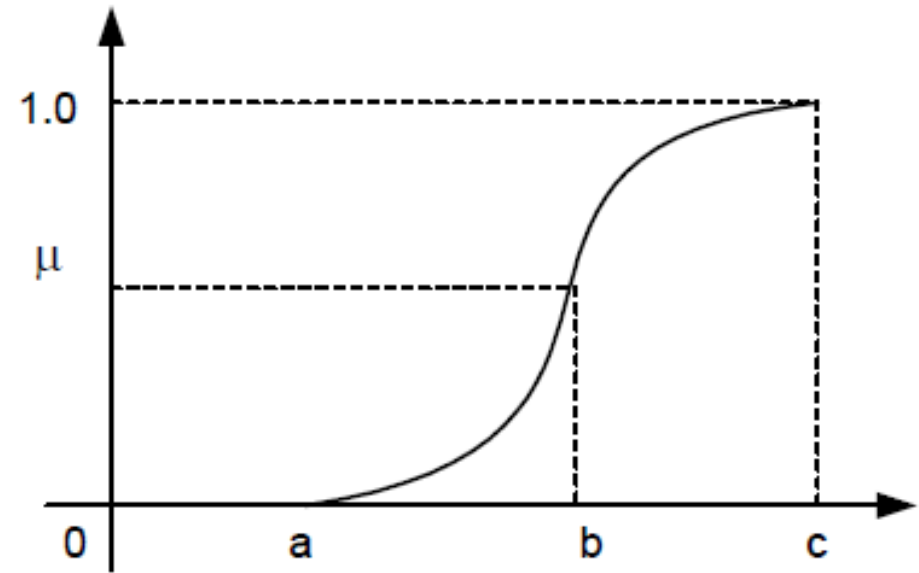
$$\mu[x] = \begin{cases} 0; & x \leq a \text{ atau } x \geq c \\ (x-a)/(b-a); & a < x \leq b \\ (c-x)/(c-b); & b < x < c \end{cases}$$

Trapezium, Sigmoid



Trapezium

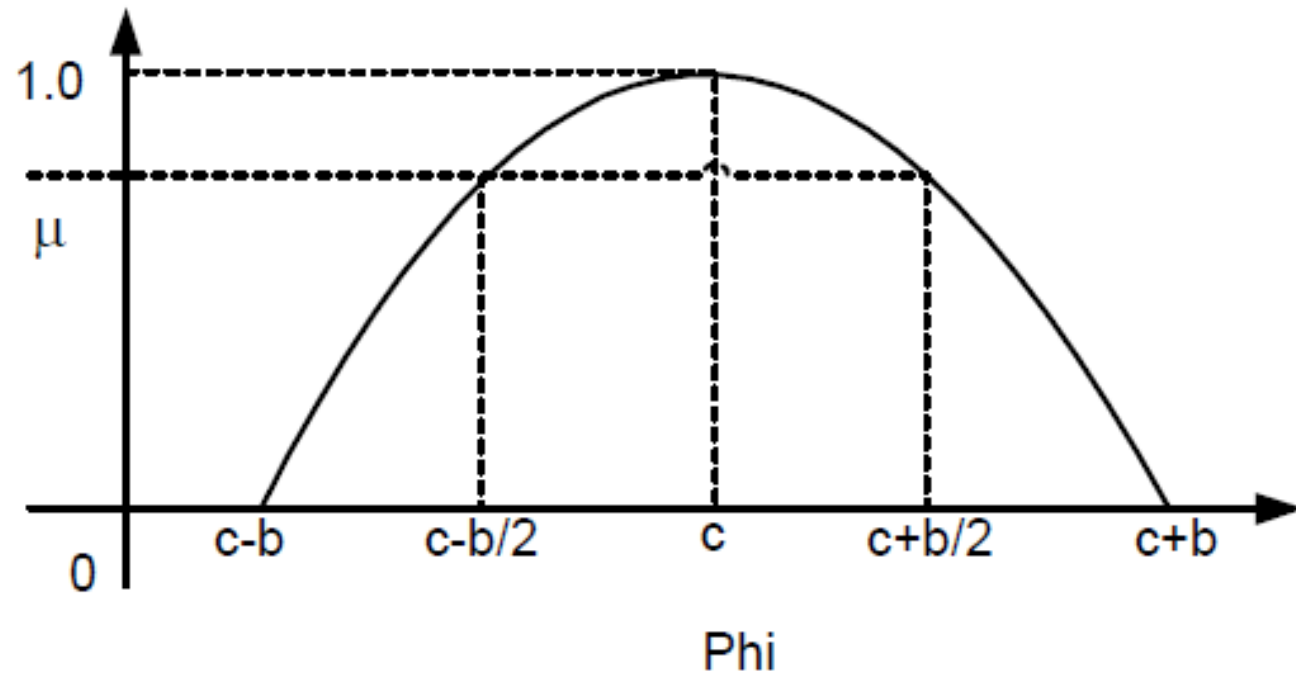
$$\mu[x] = \begin{cases} 0; & x \leq a \text{ atau } x \geq d \\ (x-a)/(b-a); & a < x \leq b \\ 1; & b < x \leq c \\ (d-x)/(d-c); & c < x < d \end{cases}$$



Sigmoid

$$\mu[x;a,b,c]_{\text{sigmoid}} = \begin{cases} 0; & x \leq a \\ 2 \left(\frac{x-a}{c-a} \right)^2; & a < x \leq b \\ 1 - 2 \left(\frac{c-x}{c-a} \right)^2; & b < x < c \\ 1; & x \geq c \end{cases}$$

Phi



$$\mu[x; a, b, c]_{\text{phi}} = \mu[x; c-b, c-b/2, c]_{\text{sigmoid}}; \quad x \leq c$$

$$\mu[x; c, c+b/2, c+b]_{\text{sigmoid}}; \quad x > c$$

Operasi Fuzzy

- OR (Union)
- AND (Intersection)
- Complement

OR (Union)

- $A = \{1.0, 0.2, 0.75\}$
- $B = \{0.2, 0.45, 0.5\}$
- $A \cup B = \{\text{MAX}(1.0, 0.2), \text{MAX}(0.2, 0.45), \text{MAX}(0.75, 0.5)\}$
- $= \{1.0, 0.45, 0.75\}$

AND (Intersection)

- $A = \{1.0, 0.2, 0.75\}$
- $B = \{0.2, 0.45, 0.5\}$
- $A \cap B = \{\text{MIN}(1.0, 0.2), \text{MIN}(0.2, 0.45), \text{MIN}(0.75, 0.5)\}$
- $= \{0.2, 0.2, 0.5\}$

Complement

- $A^c = \{1-1.0, 1-0.2, 1-0.75\}$
- $A^c = \{0.0, 0.8, 0.25\}$

- $B^c = \{1-0.2, 1-0.45, 1-0.5\}$
- $B^c = \{0.8, 0.55, 0.5\}$

Contoh Soal

Contoh Operasi Fuzzy

- Nilai keanggotaan GPA 3.2 pada himpunan GPA nilai tertinggi 0.7 .
- Nilai keanggotaan 8 semester pada himpunan lulus cepat 0.8 .
- α -predicate GPA nilai tertinggi **AND** lulus cepat :

AND

$$\mu_{A \cap B} [x] = \min(\mu_A[x], \mu_B[x])$$

- μ GPA nilai tertinggi [8] lulus cepat = $\min(\mu$ GPA nilai tertinggi [3.2], μ lulus cepat
- = $\min(0.7, 0.8)$
- = 0.7

Contoh Operasi Fuzzy

- α -predicate untuk GPA tinggi **OR** lulus cepat :

OR

$$\mu_{A \cup B}[x] = \max(\mu_A[x], \mu_B[x])$$

- μ GPA tinggi lulus cepat = max (μ GPA tinggi [3.2], μ lulus cepat [8])
- = max (0.7, 0.8)
- = 0.8

- α -predicate untuk GPA tidak tinggi :

NOT (Complement)

$$\mu_A'[x] = 1 - \mu_A[x]$$

- μ GPA tinggi ' = $1 - \mu$ GPA tinggi [3.2] = $1 - 0.7 = 0.3$

Daftar Pustaka