technische universität
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Dept. of Computer Science
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Tutorial for

Introduction to Computational Intelligence in Winter 2009/10

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http://ls11-www.cs.uni-dortmund.de/people/rudolph/teaching/lectures/CI/WS2009-10/lecture.jsp

Sheet 5, Block B

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Exercise 5.1: Fuzzy Sets (5 Points)

Give membership functions that define the following fuzzy sets appropriately from your point of view:

(a) A_1: Young people, B_1: middle-aged people, C_1: old people.

(b) A_2: Slow car, B_2: fast car, C_2: too fast car.

(c) A_3: Great weather, B_3: Nice weather, C_3: bad weather.

To do this, first define a crisp set (domain, unit) over which the fuzzy sets are defined, respectively (e.g. the crisp set $X = \{x \in \mathbb{R} | x \in [0, 100]\}$ would be appropriate for fuzzy sets 'cold coffee; hot coffee' and the unit is temperature in ^{o}C). Give the membership functions for the triples of fuzzy sets as a (drawn/plotted) graphic with the appropriate domain on the horizontal axis and the degree of membership on the vertical axis, and as a formula.

Perform the operations $A_i^c, B_i^c, A_i \cup B_i, A_i \cap B_i$ for all $i = \{1, 2, 3\}$ and give the resulting sets by drawing/plotting their membership function, respectively.

Exercise 5.2: α-cuts (5 Points)

Let A and B be fuzzy sets over the crisp set X.

The α-cut $A^{\geq\alpha}$ of A is defined as $A^{\geq\alpha} := \{x \in X | A(x) \geq \alpha\}$.

Prove that the following statements are correct:

(a) $A \subseteq B \Leftrightarrow \forall\alpha \in [0, 1) : A^{\geq\alpha} \subseteq B^{\geq\alpha}$

(b) $A = B \Leftrightarrow \forall\alpha \in [0, 1) : A^{\geq\alpha} = B^{\geq\alpha}$