NIE-MPI: Tutorial 8

last update: September 15, 2026, 13:55 by Francesco Dolce

8.1 Fuzzy set operations

Exercise 8.1. Consider the fuzzy sets describing the speed of a car, ranging from 0 to 140 km/h. We have the following interpretations of the speed: very slow, slow, medium, high, very high. Their membership functions are continuous and partially linear functions given by the values in Table 8.1. Draw the graphs of these functions.

membership functions	speed [km/h]														
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
μ_{vs}	1	1	0.5	0	0	0	0	0	0	0	0	0	0	0	
μ_s	0	0.5	1	1	1	0.5	0	0	0	0	0	0	0	0	0
μ_m	0	0	0	0	0	0.5	1	1	1	0.5	0	0	0	0	0
μ_h	0	0	0	0	0	0	0	0	0.5	1	1	0.5	0	0	0
μ_{vh}	0	0	0	0	0	0	0	0	0	0	0.5	1	1	1	1

Table 8.1: Values of membership functions for car speeds. The function are linear between the specified points.

Exercise 8.2. Write the definition and draw the graph of the membership function of the fuzzy set "high speed" $\cap$ "not very high speed" using the following t-norms:

a) Gödel,

b) Łukasiewicz,

c) product.

Exercise 8.3. Write the definition and draw the graph of the membership function of the fuzzy set "slow" $\cup$ "medium speed" using the following t-norms (and De Morgan's law):

a) Gödel,

b) Łukasiewicz,

c) product.