PP09: Learning from critical values - adverse event identification and classification
Milena Balcerzak & Edyta Winciorek

Rule base ← contains the set of fuzzy rules

- If a patient has normal blood pressure and normal heart rate, then there is no risk of adverse event.
- If a patient has high blood pressure and normal heart rate or normal blood pressure and low heart rate, then there is a low risk of adverse event.
- If a patient has low blood pressure and low heart rate or high blood pressure and high heart rate, then there is a medium risk of adverse event.
- If a patient has high blood pressure and low heart rate or low blood pressure and high heart rate, then there is a high risk of adverse event.

AE Risk
- Low Risk
- Medium Risk
- High Risk

Blood Pressure
- Low
- Normal
- High

Heart Rate
- Low
- Normal
- High

Linguistic variables represent crisp information in a form and precision appropriate for the problem (usually in a form of word or sentence).

Values for linguistic variable. For example, given the signal is a linguistic variable if its values are linguistic rather than numerical, i.e., low, normal, high.

Fuzzy set theory permits the gradual assessment of the membership of elements to the given set; this is described with the aid of a membership function valued in the real unit interval [0, 1].

Linguistic Variables

Process of transforming crisp values into grades of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term.

Linguistic Labels

Fuzzy set theory permits the gradual assessment of the membership of elements to the given set; this is described with the aid of a membership function valued in the real unit interval [0, 1].

Membership Functions

Fuzzification

Inference
- Every rule has a weight (a number between 0 and 1), which is applied to the number given by the antecedent.
- After proper weighting has been assigned to each rule, the implication method is implemented. A consequent is a fuzzy set represented by a membership function, which weights appropriately the linguistic characteristics that are attributed to it.

Aggregation
- Because decisions are based on the testing of all of the rules in a fuzzy inference system, the rules must be combined in some manner in order to make a decision. Aggregation is the process by which the fuzzy sets that represent the outputs of each rule are combined into a single fuzzy set.

Defuzzification

A reasoning mechanism performs the inference from facts & rules

- It can be inferred that the considered patient is at risk of occurrence of an adverse event.