Classification of Fuzzy Sets

The fuzzy sets can be classified based on the membership functions. They are:

- **Normal fuzzy set**. If the membership function has at least one element in the universe whose value is equal to 1, then that set is called as normal fuzzy set.

- **Subnormal fuzzy set**. If the membership function has the membership values less than 1, then that set is called as subnormal fuzzy set.

These two sets are shown in Fig. 4.2.

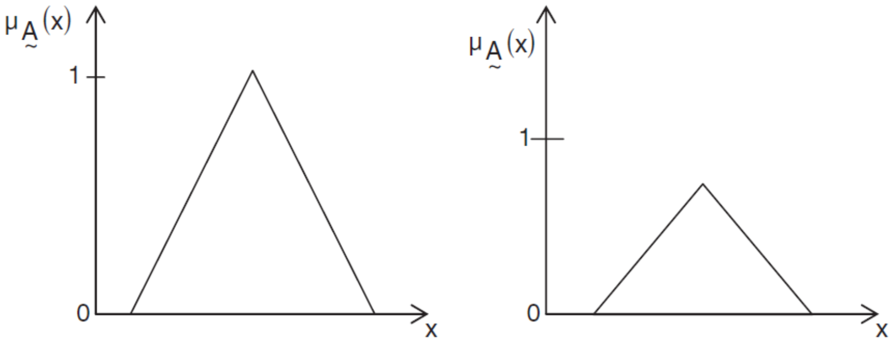


Fig. 4.2. (1) Normal fuzzy set and (2) subnormal fuzzy set

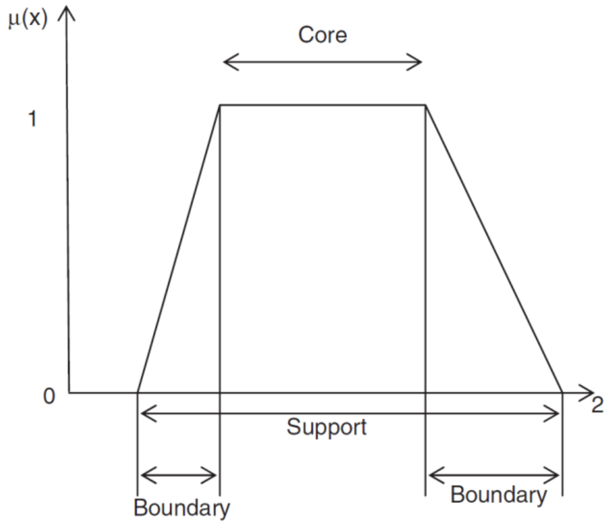
Convex fuzzy logic

An important property of fuzzy sets defined on R is convexity. It is a generalization of the classical concept of convexity of fragile groups. A fuzzy set is said to be convex if any point within the set can be connected to any other point within the set by a straight line that lies entirely within the set.

The boundary of a membership is the region of universe has a nonzero membership but not full membership. his defines the boundary of a membership function for fuzzy set A,

The boundary has the elements whose membership is between 0 and 1, 0

$$\boldsymbol{B}(\mathrm{A}) = \{\, \mathrm{s}{:}\, \mathrm{s} \in \mathrm{S} :\ 0 < \mu_{\mathrm{A}}(\mathrm{s}) < 1\}$$



And defining two important terms.

- **Crossover point**

The crossover point of a membership function is the elements in universe whose membership value is equal to 0.5,

$$\boldsymbol{Cros}(\boldsymbol{A}) = \{\, \boldsymbol{s}{:}\, \boldsymbol{s} \in \boldsymbol{S} :\ \boldsymbol{\mu_A}(\boldsymbol{s}) = \mathbf{0.5}\}$$

- **Height of the set**

The height of the fuzzy set A is the maximum value of the membership function.

$$\mathrm{h}(\mathrm{A}) = max\,\{\mu_{\mathrm{A}}(\mathrm{s})\}$$