

Getting Started with Fuzzy Logic

Fuzzy logic handles imprecision by allowing values to have degrees of truth between 0 and 1. It is an alternative approach to artificial intelligence, mimicking how humans often draw inferences from a preponderance of evidence available, even if it is incomplete. In the following steps we will build a fuzzy set.

1. Choose the Domain:

Decide what your fuzzy set will describe:

- Example: Temperature

2. Label your Fuzzy Set:

Pick the concept for your fuzzy set

- Example: Warm

3. Define the Universe:

Example: Temperature ranges from 0°C to 40°C

4. Design Membership Functions:

Define a function $\mu(x)$ that maps a temperature input x (from your domain) to a membership degree between 0 and 1:

- $x = 15^\circ\text{C}$: Membership = 0
- $x = 22^\circ\text{C}$: Membership = 1
- $x = 28^\circ\text{C}$: Membership = 0.25
- $x = 30^\circ\text{C}$: Membership = 0

5. Write the Membership Functions Mathematically

$$\mu_{\text{Warm}}(x) = \begin{cases} 0, & x \leq 15 \\ \frac{x - 15}{7}, & 15 < x \leq 22 \\ \frac{30 - x}{8}, & 22 < x \leq 30 \\ 0, & x > 30 \end{cases}$$

6. Test it with values:

- $\mu(20) = 0.71$, quite warm
- $\mu(10) = 0$, not warm at all
- $\mu(40) = 0$, not warm at all (too hot to be considered warm)

And that's it! You have built a fuzzy set which has a defined fuzzy concept and a membership function that can evaluate any input.