SNS COLLEGE OF ENGINEERING
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Artificial Intelligence & Natural Language Processing

Fuzzy Logic System Architecture

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Fuzzy Logic System Architecture

- **Fuzzification –** Converts crisp inputs into fuzzy values using membership functions.
- **Knowledge Base –** Stores fuzzy rules and membership functions.
- **Inference Engine –** Applies fuzzy reasoning (using AND, OR, NOT operations).
- **Defuzzification –** Converts fuzzy outputs back into crisp values.

Fuzzy Logic System Architecture

- Fuzzy logic provides a way to represent and process vague, uncertain, and imprecise information. It is widely used in control systems, decision-making, and AI-based automation. The book discusses fuzzy set theory, fuzzy logic, and fuzzy control systems, which are essential for handling continuous and ambiguous data

Fuzzy Logic System (FLS)

A **Fuzzy Logic System (FLS)** consists of four main components:

1. Fuzzification Module

Converts **crisp (precise) input data** into fuzzy values.

Uses **membership functions** to map real-world values into **fuzzy sets** (e.g., "low," "medium," "high").

Example: A temperature of **25°C** may be **"50% warm" and "50% cool"**.

2. Knowledge Base (Rule Base & Database)

Stores **fuzzy rules** and **membership functions**.

Rules are usually **IF-THEN** statements (e.g., **IF temperature is high THEN fan speed is fast**).

The database contains information about fuzzy sets and linguistic variables.

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3. Inference Engine

Applies fuzzy logic rules to the **fuzzified input**.

Uses **fuzzy operations** (AND, OR, NOT) to determine a fuzzy output.

Example: IF **speed is high AND road is wet, THEN braking should be gentle**.

4. Defuzzification Module

Converts fuzzy output values **back into crisp (numeric) values**.

Uses methods like **centroid, max membership, and mean of maximum**.

Example: Converts **fuzzy braking command** to an exact braking force percentage.

Applications of Fuzzy Logic Systems

Applications of Fuzzy Logic Systems

- **Industrial Automation** – Fuzzy logic controllers in washing machines, air conditioners.
- **Automotive Systems** – Adaptive cruise control, anti-lock braking systems (ABS).
- **AI & Robotics** – Decision-making in uncertain environments.
- **Healthcare** – Medical diagnosis, patient monitoring systems.


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