

Lecture on Fuzzy Logic(Unit-3-Lecture 1)



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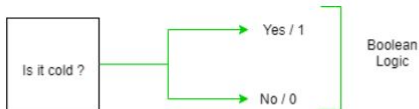
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- What is Fuzzy and what is logic?
- What is Fuzzy Logic?
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- What is fuzzy logic in AI?
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Objectives of unit 3.

- 1. To define the basic notions of fuzzy logic.
- 2. To introduce the logical operations and relations on fuzzy sets.
- 3. To learn how to obtain results of fuzzy logical operations.

- The term fuzzy refers to things which are not clear or are vague. In the real world many times we encounter a situation when we can't determine whether the state is true or false, their fuzzy logic provides a very valuable flexibility for reasoning. In this way, we can consider the inaccuracies and uncertainties of any situation.
- Fuzzy logic is a technique for representing and manipulating uncertain information.
- In boolean system truth value, 1.0 represents absolute truth value and 0.0 represents absolute false value. But in the fuzzy system, there is no logic for absolute truth and absolute false value. But in fuzzy logic, there is intermediate value too present which is partially true and partially false.

Basic Example of Fuzzy Logic



What is Fuzzy and what is logic?

- Fuzzy means lacking in clarity or definition moving the camera causes fuzzy photos The line between our areas of responsibility is fuzzy. This things that are difficult to perceive are fuzzy, indistinct or vague or unclear.
- In simple words, logic is “the study of correct reasoning, especially regarding making inferences.” Logic began as a philosophical term and is now used in other disciplines like math and computer science. While the definition sounds simple enough, understanding logic is a little more complex.

What is Fuzzy Logic?

- A computational paradigm that is based on how humans think.
- Fuzzy Logic looks at the world in imprecise terms, in much the same way that our brain takes in information (e.g. temperature is hot, speed is slow), then responds with precise actions.
- The human brain can reason with uncertainties, vagueness, and judgments. Computers can only manipulate precise valuations. Fuzzy logic is an attempt to combine the two techniques.
- “Fuzzy” – a misnomer, has resulted in the mistaken suspicion that FL is somehow less exacting than traditional logic

- "Fuzzy logic was formulated by Lotfi Zadeh of the University of California at Berkeley in the 1965, based on earlier work in the area of fuzzy set theory.
- Zadeh had observed that conventional computer logic couldn't manipulate data that represented subjective or vague ideas, so he created fuzzy logic to allow computers to determine the distinctions among data with shades of gray, similar to the process of human reasoning.
- Thousands of researchers are working with fuzzy logic and producing patents and research papers. According to Zadeh's report on the impact of fuzzy logic as of March 4, 2013, there are 26 research journals on theory or applications of fuzzy logic, there are 89,365 publications on theory or applications of fuzzy logic in the INSPEC database.

- Fuzzy logic is useful for commercial and practical purposes.
 1. It can control machines and consumer products.
 2. It may not give accurate reasoning, but acceptable reasoning.
 3. Fuzzy logic helps to deal with the uncertainty in engineering.

What is fuzzy logic used for?

- New computing methods based on fuzzy logic can be used in the development of intelligent systems for decision making, identification, pattern recognition, optimization, and control.
- Fuzzy logic has been used in numerous applications such as facial pattern recognition, air conditioners, washing machines, vacuum cleaners, antiskid braking systems, transmission systems, control of subway systems and unmanned helicopters, knowledge-based systems for multiobjective optimization of power systems.

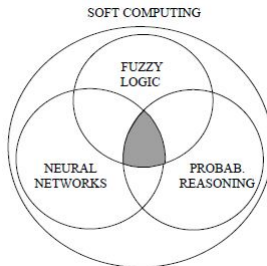
What is fuzzy logic in AI?

- Fuzzy Logic (FL) is a method of reasoning that resembles human reasoning. The approach of FL imitates the way of decision making in humans that involves all intermediate possibilities between digital values YES and NO. The fuzzy logic works on the levels of possibilities of input to achieve the definite output.
- Fuzzy set theory is a research approach that can deal with problems relating to ambiguous, subjective and imprecise judgments, and it can quantify the linguistic facet of available data and preferences for individual or group decision-making.

What is fuzzy logic in Soft Computing?

- Neural networks and Fuzzy Logic Systems are often considered as a part of Soft Computing area.
- Fuzzy Logic is an approach to variable processing that allows for multiple values to be processed through the same variable. Fuzzy logic is designed to solve problems by considering all available information and making the best possible decision given the input.

Soft computing as a composition of Fuzzy Logic



- Intersections include:
 - neuro-fuzzy systems and techniques,
 - probabilistic approaches to neural networks (especially classification networks) and fuzzy logic systems,
 - and Bayesian reasoning.

What is fuzzy logic in neural networks?

- Fuzzy logic is largely used to define the weights, from fuzzy sets, in neural networks. When crisp values are not possible to apply, then fuzzy values are used. We have already studied that training and learning help neural networks perform better in unexpected situations.

Why to use Fuzzy Logic in Neural Network?

- Following are some reasons to use fuzzy logic in neural networks
 1. Fuzzy logic is largely used to define the weights, from fuzzy sets, in neural networks.
 2. When crisp values are not possible to apply, then fuzzy values are used.
 3. We have already studied that training and learning help neural networks perform better in unexpected situations. At that time fuzzy values would be more applicable than crisp values.
 4. When we use fuzzy logic in neural networks then the values must not be crisp and the processing can be done in parallel.

What are the advantages of fuzzy logic?

- A Fuzzy Logic System is flexible and allow modification in the rules. Even imprecise, distorted and error input information is also accepted by the system. The systems can be easily constructed.



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Thanking You