The concepts of precisiation and cointension

Machines cannot think like humans do, yet. In order to make a machine perform tasks, it needs clear instructions. As Zadeh states: ”In a one-way communication via natrual language between a human (sender) and a machine (recipient), mm-precisiation is a necessity because a machine cannot understand unprecisiated natural language.” [2, 2760]. Because reality is fuzzy, and most concepts in science are fuzzy, tasks need to be translated for machines to understand. Zadeh explains the different modalities of precisiation and expands on the fact that bivalent logic is often not cointensive. These concepts are explained regorously in chapter three of the paper. The purpose of the text is to convince the reader of the value that fuzzy logic may offer over a bivalent-logic-based approach, and the importance of the implications for science.

The idea that science is bivalent-logic-based stood out to me. It's true that an hypothesis is proven to be true or false, but the formulation of the hypothesis itself may contain degrees or uncertainties. I'm left wondering why it would be useful to prove a statement true or false to a certain degree in science. In the fifth lecture of Fuzzy Logic, we discussed uncertainty, human reasoning and linguistic modelling. During this lecture, we had a discussion about probability that closely resembles my doubts in this matter. The question was: ”You must drink from the one you choose. Which would you choose to drink from?” [3, slide. 9]. One drink had a membership degree equal to the other drinks probability of being potable. If a drink is potable with a degree of 0.91, is it safe to drink? What about a degree of 0.500001, or 0.499999? Uncertainty could be stated in the hypothesis, for example: given a bottle of water with 0.01% poison, would it be potable? The proposition would by bivalence be true or false. In this case the answer would be more valuable than a degree.

Zadeh states that many concepts in science are a matter of degree, and that therefore bivalent-logic-based definitions of scientific concepts are not cointensive [2, 2769], meaning that the precisiated meaning is not close from the actual meaning. Then he states that fuzzy logic is a necessity to formulate cointensive definitions of fuzzy concepts. This statement implies that matter of degrees cannot be handled without fuzzy logic, because scientific concepts with a matter of degree are fuzzy concepts. Either that, or the statements have no relation. He seems to label scientific concepts with a matter of degree as fuzzy concepts. I have strong doubt that any scientific question should be answered with an associated degree of certainty.

The text uses explicit terms, that were often unfamiliar to me, to describe important concepts, forcing me to investigate and broaden my knowledge. The word ‘precisiation’ may not be found in a dictionary, but Zadeh has defined, used, and expanded upon the concept in preceding chapters and other writings such as [1]. Another term ‘cointension’ is explained in detail [2, 2760]. I wasn't aware that any degree of closeness existed between precisiend and precisiand.

Question 2

References

[1] L.A. Zadeh, ”The Concept of Cointensive Precisiation - A key to Mechanization of Natural Language Understanding”.

[2] L.A. Zadeh, ”Is there a need for fuzzy logic?”, In Information Sciences, Volume 178, Issue 13, 2008, Pages 2751-2779, ISSN 0020-0255.

[3] A. Bilgin, Lecture 5 - Uncertainty, human reasoning and linguistic modelling.