



Lotfi A. Zadeh
— The Father of Fuzzy Sets —

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“Probability Theory and Fuzzy Logic”

Thursday, April 24, 2003 — 2:00-3:30 PM

Basement Conference Room, Building 200, TA-16

(Uncleared & L-Cleared individuals please contact Rachel Morse @ 7-5150 by April 21)



ABSTRACT*

How does fuzzy logic relate to probability theory? This question was raised shortly after the publication of Professor Zadeh’s seminal paper on fuzzy sets (1965). And it is a question that has been and continues to be an object of controversy.

Probability theory as we know it today, call it PT, is based on bivalent logic. Professor Zadeh will articulate a novel view that probability theory should be generalized by basing it on fuzzy logic rather than on bivalent logic. There are two compelling reasons for this shift. First, the generalized probability theory, call it perception-based probability theory (PTp), has the capability to operate on perception-based information—a capability which PT does not have. Second, in PTp everything is, or is allowed to be, a matter of degree. In this context, PTp has a much closer rapport with reality than PT.

A basic assumption in PTp is that subjective probability is a perception of likelihood. Perceptions are intrinsically imprecise and so are subjective probabilities. In PTp, subjective probabilities are fuzzy numbers carrying linguistic labels.

A major difference between PTp and PT is that in PTp all concepts have, or are allowed to have, a fuzzy structure. In particular, in PTp, in contrast to PT, independence is a matter of degree, as it should be. Furthermore, the degree of independence is context dependent.

Fuzzy-logic-based probability theory is more general and more complex than bivalent-logic-based probability theory. As is true of all generalizations, complexity is the price that has to be paid to achieve greater problem-solving capability and better rapport with reality.



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