# MSS414 FUZZY SET THEORY

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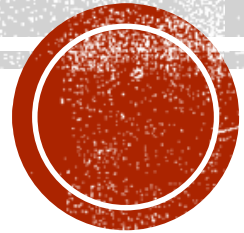

# FUZZY SET THEORY

- Lotfi A. Zadeh 1965
- Theoretical
  - Natural
  - Legitimate
  - Important
- Application
  - Follow the needs for changes in industrial environment
- Fuzzy set theory helps reduce "fuzziness" that is surrounding the variables etc.
- In average,10 years gap between theoretical and application

- Fuzzy booms in the 90s
  - Very applicable
  - Easy to understand
  - Attractive to industrialists
- Application oriented development become diversified
- Leading time between theoretical and application start blurring

# CRISPNESS, VAGUENESS, FUZZINESS, UNCERTAINTY

- Classical: Crisp set, crisp number, crisp modelling, crisp (hard) computing etc.
- Dichotomous, binary
  - Hot/Cold
  - Tall/Short
  - Rich/Poor
- Characteristic function
- Set drawing
- Crisp=sharp set
- Structure or model definitely known
- Too ideal, too good to be true
- To assert factuality, real-life data and problems, "crisp idea" is no longer suitable

The relationship between formal languages and domains in which they have models must in the empirical sciences necessarily be guided by two considerations that are by no means as important in the formal sciences:

(a) The relationship between the language and the domain must be closer because they are in a sense produced through and for each other;

(b) extensions of formalisms and models must necessarily be considered because everything introduced is introduced to make progress in the description of the objects studied. Therefore we should say that the formalization of the concept of approximate constructive necessary satisfaction is the main task of semantic study of models in the empirical sciences. [Apostel 1961, p. 26]

- Human thinking and feeling in which ideas, pictures, image and value systems were formed has more concept or comprehension that can be represented by words.
- Living language vs logical language
- Two major drawbacks in modelling
  - Real world is not deterministic
  - Human being cannot recognized too detail data, process and understand them (simultaneously)
- *Stochastic uncertainty*: The future state of the system might not be known precisely
  - Probability and statistic
- *Fuzziness*: vagueness concerning semantic (Appear in many areas)
  - Judgement
  - Evaluation
  - Decisions
- Represent daily languages

- The meaning of word often vague
- Using word as a label for a set
  - Birds, tall men, beautiful, red roses
- Subjective, not objective

Zadeh [1965, p. 339] writes, "*The notion of a fuzzy set provides a convenient point of departure for the construction of a conceptual frame-work which parallels in many respects the framework used in the case of ordinary sets, but is more general than the latter and, potentially, may prove to have a much wider scope of applicability, particularly in the fields of pattern classification and information processing. Essentially, such a framework provides a natural way of dealing with problems in which the source of imprecision is the absence of sharply defined criteria of class membership rather than the presence of random variables* ."