

## **Advances in Fuzzy Logic and its applications to business**

**Carmen Lozano and Jesús Macías-Durán**

**Abstract:** Fuzzy set theory and fuzzy logic have been successfully developed in mathematics and engineering as a tool to study phenomena surrounded by vagueness and imprecision. In recent years, these concepts have found great acceptance in social sciences, particularly in business, since they provide answers to those problems in the real world that cannot be modeled using classical mathematics. For example, personnel selection in a complex organization or conflict between countries are not easy to study, since many variables, parameters and inter-connections are involved on a vague way in these processes. In order to resolve some of these problems, we can turn our attention to another kind of mathematics tool: fuzzy logic.

Topics:

**1. Introduction to Fuzzy set theory**

Definition and explanation of a set, fuzzy set, membership functions, fuzzy numbers and triangular fuzzy numbers.

**2. Linguistic labels**

The Linguistic variables are fundamental when we want to represent knowledge in approximate reasoning. A linguistic variable is a variable whose values are words or sentences in a natural or artificial language.

**3. Decision-making theory**

This part deals with an introduction to Decision-making theory. We introduce decision-making process and techniques of analysis, such as problem definition and construction of a decision model based on fuzzy logic.

**4. Fuzzy set theory and its applications to business**

All the topics defined are applied here to business. First, we study a decision-making problem consisting in the selection of the subjects and ideal companies. Second, we use fuzzy logic to study a deterministic model (ordinal differential equations) about trade relations between two economic powers. This model is then applied to the commerce relation between China with USA.

The course requires a little mathematical background (calculus and set theory).

**Audience:**

Our tutorial is designed for undergraduate students and also included some high-level concepts for professionals and researchers.

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Carmen Lozano obtained her PhD degree and master's degree in sciences from the Department of Mathematics of the Center for Research and Advanced Studies of the National Polytechnic Institute of Mexico (Cinvestav - IPN). She is member of the

National System of Researches, SNI, from the CONACYT. Carmen Lozano is a researcher at the Business School of the Universidad La Salle México. Her research focuses on fuzzy logic applied to social sciences, such that Fuzzy set theory applied to accounting sciences.

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- Technical requirements (equipment, hardware, and software): Excel.