Preface

This book was thought as a non-conventional first course textbook in Fuzzy Logic for engineers ending with an introduction to one of the most fruitful topics arisen from it, Fuzzy Control. It is from the teaching's strategy of the authors, summarized by "Nothing can substitute the own homework of the student" from which it comes its non-conventional character, partially manifested by the 'continuous' form of presenting the considered topics by joining theoretical explanations and examples, and not always following the typically mathematical style of 'theorem-corolaries'.

Behind this strategy is the opinion that, at the university level, students and professors ought to learn jointly, students do not wait to receive everything from the professor's lectures, but should read more than a single recommended textbook. Consequently, this book is neither a manual with recipes to be uncritically applied, nor it is directed to those that can be only interested in mathematical subtleties. The reader should be aware that fuzzy logic is the study and computational management of imprecision and non-random uncertainty, both with the highest accuracy and precision possible at each case, that fuzzy logic is not fuzzy in itself.

Each university course requires a particular teaching tactic that not only depends on the number of lecturing hours, but on the aim of the course and on the audience's characteristics. In particular, additional tutorials supplied by the professor are essential for a good learning process. Tutorials in which other forms of considering the course's topics and more sophisticated problems can be proposed. This is at the own hands of the professor.

The book just presents some basic mathematical models for fuzzy logic but without the intention to just subordinate it to mathematics. Fuzzy logic is neither a part of mathematics, nor even of logic, like Physics is not so. Notwithstanding, what is paramount is the importance and usefulness of mathematical models in experimental sciences and technology, as well as in computer science and computer technology and, in particular, in Soft Computing, where fuzzy logic plays a pivotal role. But the suitability of such models only can come from the success of its testing against some reality, for instance, in true applications; applications play in the techno-scientific world an analogous role to that of experimentation in natural sciences. For instance, if the branch called 'Fuzzy Control' served not as a direct

justification of fuzzy logic, the success fuzzy logic has in control applications can be seen as a kind of experimentation to show its usefulness in the study of dynamical systems linguistically described by systems of imprecise rules. Fuzzy logic is much more than what is in this introductory textbook; its applications spread along many domains of science and technology.

The reader should be early acquainted with the fact that, differently from classical bi-valuate logic, almost all in fuzzy logic are context-dependent and purpose-driven. For instance, when representing a system of imprecise linguistic rules in fuzzy terms, all the predicates, connectives, and conditionals in the rules should be specified accordingly with its contextual meaning and the type of inference, forwards or backwards, to be done. In fuzzy logic not only everything is a matter of degree, but its practice requires the art of designing systems by means of the available theoretic armamentarium. The student should be conscious that a mistake in the design process can conduct to solve a different problem than the targeted one.

It should never be forgotten that it is most important in research to not stop questioning (Albert Einstein). Posing good questions (Isaac Rabi) whose answers can result in fertile ones (Karl Menger) is what reveals the relevance of a researcher.

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