

## Book reviews

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## Fuzzy Sets and Fuzzy Logic: Theory and Applications

Prentice Hall, New Jersey 1995.

574 pages, 134 figures, ISBN 0-13-101171-5

I can begin with the statement that this is an extraordinary good book. It can serve as a teaching for everybody who wants to get information on many aspects of fuzzy set theory, fuzzy logic and their applications, and it also shows the ways to the new paradigm of soft computing. Of course, it is not possible to cover everything in one book and to be precise in all details. Hence, some parts may seem to be not extensive enough. However, very extensive bibliography, which has 1731 (!) entries, makes possible to find a detailed information on any topic discussed in the book.

Let us now say few words about the contents. The book consists of 17 chapters divided into Part I: Theory and Part II: Applications. At the end, 6 appendices are attached which are devoted to neural networks, genetic algorithms, rough sets, proofs of three theorems from Chapter 3 (Operations on Fuzzy Sets) and glossaries on key concepts and symbols. The book is closed by the mentioned bibliography and 3 indices (bibliographical, name and subject ones). One can see that no important and useful constituent of the good book is omitted. All the indices are indeed exhaustive (all attempts to check them led to full satisfaction). Furthermore, each chapter contains many examples and it is closed by exercises which are very useful for better understanding to the topic.

Part I (Theory) is focused on explanation of the main theoretical aspects among which one may find the description of the paradigm shift from classical sets to fuzzy sets and the overview of fuzzy set theory, which includes properties of fuzzy sets and their operations, arithmetic operations with fuzzy numbers (the term “fuzzy arithmetics” sounds somewhat strange), fuzzy relations and fuzzy relation equations. The last three chapters of this part include possibility theory, fuzzy logic and uncertainty-based information.

Part II (Applications) is not only overview of the realized applications but it contains especially the explanation of the methods how various applications can be done. This makes the book even more valuable. Eight chapters of this part include methods for constructing fuzzy sets, the theory of approximate reasoning (surprisingly, not placed in Part I), fuzzy systems where also fuzzy control is explained, pattern recognition, fuzzy databases and fuzzy decision making. The final two chapters include engineering and various miscellaneous applications.

Some parts might be, in my opinion, elaborated a little more. For example, arithmetic operations with fuzzy numbers deal only with  $\alpha$ -cuts and employ the extension principle but other methods, based e.g. on convolution principle are even not mentioned (though cited — M. Mareš: *Computation Over Fuzzy Quantities*. CRC Press, Boca Raton 1995). I appreciate that the table containing various kinds of fuzzy implications does not include erroneous terms like “Mamdani’s implication” (as many other books do). Section 11.4 Multiconditional Approximate Reasoning does not clearly distinguish between fuzzy interpolation (though this term is used) and logical inference. In the latter case, the fuzzy relation  $R$  should be obtained by the intersection  $R = \bigcap R_i$  while it is union in the former one. It is also a pity that the authors do not correctly refer to the works which were started by J. Pavelka (*On Fuzzy Logic I, II, III*. *Zeit. Math. Logik. Grundle. Math.* 25 (1979), 45–52, 119–134, 447–464) and followed by several other ones. The statement that these works are “examinations of various aspects of the relationship between multivalued logic and fuzzy logic” is not completely true as these works establish a theoretical frame for

the fuzzy logic being a specific many-valued logic which aims at modelling of the vagueness phenomenon. This logic is now usually called "fuzzy logic in narrow sense". Let us mention that most of the issues of the reviewed book can be theoretically explicated and justified on the basis of the latter.

Some other critical remarks can, of course, be stated. However, they cannot harm the statement in the beginning of this review. This book is indeed excellent and I recommend it to everybody who wants to learn fuzzy set theory and its applications, but also to the specialists as they can enjoy the aggregating view of the fundamental parts of this, now so extensive, subject.

*Vilém Novák*