

Book Reviews

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BOOK REVIEWS

Novák, V. — Perfilieva, I. — Močkoř, J.:

MATHEMATICAL PRINCIPLES OF FUZZY LOGIC.

Kluwer Academic Publishers, Boston-Dordrecht-London 1999, xiii + 320 pp.

ISBN 0-7923-8595-0

Since 1965 introduction of fuzzy sets by L. A. Zadeh, fuzzy sets and fuzzy logic became an important tool in soft computing and in uncertainty modelling stressing the vagueness aspect. Among several monographs devoted to fuzzy sets and fuzzy logic (for example Zimmermann, Nguyen and Walker, Lowen), only few of them provide a systematic course of the formal theory of fuzzy logic (for example, Gottwald, Hájek). The monograph under review is based on logical formalism demonstrating that fuzzy logic is a well-developed logical theory. More, it includes the theory of functional systems in fuzzy logic, which provide explanation of what (and how) can be represented by formulae of fuzzy logic calculi. Important is also the categorical look on fuzzy sets and the philosophical point of view in presentation of fuzzy logic as the theory of common-sense human reasoning based on the use of natural language. The book consists of eight chapters starting with the introductory discussion about the motivation, development, structure and potential of fuzzy logic for applications.

Basic algebraic concepts necessary for the next logical calculi are included into *Chapter 2*, while the third chapter briefly reminds basic concepts of classical logic. The main parts of the monograph are contained in the chapters 4–7.

Especially important is *Chapter 4* devoted to the fuzzy logic in narrow sense. Authors extend the Pavelka approach to fuzzy logic, i.e., they work with the Lukasiewicz algebra of the truth-values. Several results related to deduction, contradiction, completeness, soundness, etc. of presented fuzzy logic are the stones from which they have built their theory. Also fundamentals of the model theory and the computability questions are included in this major chapter.

Chapter 5 is devoted to functional systems in fuzzy logic theories. A notable role here is played by the Mc Naughton theorem. Disjunctive and conjunctive normal forms are generalized into discussed fuzzy logic. For applications, several presented approximation models of continuous functions may be important.

Chapter 6 deals with fuzzy logic in broader sense. Especially, a formalization of intension and extension concepts, evaluating linguistic syntagma and description via IF — THEN rules form a sound background for engineering and industrial applications of fuzzy logic. The seventh chapter investigates the fuzzy sets and fuzzy logic within category theory. In this more abstract chapter, three possible categories of fuzzy logic are discussed.

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Next, the place of fuzzy logic in the framework of Heyting algebras and MV-algebras is shown. The last chapter brings some historical and concluding remarks, outlining some actual problems of fuzzy logic. The monograph is completed by index and an appropriate list of references. This interesting book will be surely an important source for researchers and students in mathematics and soft computing, as well as for everybody interested in fuzzy logic.

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