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Mathematics Behind Fuzzy Logic

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Fuzzy set theoretical approach to numerous problems of applied mathematics and, especially, fuzzy logical analysis of those problems become frequent in the modern mathematical modelling of the real world. It is desirable to offer the mathematically oriented reader a summary of the background of the principles of fuzzy logic in a lucid and compact form. The referred book aims to offer such summary of mathematical backgrounds of fuzzy reasoning, and it does so with excellent mathematical culture.

The relatively brief booklet is divided into four main chapters. Each of them is completed by well chosen exercises the solutions of which are offered at the end of the book, together with bibliography (38 items) and index. The first chapter, titled “*Residual Lattices*” is rather introductory. It presents the concept of lattice, lattice filters, BL-Algebras and related notions. The second chapter is devoted to “*MV-algebras*” and to their connection with other similar objects like Wajsberg algebras or Boolean algebras. The third chapter deals with “*Fuzzy Propositional Logic*”, its semantics, axiomatics and completeness. Finally, the fourth chapter, titled “*Fuzzy Relations*” presents the fuzzy relational equations, fuzzy similarity relations and their connections with fuzzy reasoning.

The particular topics treated in the referred book are well chosen, the explanation is clear and the work itself forms a compact unit. The presentation of fuzzy set theoretical and fuzzy logical concepts is based on the theory of lattices to which the values of the membership functions of fuzzy objects belong. This rather abstract approach to the given topic is fully adequate to the character of fuzzy logical concepts. The text is well readable for everybody who is familiar with mathematical and logical symbolics. The book is very useful for readers looking for compact summary of mathematical foundations of fuzzy logic and fuzzy reasoning. The rich offer of exercises means that the referred publication can be used also as highly qualified textbook.

Milan Mareš

Mathematics Behind Fuzzy Logic. Authors: Turunen, Esko. Buy this book. Many results in fuzzy logic depend on the mathematical structure the truth value set obeys. In this textbook the algebraic foundations of many-valued and fuzzy reasoning are introduced. The book is self-contained, thus no previous knowledge in algebra or in logic is required. It contains 134 exercises with complete answers, and can therefore be used as teaching material at universities for both undergraduated and post-graduated courses. Chapter 1 starts from such basic concepts as order, lattice, equivalence and residuated lattice. It contains a full section on BL-algebras. Chapter 2 concerns Fuzzy mathematics forms a branch of mathematics related to fuzzy set theory and fuzzy logic. It started in 1965 after the publication of Lotfi Asker Zadeh's seminal work Fuzzy sets. A fuzzy subset A of a set X is a function $A: X \rightarrow L$, where L is the interval $[0,1]$. This function is also called a membership function. A membership function is a generalization of a characteristic function or an indicator function of a subset defined for $L = \{0,1\}$. More generally, one can use a complete lattice L in a