

## Book reviews

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D. BUTNARIU, E.P. KLEMENT

**Triangular Norm-Based Measures and Games with Fuzzy Coalitions**

Theory and Decision Library, Series C: Game Theory, Mathematical Programming and Operations Research.

Kluwer Academic Publishers, Dordrecht – Boston – London 1993.

ix + 200 pages, 17 figures, 1 table, Index, Bibliography.

ISBN 0-7923-2369-6.

Triangular norms and related concepts belong to modern and perspective tools the further the more used in the fuzzy set theory. They appear especially adequate to theoretical models describing the abstract core of various application of that theory to practical problems. For this purpose the triangular norm-based measures represent an effective theoretical tool for general description of some properties of fuzzy sets. And, continuing this considerations, the fuzzy coalition game theory belongs to the most interesting application area of fuzzy set functions theory in general, and of the triangular norm-based measures especially.

The referred book covers, in a brief but logically consistent way, the wide scale of concepts and results from the triangular norm over the related measures up to the fuzzy coalition game theory. The aiming of the description of general ideas to relatively narrow and specialized problems of coalition game theory enables the authors to keep the homogeneity of the explanation of the subjects being on different levels of generality.

The book is divided into six chapters, where the first one brings a brief explanation of the triangular norms and related theoretical apparatus.

The triangular norm-based measures are described in the following two chapters. First, in the general form with a stress to the decomposition theorem and integral representation, and then the special type of  $T_\infty$ -measures is considered. The symbol  $T_\infty$  denotes the triangular norm defined by

$$T_\infty(x, y) = \min(0, x + y - 1)$$

for  $x, y \in [0, 1]$ . Properties of the  $T_\infty$ -measures, namely their Jordan decomposability, are significant for understanding the following presentation of fuzzy coalition games.

The fourth chapter is devoted to the introduction of games with fuzzy coalitions. Here, fuzzy coalition is a fuzzy subset of the general non-empty set of players and the values of their membership functions represent the share of participation of players on the total worth of coalitions. The diagonal Aumann-Shapley value is presented as the adequate solution concept of such game. Extensions of the diagonal value are investigated in the next, fifth, chapter.

The last chapter is focused to some inspirative applications of the presented theory, namely to the relation between the coalition game solutions (like values or cores) and economic equilibria, games with crisp coalitions as special modification of the fuzzy ones, plausibility and possibility measures, etc.

The book is completed by index and a representative bibliography.

The authors in their introduction mention the fact that their book does not exhaust the subject. In fact, it is really so. But they succeeded to introduce all the essential facts and concepts and, what is most pleasant, their presentation of the subject is lucid, consistent and adequately extensive in details.

All these qualities recommend the referred book to be a good source of the essential information on the topics mentioned in its titles.

*Milan Mareš*

LEONID KITAINIK

**Fuzzy Decision Procedures With Binary Relations**

Theory and Decision Library Series D: System Theory, Knowledge Engineering and Problem Solving, No. 13.

Kluwer Academic Publishers, Boston – Dordrecht – London 1993.

254 + xxiii pages, 27 figures, 9 tables.

ISBN 0-7923-2367-X.

The fuzzy decision-making theory and algorithms belong to most prospective branches of the fuzzy set theory and applications. The natural vagueness of many elements of practical decision-making situations represents a wide area for effective application of the concept of fuzziness. The referred book contributes to the publications dealing with fuzzy decision-making procedures in an interesting way.

The book is based on the paradigm of mutual influence of the fuzzy and crisp decision-making underlines the duality between the empiric practical approach to the uncertainty and its theoretical models. The concept of fuzziness can offer a link between both of them. In this sense the fuzzy decision-making procedures represent a generalization of the crisp models and, on the contrary, they offer a new original explanation and methods for the crisp theory.

The fuzzy decision-making methods based on binary relations are treated in their completeness with respect to various relations among them as well as to other branches of mathematics.

The book is divided into 15 chapters which can be grouped in five principal parts. The first one, containing Chapters 1–5, is devoted to introductory and auxiliary concepts, to systemization of the decision rules with binary relations, to the formalism used for the description of decision procedures, and to the discussion of motivations and heuristic background.

Chapter 6 itself form a specific part presenting the-axiomatics and motivation of fuzzy inclusions and fuzzy implications. This subject includes also the representation theorem and, of course, the properties and characteristic of fuzzy inclusions.

The generality of Chapter 6, going far beyond the proper subject of the referred book, has its counterpart in Chapter 10 devoted to another subject of similar generality, namely to the cut techniques of handling fuzzy subset. It deals especially with invariant, antiinvariant and eigen fuzzy subsets and fuzzy relational systems.

With this specific exception, Chapters 7–13 form another of the principal parts. They present the main results on decision procedures based on binary relations. They deal namely with contensiveness of fuzzy dichotomous decision procedures in universal and fuzzy environment, to choice and ranking with fuzzy relations, efficiency of fuzzy decision procedures and decision-making with some special classes of binary fuzzy relations.

Finally, Chapter 14 presents the application of the fuzzy approach to crisp choice rules, and Chapter 15 concerns some applications of the presented theory to decision support systems and to multipurpose decision-making.

The book is completed by an index and list of references including 126 items.

The referred publication presents an interesting and well based view on the fuzzy decision procedures with binary preferences. It will be useful for everybody who is interested in applications of the fuzzy set theory to the optimization problems but also to the artificial intelligence procedures and related topics.

*Milan Mareš*

BERNARD R. GELBAUM, JOHN M. H. OLMSTED

### Theorems and Counterexamples in Mathematics

Springer-Verlag, New York - Berlin - Heidelberg - London 1990.

XXIV + 305 pages; 24 illustrations.

ISBN 0-387-97342-7 New York - Berlin - Heidelberg

ISBN 3-540-97342-7 Berlin - Heidelberg - New York.

The referred book offers a concentrated overview of the basic results of the modern mathematics. It aims to present a wide scale of mathematical knowledge in an brief condensed but lucid form in which any experienced reader can easily find the desired particular piece of mathematical knowledge. Effective orientation in the text is enabled by good arrangement of the presented facts supported by a rich glossary/index of concepts.

Even the graphical presentation of the text allows to distinguish easily between definitions, theorems and (counter)examples.

The subjects processed in the book are divided into five chapters. The first one concerns algebra including group theory, algebra in the narrower sense and linear algebra with linear programming. The second and most extensive chapter deals with analysis including the classical real analysis, measure theory, topological vector spaces, topological algebras, differential equations and complex variable.

The following three chapters are much shorter but also full of facts. They are devoted to geometry and topology including Euclidean geometry, topological spaces and brief section on differential topology, further, to probability theory including stochastic independence phenomena, stochastic processes in general and especially the transition matrices, and finally to the foundations which in this case mean the logic and set theory.

The book is introduced by a brief preface. Extremely important for the book of this sort are the appendices represented by a rich bibliography of references, list of symbols and the glossary/index already mentioned above.

The referred book is inspired by the evident success of "Counterexamples in Analysis" published by the same authors in 1964. Its content is more extensive and it usefully reflects the progress in teaching and interpreting mathematics achieved during the twenty five years between both books.

At least one book of this sort should be ready in any mathematical library. Each professional mathematician needs at least sometimes verify the exactness of his knowledge in less routine branches of mathematics. The referred booklet allows to do it easily and with pleasure.

*Milan Mareš*