Liu, Baoding

Uncertainty theory. 2nd ed. (English) Zbl 1141.28001

Studies in Fuzziness and Soft Computing 154. Berlin: Springer (ISBN 978-3-540-73164-1/hbk). x, 255 p. (2007).

Formally, this book is the 2nd edition of Liu's "Uncertainty theory" from 2004 (see Zbl 1072.28012), actually however it is a new edition. Only the first two chapters of both editions more or less coincide. Whereas the first (premature?) edition consists in a somewhat tedious discussion of all possible hybrid-combinations of uncertainty approaches, the new text is concentrated at the essentials. After a short introduction into measure and integration theory (chapter 1) and into probability theory (chapter 2) the author presents in chapter 3 in an axiomatic way his credibility theory for fuzzy variables. The simultaneous consideration of both probability and fuzziness, called chance theory, follows in chapter 4. Formally, a chance space is the product space of a probability space and a credibility space (i.e. interaction between probability and fuzziness is not allowed!?). Due to the self-duality of the chance measure many probability-like investigations are possible. So the author introduces and discusses e.g. chance distributions and their moments, inequalities, convergence concepts, characteristic functions, conditional chance,...

The presentation is clear and correct but formal. The value of this kind of chance theory should be discussed, especially the author's conviction that "a self-dual measure is absolutely needed in both theory and practice". The classical (evidence-theoretic) approach uses a dual pair of measures, belief and plausibility, and the distance from self-duality is used (in form of lower and upper probabilities) to measure the amount of fuzziness up to a self-dual (probability) measure. From this practical point of view, author's use of self-dual (credibility) measures from the beginning leads to some kind of defuzzification and therefore to a probability-like theory. It seems to me, however, defuzzification at the phase of modelling is premature, defuzzification should be done not till the phase of decision.

Reviewer: Wolfgang Näther (Freiberg)

MSC:

28-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to measure and integration
28E10	Fuzzy measure theory
68T37	Reasoning under uncertainty in the context of artificial intelligence
60A05	Axioms; other general questions in probability
03E72	Theory of fuzzy sets, etc.

Keywords:

probability theory; credibility theory; chance theory; hybrid variable

Full Text: DOI