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**Possibility theory with applications to data analysis.**

UMIST Control Systems Centre Series. 5. Taunton: Research Studies Press. New York, NY: John Wiley & Sons, xxvii, 261 p. £55.00 (1998).

Possibility theory is a tool to integrate various uncertainty techniques using techniques from statistics, logical reasoning and probabilistic modelling. The main concept involved is that of a fuzzy set, i.e., a mapping from the universe of discourse into the unit interval. The book provides a guide to recent research in this field with emphasis on applications of fuzzy mathematics to control theory. After discussing various kinds of uncertainty in control systems, the author shows how to extend conventional tools from probability theory to handle vaguely described events and imprecise probabilities. The concepts of fuzzy sets and fuzzy relations are derived as generalisations of their classical counterparts. Standard formulations of probabilistic concepts are summarised in the appendices. The presentation continues by introducing concepts specific to possibility theory: possibility distributions and confidence measures that are derived from fuzzy sets and upper and lower probabilities. The author discerns two main perspectives within possibility theory: logical and measure-theoretic. The first represents knowledge in a rule-based format, while the latter rests on the backbone of probability theory as in conventional signal processing. As an application of fuzzy measures and fuzzy integrals, the author presents a concept for an online evaluation of the reliability of a dynamic process. Possibilistic change detection extends the conventional change detection by introducing fuzzy thresholds in classifying the variable under consideration as an indicator for a stable or unstable condition of the process. The authors describes several approaches to construct these fuzzy thresholds based on upper and lower distribution functions, ranking procedures of fuzzy quantiles and random closed sets induced by time-correlated data. Dynamic change detection is considered within the framework when the underlying probabilistic model is known only approximately. For instance, it is shown that incomplete information about the noise distribution of a signal leads to the concept of fuzzy data. The book is fairly easy to read, as the only prerequisite is basic knowledge in higher mathematics. Every chapter ends with a useful summary accompanied by general methodological and philosophical discussions. Theoretical concepts are illustrated throughout by examples and simulations. The corresponding MATLAB fuzzy systems toolbox is available from the WEB.

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