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Sinopsis

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Goguen categories extend the relational calculus and its categorical formalization to the fuzzy world. Starting from the fundamental concepts of sets, binary relations and lattices this book introduces several categorical formulations of an abstract theory of relations such as allegories, Dedekind categories and related structures. It is shown that neither theory is sufficiently rich to describe basic operations on fuzzy relations. The book then introduces Goguen categories and provides a comprehensive study of these structures including their representation theory, and the definability of norm-based operations.

The power of the theory is demonstrated by a comprehensive example. A certain Goguen category is used to specify and to develop a fuzzy controller. Based on its abstract description as well as certain desirable properties and their formal proofs, a verified controller is derived without compromising the - sometimes - intuitive choice of norm-based operations by fuzzy engineers.