On Incomplete Conjunctive Information

Didier Dubois and Henri Prade
L.S.I., Université Paul Sabatier, 118 route de Narbonne, 31062 Toulouse, France

Many information systems capable of handling incomplete or fuzzy information manipulate objects with single-valued attributes. Information is then said to be disjunctive. Information is said to be conjunctive when pertaining to many-valued attributes. While a piece of incomplete disjunctive information is easily represented by means of a set of mutually exclusive possible values, modeling incomplete conjunctive information theoretically leads to consideration of families of sets, since attributes are then set-valued under complete information. Some proposals are made to efficiently and rigorously represent incomplete conjunctive information and deal with query evaluation, especially in the case where only upper and/or lower bounds of the set of values of a many-valued attribute are known. This approach can be applied to the processing of time intervals, as well as to spatial reasoning, among other topics, in knowledge-base management.

Fuzzy Medical Diagnosis Decision Making Revisited

Augustine O. Esogbue
School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332-0205

The fuzzy medical diagnosis decision models of Esogbue and Elder employed fuzzy set theory to directly and more correctly model all the information nets useful in reaching a scientific understanding of a patient's health status. The resultant medical hypothesis decision model is actually a subproblem of the entire medical diagnosis problem, with each component requiring some or all of the following fuzzy information nets: (1) patient past history, H; (2) medically designated symptoms, A; (3) signs observed by the physician, S; and (4) results of clinical and diagnostic tests, Z. For example, medical hypothesis requires $\{H, A\}$, initial preliminary diagnosis $\{H, A, S\}$, other preliminary diagnosis $\{H, A, S, Z\}$, and final diagnosis $\{H, A, S, Z\}$. This paper sketches the basic aspects of a model based on fuzzy dynamic programming that can be employed in linking these phases up in an adroit manner. The attendant computational issues are under investigation and will be discussed in a subsequent paper.

An Approach to the Automated Acquisition of Production Rules

Kenneth M. Ford and Frederick E. Petry
Computer Science Department, Tulane University, New Orleans, Louisiana 70118

The most serious bottleneck confronting developers of expert systems is the elicitation of expert knowledge. This paper presents an approach to the interactive derivation of

entailments from data obtained from repertory grids provided by domain experts. These entailments can provide a basis for the automatic generation of rules for expert systems.

Rather than the conventional distance-based cluster-analytic approaches or the more recent fuzzy set approaches, this paper proposes a logic of confirmation analysis in which repertory grid data can be viewed as a collection of two-dimensional arrays. These arrays, referred to as α planes, are used for the derivation of entailments.

Address correspondence to Frederick E. Petry.

A Utility-Valued Logic for Decision Making

Robin Giles
Mathematics Department, Queen's University, Kingston, Ontario, K7L 3N6 Canada

In this paper a logic particularly appropriate for decision-making applications is described. In order to express beliefs, the notion of a sentence is replaced by that of an assertion. It is then natural to take the corresponding "truth value" to be the utility associated, as in standard decision theory, with the act of making the assertion, and connectives become ordinary real-valued functions. The representation of decision-making rules (in the sense of expert systems) as assertions is studied, and it is shown that common but moderately sophisticated rules (including degrees of belief and limiting conditions) admit a very simple representation involving only linear functions. The structure of the corresponding formal logic in which variables are used to denote arbitrary assertions is briefly described. It turns out that this logic admits a deductive method closely analogous to Robinson's method of resolution. Using this method, a problem in deduction in the logic of assertions becomes a problem in linear programming, and the assertional form of resolution coincides with Fourier's method for solving such problems.

An Improved Method of Performing Fuzzy Arithmetic for Computer Vision

James A. Givens and Hossein Tahani
226 Electrical Engineering, University of Missouri-Columbia, Columbia, Missouri 65211

In computer vision, we often have the capability of looking at a scene through several different sensors and/or of looking at a time sequence of images from the scene. The theory of fuzzy sets offers a powerful and natural way of calculating an overall confidence in the classification based on the confidence measures from these multiple images; however, it is difficult to perform these operations quickly and accurately. This paper presents a way of representing fuzzy numbers and performing computations with them based on a λ-cutset representation of fuzzy sets and using interval arithmetic. The λ-cutset algorithm, particularly the authors' version of the algorithm restricted to the positive real numbers, provides a much faster and more efficient way of performing calculations with fuzzy numbers than the approximate discretization approach. In