Forthcoming Papers

E. Fagioli and M. Zaffalon, 2U: an exact interval propagation algorithm for polytrees with binary variables

This paper addresses the problem of computing posterior probabilities in a discrete Bayesian network where the conditional distributions of the model belong to convex sets. The computation on a general Bayesian network with convex sets of conditional distributions is formalized as a global optimization problem. It is shown that such a problem can be reduced to a combinatorial problem, suitable to exact algorithmic solutions. An exact propagation algorithm for the updating of a polytree with binary variables is derived. The overall complexity is linear to the size of the network, when the maximum number of parents is fixed.

I. Düntsch and G. Gediga, Uncertainty measures of rough set prediction

The main statistics used in rough set data analysis, the approximation quality, is of limited value when there is a choice of competing models for predicting a decision variable. In keeping within the rough set philosophy of non-invasive data analysis, we present three model selection criteria, using information theoretic entropy in the spirit of the minimum description length principle. Our main procedure is based on the principle of indifference combined with the maximum entropy principle, thus keeping external model assumptions to a minimum. The applicability of the proposed method is demonstrated by a comparison of its error rates with results of C4.5, using 14 published data sets.

T. Schaub and S. Brüning, Prolog technology for default reasoning: proof theory and compilation techniques

The aim of this work is to show how Prolog technology can be used for efficient implementation of query answering in default logics. The idea is to translate a default theory along with a query into a Prolog program and a Prolog query such that the original query is derivable from the default theory iff the Prolog query is derivable from the Prolog program. In order to comply with the goal-oriented proof search of this approach, we focus on default theories supporting local proof procedures, as exemplified by so-called semi-monotonic default theories. Although this does not capture general default theories under Reiter's interpretation, it does so under alternative ones'.

For providing theoretical underpinnings, we found the resulting compilation techniques upon a top-down proof procedure based on model-elimination. We show how the notion of a model elimination proof can be refined to capture default proofs and how standard techniques for implementing and improving model elimination theorem provers (regularity, lemmas) can be adapted.
and extended to default reasoning. This integrated approach allows us to push the concepts needed for handling defaults from the underlying calculus onto the resulting compilation techniques.

This method for default theorem proving is complemented by a model-based approach to incremental consistency checking. We show that the crucial task of consistency checking can benefit from keeping models in order to restrict the attention to ultimately necessary consistency checks. This is supported by the concept of default lemmas that allow for an additional avoidance of redundancy.

T. Drakengren and P. Jonsson, A complete classification of tractability in Allen's algebra relative to subsets of basic relations

We characterise the set of subalgebras of Allen's algebra which have a tractable satisfiability problem, and in addition contain certain basic relations. The conclusion is that no tractable subalgebra that is not known in the literature can contain more than the three basic relations (≡), (b) and (b⁻), where b ∈ {d, o, s, f}. This means that concerning algebras for specifying complete knowledge about temporal information, there is no hope of finding yet unknown classes with much expressivity. We also classify completely some cases where we cannot even express complete information (but close to complete), showing that there are exactly two maximal tractable algebras containing the relation (< >), exactly two containing the relation (< > m m⁻), and exactly three containing the relation (< m). The algebras containing (< >) can express the notion of sequentiality; thus we have a complete characterisation of tractable inference using that notion.

T. Bylander, Worst-case analysis of the perceptron and exponentiated update algorithms

C. Witteveen and W. van der Hoek, Recovery of (non)monotonic theories

J.L. Pollock, The logical foundations of goal-regression planning in autonomous agents