

# A Note on Classification-Based Reasoning and Semi-Structured Objects

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# A note on classification-based reasoning and semi-structured objects

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## Abstract

In this talk, we present a work in progress on the representation and manipulation of semi-structured data in an object-based representation environment. This research work is carried out in the field of knowledge representation and reasoning in order to build intelligent systems (according to artificial intelligence standards).

Object-based representation systems and classification-based reasoning are the representation and reasoning formalisms underlying this research work. An object-based representation system is based on a hierarchy  $H = (X, \sqsubseteq)$  of classes, where classes in  $X$  are related by the subsumption relation  $\sqsubseteq$  (a structural partial ordering). A class represents a real-world concept and is composed of a collection of attributes describing the characteristics and the behavior of the concept. Reasoning is based on inheritance (for knowledge sharing in  $H$ ) and classification, i.e. to insert a new class in  $H$ , to determine the possible class of an object, to handle queries and to draw inferences.

Semi-structured data are data whose structure is not regular, heterogeneous, partial, has not a fixed format and quickly evolves. In our context, semi-structured data are represented as semi-structured objects, i.e. objects without classes, and they are manipulated by classification procedures. Semi-structured objects may be grouped within semi-structured classes that are composed of a conjunction and a disjunction of attributes. Semi-structured classes may be then classified within a hierarchy, on the basis of a subsumption relation  $\sqsubseteq$ , following an adaptation of the classical algorithm of classification-based reasoning (allowing to take into account disjunctions of attributes). Taking advantage of the hierarchical organization, semi-structured objects and classes may be then used for problem-solving purposes (drawing inferences on the data).

A parallel may be drawn between semi-structured classes and polythetic classes, introduced in the field of data analysis to take into account the irregularity of real-world concepts such as biological concepts. Semi-structured objects and classes may be exploited for several purposes, such as knowledge representation, knowledge discovery in data bases, text mining, integration of heterogeneous databases, and design of corporate memories.

**Keywords:** knowledge representation, reasoning formalisms, classification-based reasoning, problem solving, semi-structured data, polythetic classes, classification.