(Probabilistic) Description Logics

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Abstract

The Semantic Web aims at making information available in a form that is understandable and automatically manageable by machines. Ontologies are engineering artifacts used to this purpose, and Description Logics (DLs) are a family of logic-based languages particularly suitable for modeling (and reasoning upon) ontologies and the Semantic Web. Great effort has been spent in identifying decidable or even tractable DLs. Efficient DLs reasoners have been implemented in procedural, object-oriented languages or Prolog.

Nonetheless, incompleteness or uncertainty is intrinsic of much information on the World Wide Web. This motivated the research in Probabilistic DLs, some of which derived from approaches from the Logic Programming area. Conversely, for knowledge representation and reasoning, integration with rules and rule-based reasoning is also crucial in the so-called Semantic Web stack vision.

In this talk, I will focus on probabilistic DLs. First, I will briefly overview DLs and reasoning systems. After recalling the Distribution Semantics from Probabilistic Logic Programming, I will show how it and other probabilistic approaches have been applied to DLs, and what inference systems for Probabilistic DLs are available. Learning Probabilistic DL theories is also an interesting issue. A demo of a Web-based system for Probabilistic DLs implemented in SWI Prolog, and SWISH, will conclude this part of the talk.

A further research activity has been conducted by the AI and LP community in order to facilitate the integration of DL theories with rules and rule-based reasoning, since this is also crucial in the Semantic Web. Proposals like Datalog+/- and its extensions, ASP-based systems or Abductive Logic Programming for modeling and reasoning upon ontologies, are significant attempts which should be considered seriously by the LP community. I will briefly mention these approaches, ending the talk.