On the Semantics and Complexity of Probabilistic Logic Programs

Abstract
We examine the meaning and the complexity of probabilistic logic programs that consist of a set of rules and a set of independent probabilistic facts (that is, programs based on Sato's distribution semantics). We focus on two semantics, respectively based on stable and on well-founded models. We show that the semantics based on stable models (referred to as the "credal semantics") produces sets of probability measures that dominate infinitely monotone Choquet capacities; we describe several useful consequences of this result. We then examine the complexity of inference with probabilistic logic programs. We distinguish between the complexity of inference when a probabilistic program and a query are given (the inferential complexity), and the complexity of inference when the probabilistic program is fixed and the query is given (the query complexity, akin to data complexity as used in database theory). We obtain results on the inferential and query complexity for acyclic, stratified, and normal propositional and relational programs; complexity reaches various levels of the counting hierarchy and even exponential levels. (AU)