Implementation of a Probabilistic Logic with both precise and imprecise connectives in a CAS.

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Abstract

In this work a new Probabilistic Logic, $PL^{\approxeq}$, is described in a semantic and in a syntactic way. One of the main characteristic of this logic is the use of both, precise and imprecise connectives.

In order to allow imprecise probabilities, each formula from $PL^{\approxeq}$ is provided with an interval that reflects the minimum and maximum probabilities possible for this formula. These two real numbers in [0, 1] interval can be stored in a standard float point notation but for the calculus of precise connectives an exact representation of the real numbers is needed. Thus, the implementation of the semantic of precise connectives of $PL^{\approxeq}$ requires a CAS tool, since an exact calculus of the probabilities is needed which it is not supported by traditional float point languages.

Syntactic rules of the logic $PL^{\approxeq}$ will be implemented in a CAS to allow the computer to simplify formulae and to obtain results.

As an example of application of this logic some examples involving card games will be implemented. Precise connectives will be used, for instance, for the calculus of traditional probabilities like the probability of obtaining a better result than the opponent. Imprecise connectives and imprecise probabilities will be used for the calculus of the probability of the event “opponent is bluffing”.