Probabilistic Abduction under incomplete information from the standpoint of possibility theory

D. Dubois
IRIT, Université Paul Sabatier,
Tolouse (France)

The counterpart to Bayes rule in numerical possibility theory formally copes with the abduction problem when only partial prior information is available. Prior information may be missing either because there are no statistical data on which to rely on, or simply because a human expert is reluctant to provide a subjective assessment of this prior probability.

This talk reconsiders the simple problem of probabilistic abduction when the prior probability of the hypothesis is not available and suggests that possibility theory can handle this kind of situation. The problem remains an open issue since a simple sensitivity analysis on the value of the unknown prior yields empty results.

We survey and comment on various solutions to this problem: the use of likelihood functions(as in classical statistics), the use of information principles like maximal entropy, Shapley value, maximum likelihood.

We also study the problem in the setting of de Finetti coherence approach, which does not exclude conditioning on contingent events with zero probability. We show that the ad hoc likelihood function method can be reinterpreted in terms of possibility theory and that it is consistent with most other formal approaches.