The Elephant Principle - Unique Learning in Inductive Logic

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Abstract

The use of probability functions defined on the sentences of a first-order language to model belief, and the use of conditioning to model learning, are important concepts in Inductive Logic. To propose and investigate desirable properties of such functions (which require the modelled belief system to be a 'rational' one) is one area of current research. This presentation introduces the 'Elephant Principle', which requires that a probability function should result in different functions when conditioned on different (up to permutation of constants) pieces of information, thus any learning is uniquely incorporated. More precisely, for state descriptions $\zeta = \bigwedge_{i=1}^{2^q} \alpha_i^{g_i}$ and $\zeta' = \bigwedge_{i=1}^{2^q} \alpha_i^{h_i}$ of a unary language L, a probability function w on the sentences of L satisfies the Elephant Principle if,

$$w(\theta(a_{g+1}, \ldots, a_{g+n}) \mid \zeta(a_1, \ldots, a_g)) = w(\theta(a_{g+1}, \ldots, a_{g+n}) \mid \zeta'(a_1, \ldots, a_g))$$

for every sentence θ of L, just if

$$g_i = h_i, \qquad i = 1, 2, \ldots, 2^q.$$

A classification will be given of functions which have been found, so far, to satisfy or fail to satisfy this principle, following a sketch of the method used to obtain these results.