MAXENT PRINCIPLE FOR HANDLING UNCERTAINTY WITH QUALITATIVE VALUES

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Abstract

A method for handling data in the presence of uncertainty with qualitative values is the theory of Dempster-Shafer. The DS theory is a method for reasoning under uncertainty. The idea of upper and lower theory, include the Bayesian probability as special case, and introduce the *belief function* as lower probabilities and the *plausibility function* as upper probabilities. Here we are interested in applying this theory when the numerical information required by Bayesian methods are not available. The numerical measures in presence of uncertainty may be assigned to a set of propositions as well as to a single proposition. The probabilities are apportioned to subsets and the mass v_i can move over each element.

Let the finite non empty set $=\left\{x_1,..x_n\right\}$ be the *frame of discernment* which is the set of all the hypothesis. The basic probability is assigned in the range $\left[0,1\right]$ to the 2^n subset of consisting of a singleton or conjunction of singleton of *n* elements x_i . The lower probability $P_{¿}(A_j)$ is defined as $P_{¿}(A_j)=\sum_{A_{j\subseteq ¿A_i}} m(A_j)$.

And the upper probability $P^{¿}(A_j)$ is defined as $P^{¿}(A_j)=1-\sum_{A_{j\subseteq ¿A_i}} m(A_j)$ .The $m(A_i)$ values are the independent basic values of probability inferred on each subset A_i . The *evidential interval* that provides a lower and upper bound is $EI=\left[Bl(M), Pl(M)\right]$. If m_1 and m_2 are the independent basic probabilities from the independent evidence, and $\left\{A_{1i}\right\}$ and $\left\{A_{2j}\right\}$ the sets of focal points, then the theorem of Shafer gives the rule of combination. Let m_1 and m_2 two independent basic probabilities from the independent evidence.

If $\sum_{A_{1i} \cap A_{2j} \neq} m_1(A_{1i}) \quad m_2(A_{2j}) > 0$ then $m(A) = (m_1 \oplus m_2)(A),\ A \neq \Phi, (m_1 \oplus m_2) = 2^{\Theta} \rightarrow [0,1]$ give the rule for combining two or more probability are given from independent evidence. The degree of truth, in its conventional meaning of the degree of plausibility and truth (but also of satisfaction) can be evaluated using the DS rules.

The intersection of information sets (assuming that the information is, by definition, true) tends to increase the degree of truth for which a hypothesis is definitely either confirmed or denied. The lack of convergence of the analysis means that has not verified the premise of the process. Familiar examples of aggregation techniques include arithmetic averages, geometric averages, harmonic averages, maximum values, and minimum values .

Combination rules are the special types of aggregation methods for data obtained from *multiple* sources. These multiple sources provide different assessments for the same frame of discernment and Dempster-Shafer theory is based on the assumption that these sources are *independent*. The requirement for establishing the independence of sources is an important philosophical question. *When one source is not independent we can obtain a solution using MaxEnt Principle of E.T. Jaynes.* It is possible, using MaxEnt Principle, to choose the best option handling data in the presence of uncertainty and of qualitative values.

Keywords: MaxEnt, Bayes, Belief, Uncertainty, DS Theory