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In this talk we present a study of a non-classical probability framework that allows us to deal with information with gaps and gluts, while also managing its reliability. It is built upon the logic of evidence and truth LET_K^+ , a six-valued parafinite logic introduced in [1] that extends the Belnap-Dunn logic First-Degree Entailment (FDE). LET_K^+ handles paraconsistent and paracomplete scenarios by introducing a recovery (or reliability) operator $\circ$ to restore classical principles like excluded middle and explosion for certain formulas.

First, we define twist models $M = \langle X, v \rangle$ based on a particular twist structure for LET_K^+ over $\wp(X)$. In these models, a valuation v assigns to each formula φ a triple of sets $(|\varphi|^+, |\varphi|^-, |\varphi|^\circ)$, which is interpreted as three states representing positive, negative, and reliable evidence. This triple partitions the state space of φ in M into six regions, namely, B_φ° (reliable belief), B_φ (unreliable belief), D_φ (unreliable disbelief), D_φ° (reliable disbelief), C_φ (conflict), and U_φ (uncertainty). This generalizes the four-regions partition proposed in [2] using FDE.

Based on this semantical framework, three kinds of probability functions for formulas of LET_K^+ are introduced by means of a measure μ :

- (1) A one-dimensional function $p(\varphi) = \mu(|\varphi|^+)$.
- (2) A three-dimensional “twist” function $\tilde{p}(\varphi) = (\mu(|\varphi|^+), \mu(|\varphi|^-), \mu(|\varphi|^\circ))$.
- (3) A six-dimensional function $\hat{p}(\varphi)$ that assigns probabilities by applying the measure directly to each of the six evidence regions.

We present three main results: the proof of equivalence among these three approaches, the soundness and completeness of their syntactic axiomatizations, and a generalization of classic update rules within the LET_K^+ framework. Regarding the last contribution, we obtain a one-dimensional Jeffrey update over the partition $\{\varphi, \sim\varphi\}$ (where $\sim$ is the classical negation definable in LET_K^+) and a finer-grained six-dimensional Jeffrey update over the six evidence regions.

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Referencias

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