Functional Equations Involving Fuzzy Implications and Their Applications in Approximate Reasoning

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Abstract. Research on fuzzy implications, where the truth values belong to the unit interval $[0, 1]$, are carried out from the beginning of fuzzy set theory and fuzzy logic. In recent years, investigations has been deepened, which resulted in publishing some surveys [6] and two research monographs [1, 3] entirely devoted to this class of fuzzy connectives.

In our talk we concentrate on different functional equations (or inequalities) involving fuzzy implications and their role in approximate reasoning. Firstly, based on [3] and [5], we discuss the role of distributivity equations of fuzzy implications over other fuzzy connectives in equivalent transformation of the compositional rule of inference (CRI) or similarity based reasoning (SBR) to mitigate the computational cost. Secondary, based on [4] and [7], we discuss the role of the law of importation in equivalency of the Hirarchical CRI with the classical CRI proposed by Zadeh. Next, based on [8], we show the importance of T-conditionality inequalities in generalized modus ponens.

For each of the above functional equation with fuzzy implications, we describe the current state of theoretical research and we show what are the open problems. Finally, we also mention other functional equations (or inequalities) involving fuzzy implications and considered in the scientific literature.

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