

# Semantics for the probabilistic fuzzy logic $SFP(\mathbb{L}, \mathbb{L})$ : comparison and complexity

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## Abstract

We discuss on various kinds of semantics for the algebraizable probabilistic logic  $SFP(\mathbb{L}, \mathbb{L})$ , namely, the SMV semantics given by general SMV-algebras, the standard semantics given by the so called  $\sigma$ -simple SMV-algebras, the state semantics, given by the states on the Lindenbaum algebra of Lukasiewicz logic, and the Kripke semantics, given by Kripke models. For each kind of semantics, we investigate the set of 1-tautologies and the set of 1-satisfiable formulas. For the 1-tautology, we prove that the standard semantics, the state semantics and the Kripke semantics are mutually equivalent, and we do not know whether these semantics are equivalent to the SMV semantics or not. For the 1-satisfiability, the situation is more complex: we have two (non-equivalent) kinds of 1-satisfiability, a global one and a local one. The local one is called local 1-satisfiability, and the global one is called just 1-satisfiability. For 1-satisfiability, we prove that both the Kripke semantics and the standard semantics are equivalent to the SMV semantics, but not to the state semantics; for the local 1-satisfiability, we prove that the state semantics, the Kripke semantics and the standard semantics are mutually equivalent, and we do not know whether they are also equivalent to the SMV-semantics or not.

Using this comparison, we establish some complexity results. In particular, we prove that the set of standard 1-tautologies with respect to either Kripke semantics or the standard semantics or the state semantics, as well as the set of 1-satisfiable, and locally 1-satisfiable formulas with respect to any of the above semantics, are in PSPACE.