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Comparing Alternative Definitions of Boolean-valued Fuzzy Sets

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Abstract: Two definitions of fuzzy sets with Boolean-valued membership functions, introduced by Drossos and Markakis and called by them external and internal Boolean fuzzy sets, are compared with a third, classical definition descending more directly from the original Zadeh's and Goguen's ideas. Under some rather general conditions, internal and classical Boolean fuzzy sets are proved to be equivalent in the sense that there exists a one-to-one mapping to each other conserving the set theoretic operations. On the other side, the space of external Boolean fuzzy sets is richer, so that such a mapping exists only in some rather special cases.

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