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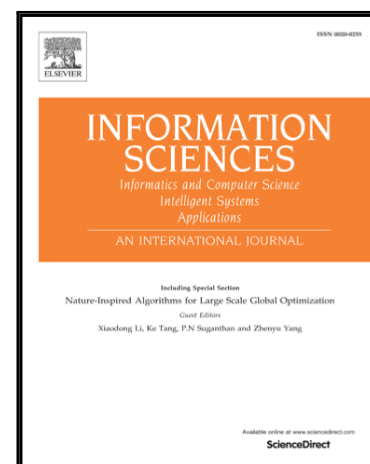
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# A new look at the distributivity for uninorms over nullnorms

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## Abstract

This paper revisits the distributivity for uninorms over nullnorms from a new perspective, transforming it into the distributivity equation involving uninorms over t-norms/t-conorms. In this paper, we show that this new perspective leads to not only all current solutions, but also many new solutions that do not appear in previous studies.

*Keywords:* Fuzzy connectives and aggregation functions, Functional equations, Distributivity equations, Uninorms, Nullnorms

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## 1. Introduction

With uncertainty modeling, distributivity naturally appears in several types of integral constructions and related functionals. For example, in the construction of pan-integrals, the pan-multiplication is distributive over the pan-addition (see Definition 8.2 in [17]). In the construction of Bencenuti integrals, the distributivity of the pseudo-multiplication over the pseudo-addition is also demanded (see pp. 230 in [5]). In the construction of  $(S, U)$  integrals, the pseudo-multiplication is restrictedly distributive over the pseudo-addition (see pp. 228 in [5]). The new area of research is directed towards distributivity equations involving uninorms and nullnorms [9, 14, 15]. In all previous works, the distributivity for uninorms over nullnorms has focused only on cases in which the

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