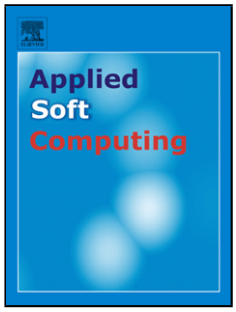

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Commentary on "A new generalized improved score function of interval-valued intuitionistic fuzzy sets and applications in expert systems" [Appl. Soft Comput., 2016(38) 988-999]

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Abstract

This commentary points out the major mistakes in "a new generalized improved score function of interval-valued intuitionistic fuzzy sets and applications in expert systems", which were initially proposed by Garg [Appl. Soft Comput., 2016(38) 988-999]. Firstly, some related basic mathematical symbols are introduced. Secondly, Garg's research results are reviewed. Subsequently, the errors of the generalized weighted averaging operators and the restrictiveness of the generalized score function proposed by Garg are discussed by using four counter-cases. Thereafter, the sources that lead to the errors of the operators and the restrictiveness of the score function are revealed. Finally, this commentary also points out some typo-grammatical errors in the commented paper.

Keywords: interval-valued intuitionistic fuzzy set, score function, multiple criteria decision making, hesitancy degree, aggregation operator

To compare and rank IVIFSs (see, K. Atanassov [1]), Garg [2] proposed a generalized weighted averaged operator and a generalized improved score function, where the operator is used for aggregating the information of the IVIFSs, and the score function is used to compare the IVIFSs. However, our work shows that the weighted averaged operator proposed by Garg [2] is invalid, and the score function should be restricted in its application environment to rank IVIFNs. For the sake of convenience, some related mathematical symbols which are used throughout this paper are introduced in the following.

1. Basic mathematical symbols

Let X be a non-empty reference set, an IVIFS $\widetilde{A}$ in X is defined as $\widetilde{A} = \{\langle x, \widetilde{\mu}_{\widetilde{A}}(x), \widetilde{\nu}_{\widetilde{A}}(x)\rangle \mid x \in X\}$, where $\widetilde{\mu}_{\widetilde{A}}(x)$ and $\widetilde{\nu}_{\widetilde{A}}(x)$ are all closed intervals in $[0,1]$, and they represents the membership degree and the non-membership degree of x to $\widetilde{A}$. For any $x \in X$, $\sup \widetilde{\mu}_{\widetilde{A}}(x) + \sup \widetilde{\nu}_{\widetilde{A}}(x) \leq 1$, and in turn, the interval intuitionistic index of x to $\widetilde{A}$ is defined as $\pi_{\widetilde{A}}(x) = [1 - \sup \widetilde{\mu}_{\widetilde{A}}(x) - \sup \widetilde{\nu}_{\widetilde{A}}(x), 1 - \inf \widetilde{\mu}_{\widetilde{A}}(x) - \inf \widetilde{\nu}_{\widetilde{A}}(x)]$, the complementary set $\widetilde{A}^c$ of $\widetilde{A}$ is defined as $\widetilde{A}^c = \{\langle x, \widetilde{\nu}_{\widetilde{A}}(x), \widetilde{\mu}_{\widetilde{A}}(x)\rangle \mid x \in X\}$. Usually, the pair $(\widetilde{\mu}_{\widetilde{A}}(x), \widetilde{\nu}_{\widetilde{A}}(x))$ is called an interval-valued intuitionistic fuzzy number (shorted by IVIFN), and it is often simplified as $([a,b],[c,d])$, where $[a,b] \subset [0,1], [c,d] \subset [0,1], b+d \leq 1$. Besides, for an IVIFN $\widetilde{A} = ([a,b],[c,d])$, Xu and Yager [4] defined a classical score function and a classical accuracy function as $S_{xu}(\widetilde{A}) = \frac{1}{2}(a+b-c-d)$, and $H_{xu}(\widetilde{A}) = \frac{1}{2}(a+b+c+d)$, respectively.

The following is a brief introduction about the generalized weighted averaging operator and the generalized improved score function proposed by Garg [2].

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