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Correlation Score Value of an Interval Valued Fuzzy Structures

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Abstract: In this paper, certain concept and derivations in which a new kind of interval-valued fuzzy correlation method has been discussed. Also we compare the actual preparation value with calculation value in a simple manner.
Keywords: Fuzzy set, interval value fuzzy set, correlation, score value, min max, union, intersection, actual correlation, algorithm.

I. INTRODUCTION

Atanassov [1, 2] analysed excellent type of fuzzy sets that is called bi fuzzy set (BFS) which is more practical in real life situations. Intuitionistic fuzzy sets handle incomplete information but not the indeterminate information and inconsistent information which exists obviously in belief system. Several authors have discussed the concept of correlation in intuitionistic fuzzy set. Smarandache and Salama [3, 4] introduced another concept of imprecise data called tripolar sets. tripolar set is a part of neutrosophy which studied the origin, nature and scope of neutralities, as well as their interactions with ideational spectra. The tripolar set generalized the concept of classical fuzzy set [5, 6,], interval-valued fuzzy set, etc. In this paper, we discuss certain concept and derivations in which a new kind of interval-valued fuzzy correlation method and compare the actual preparation .

II. PRELIMINARIES

1) *Definition 2.1[Fuzzy set]:* Let X is a set (space). A map A: X → [0,1] is called fuzzy set in X and it is defined as A = { (x , δ_A(x) / x ε X } where δ_A(x) ε [0,1].
2) *Definition 2.2 [Interval valued fuzzy set]:* Let [J] ε [0,1] and M = [M_L, M_U] ε [J], where M_L and M_U are the lower extreme and the upper extreme, respectively. For a set X, an interval valued fuzzy set [IVFS] A = { (x M_A(x)) / x ε X } where the function M_A : X → [J] defines the grade of membership of an element x to A, and M_A(x) = [M_{AL}(x), M_{AU}(x)] is called an interval-valued fuzzy number.
3) *Definition 2.3:* Let A and B are two IVFS . The correlation between A and B is defined as CORR (A,B) = ∑AB divides ∑A and ∑B.
4) *Example 2.4:* Let A = [0.2 , 0.3] and B = [0.4 , 0.5] be two IVFS. Then ∑AB = 0.23, ∑A = 0.6 and ∑B = 0.8. Hence CORR (A,B) = 0.31. In general, when i = 1,2,……..n , correlation coefficient occurs whose value in [0 , 1] .
5) *Definition 2.5:* Let A = [0.2 , 0.5] and B = [0.5 , 0.8] be two IVFS.
6) *Union:* A U B = max {A, B } = 0.8
7) *Intersection:* A ∩ B = min {A , B } = 0.2.
8) *Note 2.6:* The actual correlation score value between two IVFS's A and B is given by

Score value υ= min max{ A U B, A∩B}.

From the definition 2.5, score value is obtained by υ = 0.2.

9) *Remark 2.7:* CORR (A) ≤ CORR(B)

CORR(AB) ≤ CORR (A)

Score CORR(A) ≤ Score CORR(AB).

In nth occurrence of correlation is ρ = $\sum_{i=1}^{n}\sum_{i=1}^{n} AiBi$ divides $\sum_{i=n}^{n} Ai2 \sum_{i=1}^{n} Bi2$

Now if x ε CORR(A_n) and y ε CORR(A_n) such that x ∧ y ε CORR(A_n).

If x ∉ CORR(A_n) and y ∉ CORR(A_n) , then the following four cases arise.

Case-1: x ε X / A_n and y ε X /A_n

Case-2: x ε X / A_{n-1} and y ε X /A_{n-1}

Case-3- x ε X / A_n and y ε X /A_{n-1}

Case-4: x ε A_{n-1} and y ε R /A_n.

The correlation measure is obtained for K and L

$\rho = C(K, L) / \sqrt{C(K,K)\,C(L,L)}$

Let {Ai / i = 0,1,2,......... k } be a family of IVFS such that

a) $CORR(A_n) \subseteq CORR(A_1) \subseteq CORR(A_2) \ldots\ldots\ldots\ldots \subseteq CORR(A_k) = X$.

b) $A_n^* = A_n / A_{n-1} \ldots\ldots\ldots A_{-1}$.

III. GENERATING ALGORITHMS FOR CORRELATION COEFFICIENT'S BETWEEN IVFS'S

In this section, we form a new algorithm to find out suitable correlations between two interval-valued fuzzy sets.

A. Algorithm

1) Step-1: Set an IVFS according the problem
2) Step-2: Preparation of table for calculations.
3) Step-3: find out AUB and A∩B.
4) Step-4: Correlation coefficient CORR (A,B) = ∑AB divides ∑A and ∑B.
5) Step-5: Actual score value using min max {AUB, A∩B}.
6) Step-6: Compare the result.

B. Problem

For an interval valued fuzzy sets A and B supposed to be 10 observations ,the correlation coefficient has been formulated according to the following IVFS sets A and B as

X = { A / [0.2, 0.4], [0.3, 0.9], [0.1, 0.4], [0.2, 0.7], [0.8, 0.9], [0.1, 0.8], [0.6, 0.7], [0.4, 0.2], [0.9, 0.3] and B / [0.3, 0.6], [0.8, 0.4], [0.2, 0.7] , [0.4, 0.8], [0.7, 0.4], [0.2, 0.8], [0.6, 0.4], [0.5, 0.2] }.

1) *Step-2:* Preparation of table for calculations

N	A	B
1	[0.2, 0.4]	[0.3, 0.6]
2	[0.3, 0.9]	[0.8, 0.4]
3	[0.1, 0.4]	[0.2, 0.7]
4	[0.2, 0.7]	[0.4, 0.8]
5	[0.8, 0.9]	[0.7, 0.4]
6	[0.1, 0.8]	[0.2, 0.8]
7	[0.6, 0.7]	[0.6, 0.4]
8	[0.4, 0.2]	[0.5, 0.2]
9	[0.9, 0.3]	[0.6, 0.5]
10	[0.5, 0.9]	[0.9, 0.1]

2) *Step-3:* find out AUB and A∩B.

In this problem, we have to find union and intersection can be calculated for 10 observations as

AUB = { [0.3, 0.6], [0.8. 0.9], [0.2, 0.7], [0.4, 0.8], [0.8, 0.9], [0.2, 0.8], [0.6, 0.7], [0.5, 0.2], [0.9, 0.5], [0.9, 0.9]}

A∩B = {[0.2, 0.4], [0.3, 0.4], [0.1, 0.4], [0.2, 0.7], [0.7, 0.4], [0.1, 0.8], [0.6, 0.4], [0.4, 0.2], [0.6, 0.3], [0.5, 0.1]}.

3) *Step-4:* Correlation coefficient CORR (A,B)

Using step-3, by routine calculations, we can calculate $\rho = 0.032$.

4) *Step-5:* by using Note -2.6 ,the Actual score value is calculated as $\upsilon = [0.1, 0.1] = 0.1$.

5) *Step-6:* Comparing step-4 and step-5, all values lies in the interval [0, 1].

IV. CONCLUSION

In this work, we studied certain concept and derivations in which a new kind of interval-valued fuzzy correlation method . Also we compare the actual preparation value with calculation value in a simple manner. One can obtain squared value of IVFS by using the above algorithm.

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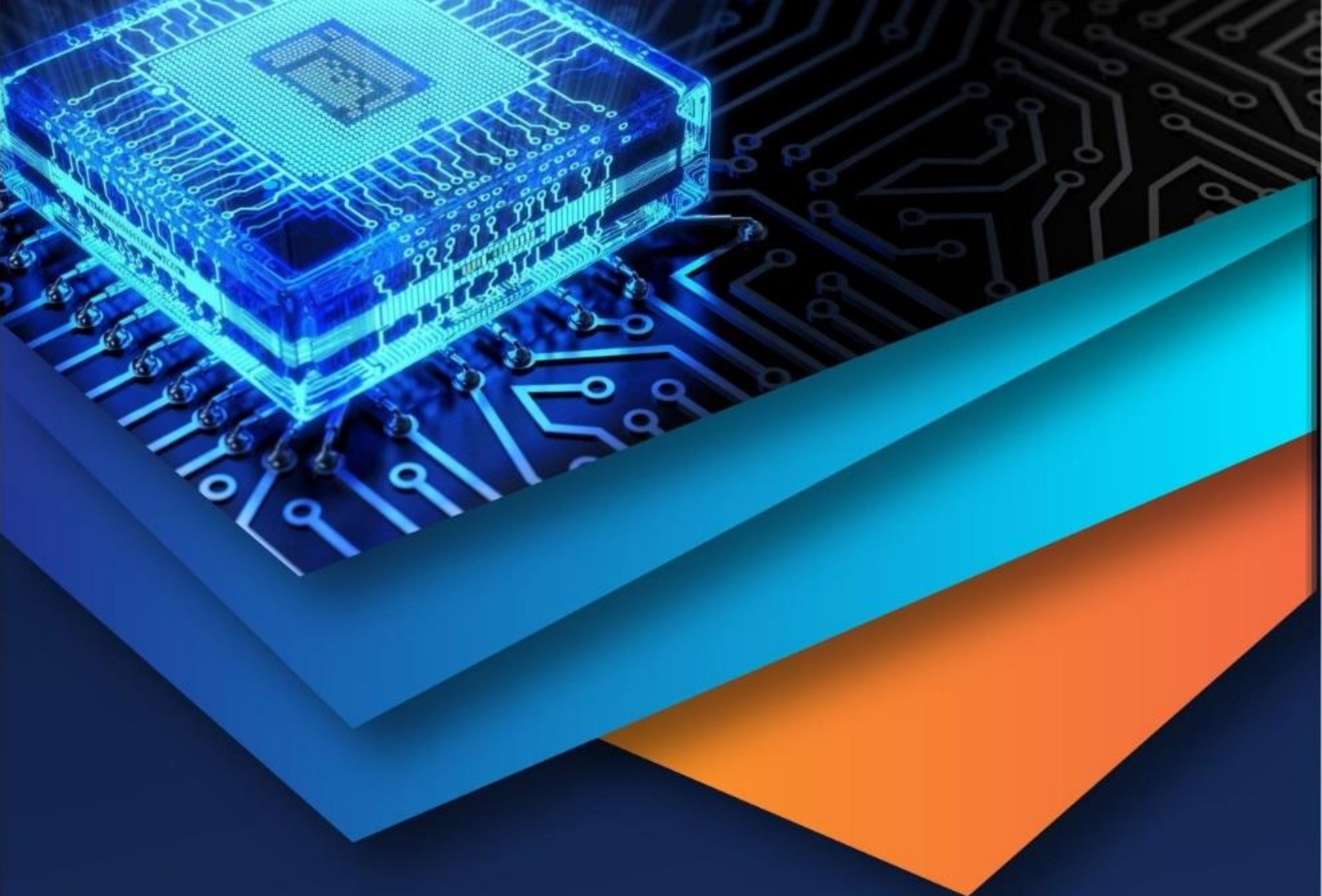

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