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Group Decision Making using Interval-Valued Intuitionistic Fuzzy Soft Matrix in Medical Diagnosis

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Abstract
Using interval-valued intuitionistic fuzzy soft matrices, we devised a new technique for solving group decision-making issues. An intuitionistic fuzzy soft matrix may be reduced by utilising the maximum and lowest values of both membership and non-membership as well as applying weight to them. The answer is found using IVIFSM's complement and value matrix. Finally, a real-world case study is used to verify the proposed approach.
Keywords: There are many different types of fuzzy sets and matrices that may be described as fuzzy. Value matrix, Complement and IFSM reduced

1.**Introduction:**

Because of their fuzziness, the foundational principles of fuzzy logic might give rise to doubt. However, in this instance, there is no obvious direction for the decision-making process to follow. More confidence might be generated by reducing fuzziness, possibly by using fuzzy logic or fuzzy sets. This sort of issue is well-suited to Zadeh's[7] traditional idea of fuzzy set. A generalisation of fuzzy set, intuitionistic fuzzy set, was developed by Atanassov[5,6]. Since Molodtsov[2] introduced soft set theory, it has gotten a lot of attention. As time went on, Maji et al.[10,11] developed an extension of fuzzy soft sets known as intuitionistic fuzzy soft sets, which is a hybrid of the fuzzy and soft sets based on intuition. It has been suggested that the use of intuitionistic fuzzy soft sets in medical diagnostics by researchers such as B.K. Saikia[1] and others Interval valued fuzzy soft sets were introduced by Yang et al[16].
When it comes to coping with uncertainty, Borah and colleagues[8] came up with the notion of a fuzzy matrix. Rows and columns of values make it possible for an analyst to methodically identify, examine, and decide between the set of values and information. It is this list that is used. With the help of this
The consistency of Interval valued fuzzy relational equations has been discussed in this paper. Interval valued fuzzy soft matrices have been introduced by P. Rajarajeswari and P. Dhanalakshmi[12,13], as have a reduced IFSM, its types, and some new operations based on weights.
It is an extension of the intuitionistic fuzzy soft matrix, which is interval-valued. Group decision approaches based on intuitionistic fuzzy soft matrices have been suggested by J. Mao et al[3]. Multiple attribute group decision making using interval-valued intuitionistic fuzzy soft

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matrices was also presented by S.Das and others[14]. In a study by Sujit Das et al[15], specialists were given more weight in group decision making.

Group decision making in medical diagnostics may be improved by allocating weight to the interval-valued intuitionistic fuzzy soft matrix. Using the weighted vector, we define the concept of reduced intuitionistic fuzzy soft matrix, and we convert interval-valued intuitionistic fuzzy membership and non-membership values into one intuitionistic fuzzy value.

2. Preliminaries:

"Fuzzy" set of rules:

What's more, it's possible to write down fuzzy sets on universal sets in the form of an ordered pair collection, such as A=(x, A(X))

A function that returns 0 or 1 is called A(x) in this example.

Set of Fuzzy Soft:

X and a set of parameters are referred to be a soft set of universal set. To put it simply, E is a two-part structure (F,A) where A is a subset of E and F is a function from A to the set of all fuzzy subsets of the set X (i.e., F: AIX). Soft fuzzy set based on intuition:

Let X be the universal set and E be the set of parameters, and let A E be the condition. Fuzzy soft sets over X are termed "intuitionistic" when one of the members of the pair (F,A) is a mapping provided by the formula F: AIX, where IX is a collection of all "fuzzy" parts of X. A fuzzy soft set with interval-valued fuzzy values:

Suppose that X is the starting universe set and that E is the set of parameters; then, A E is the condition to be satisfied. Interval valued fuzzy soft set over X is a pair (F,A) where F is a mapping provided by F: AIX where IX is the collection of all Interval valued fuzzy subsets of X. F and A are termed this. Soft set of interval-valued intuitionism:

Let X be the universal set and E be the set of parameters, and let A E be the condition. F: AIX, where IX indicates the collection of all interval-valued intuitionistic fuzzy subsets of X, is a pair (F,A) termed interval valued intuitionistic fuzzy soft set over X. Matrix of the Fuzzy

A=[aij, aij]mxn, where aij is the membership value and aij [0, 1] defines a fuzzy matrix A of rank m x n. A= [aij]mxn is the formula for this matrix. Soft Matrixes: Fuzzy Soft

Let X = a1, a2, a3...am be the universal set and E = e1, e2, e3...en be the set of parameters. Set (A,E,F,A) to a fuzzier, softer value (X,E). Assuming j=1,2,...m and i=1,2,...m, we may write Amxn = [aij]mxn as the fuzzy soft matrix form of (F,A).

In this case, aij =
Ej = Ai, and so forth.

otherwise, and the fuzzy set membership of ai is denoted by j(ai).
F(ej).

Soft matrix with interval-valued intervals:

It's worth noting that E=E1-E3-E4-E5 is the collection of parameters for X.

IX is the collection of all the interval valued fuzzy subsets of X, and A is a soft interval valued fuzzy set over U, where F is a mapping provided by F: AIX. Amxn = [aij] mxn, i=1,2,...m,

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j=1,2,3,...n, is the matrix representation of the interval-valued fuzzy soft set.
If ej A, then [L(ai), U(ai)]
Aij Equals J j in this case.
The membership value is [L(ai), U(ai)].
[0,0], otherwise j j
Soft fuzzily intuitive matrices:
E is the set of parameters defined by E=e1,e2,e3...en, and let's say that X is a universal set of a1, a2, a3, and so on.
An intuitionistic fuzzy soft set over U is defined as A = E, where F is a mapping provided by F: AIU. This may be represented in matrix form as Amxn = [aij] MXN, where A is an array of integers 1, 2, 3, etc.
In this case, [ai vj ai]
In the case when aij= [0,1], otherwise and j(ai) is the membership value and j(ai) is the membership value,
the benefit of not being a member
Interval valued fuzzy soft matrix with intuitionistic values:
It's worth noting that E=E1-E3-E4-E5 is the collection of parameters for X.
The interval valued intuitionistic fuzzy soft set (F,A) over U has the following value: AIX. Let A be greater than or equal to E. Amxn = [aij] mxn, where I is 1,2,...m, and j is 1,2,3,...n.

There are [[L(ai), U(ai)]] L(ai), U(ai)], in the event that EJ > A
Aij is defined as the following:
in addition to the fact that
The alternative is j j if [0,0]

to represent the value of membership, and [L(a), U(a)] to represent the value of not belonging to membership.

An intuitive fuzzy soft set with a reduced intuitionistic fuzzy set:

In [0,1], the weighted vector w1 + w2 = 1, and the weighted vector w4 = 1 is termed W. Is a fuzzy soft set (FW,A) over X that is intuitively fuzzy

The reduced intuitionistic fuzzy soft set of the interval valued intuitionistic fuzzy soft set with regard to the weighted vector is defined as Fw(ej) = ai,w L(ai) + w U(ai), w L(ai) + w4 U(ai) for every ej A and ai X. An interval-valued intuitionistic fuzzy soft matrix may be transformed into a reduced intuitionistic fuzzy soft set by altering the values of w1, w2, w3, and w4. Fuzzy soft intuitionistic reduced matrix.

W1 + W2 = 1, W3 + W4 = 1, and so on. An intuitive fuzzy soft set (FW,A) may thus be reduced in matrix form as Amn = [aij]mn, where aij is equal to the reduced intuitionistic fuzzy soft set (FW,A).

in which [w1] = L(ai) + w2] = U(ai)
{ j j
j j
[0,1], otherwise
The IVIFSM has been added.
Since Bmxn = [bij] mxn, then I = 1, 2,...m, and j = 1, 2, 3...n, so Amxn must be equal to [aij]. As a result, A+B = [cij] represents the product of A and B. Mathematical expression: [max (ai), max (ai)), [min (v L[a]), v L[a]]], [min (a), min (a)]
Subtraction of IVIFSM:
Assuming that Amxn=[aij] mxn is IVIFSM, Bmxn=[bij] mxn has I = 1, 2,...,m,j = 1, 2,3,...,n as input, then Then A-B = [cij] is used to express the subtraction of A and B. For mxn, it is equal

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to a combination of [min(ai), ai] and [max (v L, max (u), ui)] plus mxn, which is equal to the sum of [min L, max U].
If Amxn= [aij] mxn is IVIFSM, then Bmxn= [bij] mxn, where I = 1, 2,..., m, and j = 1, 2, 3,..., n, is the product of IVIFSM. Then A*B = [cij] is the product of A and B. In other words, mxn = [maxmin L(ai), L(ai)], [minmax L(ai), L(a)], [minmax L(a), L(a)], [minmax U(a), U(a)] IVIFSM's companion:
There is an IVIFSM if Amxn= [aij].... mxn and Bmxn= [bij] [mxn].
Then there's [c], which stands for the antithesis of A and B.
If c is equal to ([1 - U(a), [1 - L(a)]), then
Value Matrix:
2. Assuming Amxn=[aij] mxn is IVIFSM, then I = 1, 2,...,m, and j = 1, 2,...,m, and so on till n = m. As a result, the reduced IFSM value matrix is specified as V[cij] = ([ai] - vj])
3. **Interval-valued intuitionistic fuzzy soft matrix for decision making:**

Give three experts' views in the first step of this algorithm. For a certain sequence of steps, P is equal to There are five digits in the D model: 1, 2, 3, 4, and 5. Using Interval-Valued Intuitionistic Fuzzy Soft Matrices, S = s1–s5 is represented (IVIFSM).
It's easy to see how [aij] might be interpreted as the following:
Step 2: The reduced intuitionistic fuzzy soft matrix is obtained by taking the maximum and lowest values of membership and non-membership values.
Aij's [aij] is the sum of (max [aijL(ai)], aijU(ai)] and (min [aijL(ai)].
Compute the inverse of IVIFSM for the set of values P = (P1, P2, P3) [bij] the product of these two terms is equal to the product of these two terms, and the product of these two terms is equal to the product of these two terms, and the product of these two terms is equal to the product of these two terms.

Step 4: Reduce the IFSM by taking the values from Step 2 and finding the reduced IFSM

To put it another way, [bij]c = (max [1 - jU(ai), 1 - jL(ai)], and (min [1-jU(ai)])
Step 5: Once these matrices have been constructed, we may begin the process of adding them to the original intuitionistic fuzzy soft matrix and its counterpart. [cij]c = (max [(No matter how many times you've tried, you can't get it to work. You have to keep trying until you get it to work.
For the previous step, locate the value matrix.,
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Using the formula S = V[cij] - V[cij]c ==> A – B, calculate the score matrix.
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j j

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Using the formula S = V[cij] - V[cij]c ==> A – B, calculate the score matrix.

When comparing the results, add weights W = [w1, [w2, [w3,] and so forth] for interval-valued intuitionistic fuzzy soft matrix to construct reduced IFSM, [wij] = ([wv L(ai) + W [ui] + w [ui])]Step 10: Assign a weight to IVIFSM to get the set's complement.

When calculating [wij]c, you must use the formula ([w1(1 - U(ai)) + ([w2(1 - L(ai))))

W3(ai) = (Uai+1) W4(ai+1))

Step 11: It is the same from step 5 to step 8 when determining the IVIFSM weight calculation solution. Example:

Consider [15] as an example.

Intuitionistic Fuzzy Soft Matrices for the sets P = p1, p2, and P3 are shown in the following manner.

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((0.3,0.7),) ((0.3,0.4),) ((0.5,0.6),) ((0.5,0.6),) ((0.0,0.0),)

(0.1,0.2) (0.4,0.5) (0.2,0.4)

(0.2,0.4) (0.0,0.0)

((0.4,0.5),) ((0.3,0.7),) ((0.3,0.6),) ((0.3,0.7),) ((0.0,0.0),

(0.3,0.5) (0.2,0.3) (0.1,0.3)

(0.1,0.2) (0.0,0.0))

(0.3,0.6), (0.4,0.6), (0.4,0.6),

(0.4,0.6), (0.0,0.0),

P1 = ((0.3,0.4)) ((0.2,0.3)) ((0.2,0.4)) ((0.2,0.4)) ((0.0,0.0))

(0.4,0.8), (0.2,0.5), (0.2,0.5),

(0.2,0.5), (0.0,0.0),

((0.1,0.2)) ((0.3,0.4)) ((0.3,0.4)) ((0.3,0.4)) ((0.0,0.0))

((0.3,0.5),) ((0.2,0.3),) ((0.2,0.3),) ((0.3,0.4),) ((0.0,0.0),)

(0.2,0.4) (0.4,0.7) (0.5,0.6)

(0.4,0.5) (0.0,0.0)

((0.3,0.5),) ((0.5,0.6),) ((0.2,0.5),) ((0.0,0.0),

(0.7,0.1) (0.4,0.4) (0.6,0.2) (0.6,0.2) (0.0,0.0)

(0.5,0.3) (0.7,0.2) (0.6,0.1) (0.7,0.1) (0.0,0.0)

(0.6,0.3) (0.6,0.2) (0.6,0.2) (0.6,0.2) (0.0,0.0)

(0.5,0.3) (0.5,0.3) (0.5,0.3)

(0.8,0.1) (0.0,0.0)

h(0.5,0.2) (0.3,0.4) (0.3,0.5) (0.4,0.4) (0.0,0.0)

(0.5,0.3) (0.6,0.3) (0.5,0.3) (0.0,0.0) (0.7,0.2)

(0.5,0.3) (0.7,0.2) (0.5,0.2) (0.0,0.0) (0.5,0.3)

(0.6,0.3) (0.8,0.1) (0.4,0.3) (0.0,0.0) (0.6,0.2)

(0.7,0.1) (0.6,0.2) (0.0,0.0)

(0.6,0.1) (0.6,0.3)

h(0.5,0.2) (0.3,0.4) (0.7,0.1) (0.0,0.0) (0.5,0.3)

(0.5,0.3) (0.7,0.1) (0.0,0.0) (0.6,0.3) (0.4,0.5)

(0.7,0.2) (0.5,0.3) (0.0,0.0) (0.8,0.1) (0.8,0.1)

) ((0.5,0.7),)

(0.3,0.4) (0.3,0.4) (0.3,0.4)

(0.0,0.0) (0.2,0.3)

((0.4,0.5),) ((0.4,0.7),) ((0.3,0.5),) ((0.0,0.0),) ((0.4,0.5),

(0.3,0.5) (0.2,0.3) (0.2,0.3)

(0.0,0.0) (0.3,0.4))

(0.3,0.6), (0.7,0.8), (0.2,0.4),

(0.0,0.0), (0.4,0.6),

P2 = ((0.3,0.4)) ((0.1,0.2)) ((0.3,0.5)) ((0.0,0.0)) ((0.2,0.4))

(0.2,0.6), (0.5,0.7), (0.3,0.6),

(0.0,0.0), (0.5,0.6),

((0.1,0.2)) ((0.1,0.2)) ((0.2,0.3)) ((0.0,0.0)) ((0.3,0.4))

((0.4,0.5),) ((0.2,0.3),) ((0.4,0.7),) ((0.0,0.0),) ((0.4,0.5),)

(0.2,0.4) (0.4,0.5) (0.1,0.3)

(0.0,0.0) (0.3,0.4)

((0.3,0.5),) ((0.2,0.7),) ((0.0,0.0),) ((0.3,0.6),) ((0.2,0.4),)

(0.3,0.4) (0.1,0.3) (0.0,0.0)

(0.3,0.4) (0.5,0.6)

((0.3,0.7),) ((0.3,0.5),) ((0.0,0.0),) ((0.4,0.8),) ((0.7,0.8),

(0.2,0.3) (0.3,0.5) (0.0,0.0)

(0.1,0.2) (0.1,0.2))

(0.5,0.7), (0.5,0.6), (0.0,0.0),

(0.5,0.6), (0.4,0.6),

P3 = ((0.1,0.3)) ((0.3,0.4)) ((0.0,0.0)) ((0.3,0.4)) ((0.3,0.4))

(0.4,0.6), (0.4,0.5), (0.0,0.0),

(0.3,0.7), (0.3,0.4),

((0.2,0.3)) ((0.3,0.4)) ((0.0,0.0)) ((0.2,0.3)) ((0.4,0.5))

((0.1,0.2),) ((0.4,0.6),) ((0.0,0.0),) ((0.2,0.3),) ((0.1,0.4),)

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(0.5,0.7) (0.3,0.4) (0.0,0.0)
(0.5,0.6) (0.4,0.5)

Next by taking the maximum and minimum of membership and non-membership values from the above matrices,

P1 =

P2 =

P_3 = (0.7,0.1) (0.6,0.3) (0.0,0.0)
(0.6,0.3) (0.6,0.3)

(0.6,0.2) (0.5,0.3)
(0.0,0.0) (0.7,0.2)
(0.4,0.4)
(0.2,0.5) (0.6,0.3)
(0.0,0.0) (0.3,0.5)
(0.4,0.4)

P3 = (0.7,0.1) (0.6,0.3) (0.0,0.0) (0.6,0.3) (0.6,0.3)
(0.6,0.2) (0.5,0.3) (0.0,0.0) (0.7,0.2) (0.4,0.4)
(0.2,0.5) (0.6,0.3) (0.0,0.0) (0.3,0.5) (0.4,0.4)

Now, taking the complement of IVIFSM

((0.3,0.7),) ((0.6,0.7),) ((0.4,0.5),) ((0.4,0.5),) ((1.0,1.0),)
(0.8,0.9) (0.5,0.6) (0.6,0.8)
(0.6,0.8) (1.0,1.0)
((0.5,0.6),) ((0.3,0.7),) ((0.4,0.7),) ((0.3,0.7),) ((1.0,1.0),
(0.5,0.7) (0.7,0.8) (0.7,0.9)
(0.8,0.9) (1.0,1.0))

P C =
(0.4,0.7),(0.4,0.6),(0.4,0.6),(0.4,0.6),(1.0,1.0),

1 ((0.6,0.7)) ((0.7,0.8)) ((0.6,0.8)) ((0.6,0.8)) ((1.0,1.0))
(0.2,0.6), (0.5,0.8), (0.5,0.8),
(0.5,0.8), (1.0,1.0),
((0.8,0.9)) ((0.6,0.7)) ((0.6,0.7)) ((0.6,0.7)) ((1.0,1.0))

((0.5,0.7),) ((0.7,0.8),) ((0.7,0.8),) ((0.6,0.7),) ((1.0,1.0),)
(0.6,0.8) (0.3,0.6) (0.4,0.5)
(0.5,0.6) (1.0,1.0)

((0.5,0.7),) ((0.4,0.5),) ((0.5,0.8),) ((1.0,1.0),) ((0.3,0.5),)
(0.6,0.7) (0.6,0.7) (0.6,0.7)
(1.0,1.0) (0.7,0.8)
((0.5,0.6),) ((0.3,0.6),) ((0.5,0.7),) ((1.0,1.0),) ((0.5,0.6),
(0.5,0.7) (0.7,0.8) (0.7,0.8)
(1.0,1.0) (0.6,0.7))

P C =
(0.4,0.7),(0.2,0.3),(0.6,0.8),(1.0,1.0),(0.4,0.6),

2 ((0.6,0.7)) ((0.8,0.9)) ((0.5,0.7)) ((1.0,1.0)) ((0.6,0.8))
(0.4,0.8), (0.3,0.5), (0.4,0.7),
(1.0,1.0), (0.4,0.5),
((0.8,0.9)) ((0.8,0.9)) ((0.7,0.8)) ((1.0,1.0)) ((0.6,0.7))

((0.5,0.6),) ((0.7,0.8),) ((0.3,0.6),) ((1.0,1.0),) ((0.5,0.6),)
(0.6,0.8) (0.5,0.6) (0.7,0.9)
(1.0,1.0) (0.6,0.7)

((0.5,0.7),) ((0.3,0.8),) ((1.0,1.0),) ((0.4,0.7),) ((0.6,0.8),)
(0.6,0.7) (0.7,0.9) (1.0,1.0)
(0.6,0.7) (0.4,0.5)

((0.3,0.7),) ((0.5,0.7),) ((1.0,1.0),) (
(0.2,0.6),) ((0.2,0.3),
(0.7,0.8) (0.5,0.7) (1.0,1.0)
(0.8,0.9) (0.8,0.9))
P C =
(0.3,0.5),(0.4,0.5),(1.0,1.0),(0.4,0.5),(0.4,0.6),

3 ((0.7,0.9)) ((0.6,0.7)) ((1.0,1.0)) (
(0.6,0.7)) ((0.6,0.7))
(0.4,0.6), (0.5,0.6), (1.0,1.0),
(0.3,0.7), (0.6,0.7),
((0.7,0.8)) ((0.6,0.7)) ((1.0,1.0)) ((0.7,0.8)
) ((0.5,0.6))

((0.8,0.9),) ((0.4,0.6),) ((1.0,1.0),) ((0.7,0.8),
) ((0.6,0.9),)
(0.3,0.5) (0.6,0.7) (1.0,1.0)
(0.4,0.5) (0.5,0.6)

Take the maximum and minimum values,

(0.7,0.8) (0.7,0.5) (0.5,0.6) (0.5,0.6) (1.0,1.0)
(0.6,0.5) (0.7,0.7) (0.7,0.7) (0.7,0.8) (1.0,1.0)
(0.7,0.6) (0.6,0.7) (0.6,0.6) (0.6,0.6) (1.0,1.0)
(0.8,0.6) (0.8,0.6) (0.8,0.6)
(0.6,0.8) (1.0,1.0)
h(0.7,0.6) (0.8,0.3) (0.8,0.4) (0.7,0.5) (1.0,1.0)

(0.7,0.6) (0.5,0.6) (0.8,0.6) (1.0,1.0) (0.5,0.7)
(0.6,0.5) (0.6,0.7) (0.7,0.7) (1.0,1.0) (0.6,0.6)
(0.7,0.6) (0.3,0.8) (0.8,0.5) (1.0,1.0) (0.6,0.6)
(0.5,0.8) (0.7,0.7) (1.0,1.0)
(0.8,0.8) (0.5,0.6)
h(0.6,0.6) (0.8,0.5) (0.6,0.7) (1.0,1.0) (0.6,0.6)

(0.7,0.6) (0.8,0.7) (1.0,1.0) (0.7,0.6) (0.8,0.4)
(0.7,0.7) (0.7,0.5) (1.0,1.0) (0.6,0.8) (0.3,0.8)

P1C =

(0.5,0.7) (0.5,0.6) (1.0,1.0) (0.5,0.6)
(0.6,0.6)
(0.6,0.7) (0.6,0.6) (1.0,1.0) (0.7,0.7)
(0.7,0.5)
(0.9,0.3) (0.6,0.6) (1.0,1.0) (0.8,0.4)
(0.9,0.5)P2C =
P3C = (0.5,0.7) (0.5,0.6) (1.0,1.0) (0.5,0.6)
(0.6,0.6)
(0.6,0.7) (0.6,0.6) (1.0,1.0) (0.7,0.7) (0.7,0.5)
(0.9,0.3) (0.6,0.6) (1.0,1.0) (0.8,0.4) (0.9,0.5)

Finding the addition matrices for the above reduced IFSM,

(0.7,0.1) (0.7,0.1) (0.6,0.2) (0.6,0.2) (0.7,0.2)
(0.7,0.2) (0.7,0.2) (0.6,0.1) (0.8,0.1) (0.8,0.1)
(P1 + P2 + P3) = (0.7,0.1) (0.8,0.1) (0.6,0.2)
(0.6,0.2) (0.6,0.2)
(0.8,0.1) (0.7,0.1) (0.6,0.2) (0.7,0.2) (0.6,0.3)
(0.5,0.2) (0.6,0.3) (0.7,0.1) (0.4,0.4)
(0.5,0.3)
(0.7,0.6) (0.8,0.5) (0.8,0.6) (0.7,0.6) (0.8,0.4)
(0.7,0.5) (0.7,0.5) (0.7,0.7) (0.7,0.8)
(0.6,0.6)
(P1C + P2C + P3C) = (0.7,0.6) (0.6,0.6)
(0.8,0.5) (0.6,0.6) (0.6,0.6)
(0.8,0.7) (0.8,0.6) (0.8,0.6) (0.8,0.6) (0.7,0.5)
(0.9,0.3) (0.8,0.3) (0.8,0.4) (0.8,0.4)
(0.9,0.5)

Now, to find the Value Matrix

0.6 0.6 0.4 0.4 0.5
0.5 0.5 0.5 0.7 0.7
V (P1 + P2 + P3) = 0.6 0.7 0.4 0.4 0.4
0.7 0.6 0.4 0.5 0.3
h 0.3 0.3 0.6 0.0 0.2

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0.1 0.3 0.2 0.1 0.4

(0.3,0.2) (0.3,0.5) (0.5,0.4) (0.5,0.4) (0.0,0.0)
(0.4,0.5) (0.3,0.3) (0.3,0.3) (0.3,0.2) (0.0,0.0)
(0.3,0.4) (0.4,0.3) (0.4,0.4) (0.4,0.4) (0.0,0.0)
(0.2,0.4) (0.2,0.4) (0.2,0.4)
(0.4,0.2) (0.0,0.0)
h(0.3,0.4) (0.2,0.7) (0.2,0.6) (0.3,0.5) (0.0,0.0)

(0.3,0.4) (0.5,0.4) (0.2,0.4) (0.0,0.0) (0.5,0.3)
(0.4,0.5) (0.4,0.3) (0.3,0.3) (0.0,0.0) (0.4,0.4)
(0.3,0.4) (0.7,0.2) (0.2,0.5) (0.0,0.0) (0.4,0.4)
(0.5,0.2) (0.3,0.3) (0.0,0.0)
(0.2,0.2) (0.5,0.4)
h(0.4,0.4) (0.2,0.5) (0.4,0.3) (0.0,0.0) (0.4,0.4)

(0.3,0.4) (0.2,0.3) (0.0,0.0) (0.3,0.4) (0.2,0.6)
(0.3,0.3) (0.3,0.5) (0.0,0.0) (0.4,0.2) (0.7,0.2)

0.2 0.2 0.0 − 0.1 0.0

V (P1C + P2C + P3C) = 0.1 0.0 0.3 0.0 0.0

0.1 0.2 0.2 0.2 0.2

h 0.6 0.5 0.4 0.4 0.4

Score Matrix,

0.5 0.3 0.2 0.3 0.1

S =

0.3 0.3 0.5 0.8 0.7

0.5 0.7 0.1 0.4 0.4

0.6 0.4 0.2 0.3 0.1

h −0.3 − 0.2 0.2 − 0.4 − 0.2

Total of Score Matrix,

1.4 S* = 2.6 2.1 1.6h−0.9

Result:

Since the score of d2 is maximum, the patient under consideration belongs to Stage II, (i.e)., initial stage of heart disease as per the collective opinions of the group of experts.

To find the Reduced IFSM by assigning the weight of membership and non-membership values as w1 = 1, w2 = 0, w3 = 0, w4 = 1

P1 =

P2 = (0.5,0.3) (0.5,0.4) (0.0,0.0) (0.5,0.4) (0.4,0.4)

(0.4,0.3) (0.4,0.4) (0.0,0.0) (0.3,0.3) (0.3,0.5)

(0.1,0.7) (0.4,0.4) (0.0,0.0) (0.2,0.6) (0.1,0.5)

Similarly assigning the same weight to complement of IVIFSM,

(0.3,0.9) (0.6,0.6) (0.4,0.8) (0.4,0.8) (1.0,1.0)
(0.5,0.7) (0.3,0.8) (0.4,0.9) (0.3,0.9) (1.0,1.0)
(0.4,0.7) (0.4,0.8) (0.4,0.8) (0.4,0.8) (1.0,1.0)
(0.5,0.7) (0.5,0.7) (0.5,0.7)
(0.2,0.9) (1.0,1.0)
h(0.5,0.8) (0.7,0.6) (0.7,0.5) (0.6,0.6) (1.0,1.0)

(0.5,0.7) (0.4,0.7) (0.5,0.7) (1.0,1.0) (0.3,0.8)
(0.5,0.7) (0.3,0.8) (0.5,0.8) (1.0,1.0) (0.5,0.7)
(0.4,0.7) (0.2,0.9) (0.6,0.7) (1.0,1.0) (0.4,0.8)
(0.3,0.9) (0.4,0.8) (1.0,1.0)
(0.4,0.9) (0.4,0.7)
h(0.5,0.8) (0.7,0.6) (0.3,0.9) (1.0,1.0) (0.5,0.7)

(0.5,0.7) (0.3,0.9) (1.0,1.0) (0.4,0.7) (0.6,0.5)
(0.3,0.8) (0.5,0.7) (1.0,1.0) (0.2,0.9) (0.2,0.9)
(0.3,0.9) (0.4,0.7) (1.0,1.0) (0.4,0.7) (0.4,0.7)
(0.4,0.8) (0.5,0.7) (1.0,1.0) (0.3,0.8) (0.6,0.6)
(0.8,0.5) (0.4,0.7) (1.0,1.0) (0.7,0.5) (0.6,0.6)

Finding the addition matrices for the above reduced IFSM,

(0.3,0.2) (0.5,0.3) (0.5,0.4) (0.5,0.4) (0.5,0.3)
(0.4,0.3) (0.4,0.3) (0.3,0.3) (0.4,0.2) (0.7,0.2)

(P1 + P2 + P3) = (0.5,0.3) (0.7,0.2) (0.4,0.4)
(0.5,0.4) (0.4,0.4)
(0.4,0.2) (0.5,0.2) (0.3,0.3) (0.3,0.3) (0.5,0.4)
(0.4,0.4) (0.4,0.4) (0.4,0.3) (0.3,0.5) (0.4,0.4)
(0.5,0.7) (0.6,0.6) (0.5,0.7) (0.4,0.7) (0.6,0.5)
(0.5,0.7) (0.5,0.7) (0.5,0.8) (0.3,0.9) (0.5,0.7)
(P1C + P2C + P3C) = (0.4,0.7) (0.4,0.7) (0.6,0.7)
(0.4,0.7) (0.4,0.7)
(0.4,0.8) (0.5,0.7) (0.5,0.7) (0.5,0.7) (0.6,0.6)
(0.8,0.5) (0.7,0.6) (0.7,0.5) (0.7,0.5) (0.6,0.6)

Value matrix are as follows,

0.1 0.2 0.10.1 0.2
0.1 0.1 0.0 0.2 0.5
V (P1 + P2 + P3) = 0.20.5 0.0 0.1
0.0
0.2 0.3 0.0 0.0 0.1
0.0 0.0 0.1 − 0.2 0.0
0.2 0.0 − 0.2 − 0.3 0.1
−0.2 − 0.2 − 0.3 − 0.6 − 0.2
V (P1C + P2C + P3C) = −0.3 − 0.3 − 0.1 −
0.3 − 0.3
−0.4 − 0.2 − 0.2 − 0.20.0
h 0.3 0.1 0.2 0.2 0.0
0.3 0.2 0.3 0.4 0.1
0.3 0.3 0.3 0.8 0.7
0.5 0.8 0.1 0.4 0.3
0.6 0.5 0.2 0.2 0.1
0.3 − 0.1 − 0.1 − 0.4 0.(

Total of Score Matrix,
1.h−0.9

Result:

According to the group's collective wisdom, the patient in question, whose d2 score is at its highest, is in Stage II (i.e., the beginning stage of cardiac disease).

Remark:

In the case of medical diagnosis, we have found a superior result utilising our approach than the one in [15]. We may deduce from a comparison of the two outcomes above that they are all the same.

4. **Conclusion:**

The notion of interval-valued intuitionistic fuzzy soft matrix was introduced in this work. For solving decision-making difficulties, a novel and more straightforward technique has been devised that makes use of complement and value matrixes in a simplified IFSM. Furthermore, we were able to solve a medical diagnostic issue utilising our approach and get a superior outcome. If you have an uncertain decision making situation, you might use interval-valued intuitionistic fuzzy soft matrix characteristics in your future research.

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