An Application of Intuitionistic Fuzzy Soft Matrix Theory in Decision Making Based on Real Life Problem

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***Abstract*- Soft set theory is a newly mathematical tool to deal with uncertain problems. It has a rich potential for application in solving practical problems in economics, social science, medical science etc. The concept of fuzzy soft sets extended fuzzy soft set to Intuitionistic fuzzy soft sets .In this paper we proposed intuitionistic fuzzy soft matrices and defined different types of intuitionistic fuzzy soft matrices and some operators. Finally a practical example that explains the best solution is analysed and demonstrate the application of the proposed decision making method.**

Keywords: Soft sets, Fuzzy soft matrix (FSM), Fuzzy soft set (FSS), Intuitionistic fuzzy soft matrix(IFSM), Addition of IFSM, Complement of IFSM , Subtraction of intuitionistic fuzzy soft matrix.
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I. INTRODUCTION:

In 1965, Fuzzy set was introduced by Lotfi.A.Zadeh **[14]** considered as a special case of soft sets. An intuitionistic fuzzy was introduced in 1983, by K.Atanassov **[1]** as an extension of Zadeh's fuzzy set. In the year 1999, Molodtsov **[10]** introduced soft set theory as a mathematical tool for dealing with the uncertainties which tradition mathematics failed to handle. Molodtsov was shown numerous applications of this theory in solving practical problems in engineering, medical sciences, economics, environment and social sciences. In 2001, P.K.Maji, R.Biswas and A.R.Roy **[7]** studied the theory of soft sets initiated by Molodtsov **[10]** and developed several basic notions of soft set theory. In 2004, Maji et al **[8]** introduced the concept of intuitionistic soft sets. In 2010, Cagman and Enginoglu **[3]** defined soft matrices which were a matrix representation of the soft set and constructed a soft max-min decision making method. Matrices play an important role in the broad area of science and engineering. However, the classical matrix theory sometimes fails to solve the problems involving uncertainties. In 2011**[13]**, Yong et al initiated a matrix representation of a fuzzy soft set and applied it in certain decision making problems. In 2011, Babita and John **[2]** described generalized intuitionistic fuzzy soft sets and solved multi criteria decision making problem in generalized intuitionistic fuzzy soft sets. In 2012, Borah et al **[9]** extended fuzzy soft matrix theory and its application. In 2012, Chetia and Das **[4]** defined five types of product of intuitionistic fuzzy soft matrices. In 2012, Basu and Mahapatra and Mondal **[12]** defined different types of matrices in IFSS theory. Further we have adopted some new operations on these matrices and suggested here all the definitions and operations by suitable examples.

In 2013, Deli and Cagman **[5]** introduced intuitionistic fuzzy parameterized soft sets. They have also applied to the problems that contain uncertainties based on intuitionistic fuzzy parameterized soft sets. In 2013, Rajarajeswari and Dhanalakshmi **[11]** described intuitionistic fuzzy soft matrix with some traditional operations. In 2013, Jalilul and Tapan Kumar Roy **[6]** introduced properties on intuitionistic fuzzy soft matrix. In this paper, we proposed intuitionistic fuzzy soft matrices and defined different types of intuitionistic fuzzy soft matrices and some operations. Finally, We extend our approach in application of these matrices in decision making problems.

2 DEFENITIONS AND PRELIMINARIES:

The basic definitions of Intuitionistic fuzzy soft set theory that are useful for subsequent discussions are given.

2.1 Soft set [1]

Let U be an initial universe set and E be a set of parameters. Let P (U) denotes the power Set of U. Let A⊆E. A pair (F_A, E) is called a soft set over U, where F_A is a mapping given by :E→ P (U) Such that F_A (e) = φ if e ∉A. Here F_A is called approximate function of the soft set (F_A, E). The set F_A (e) is called e- approximate value set which consist of related objects of the parameter e ∈E. In other words, a soft set over U is a parameterized family of subsets of the universe U.

Example 2.1: Let U={ e_1 , e_2 , e_3 , e_4} be a set of four pens and E={{ e_1 , e_2 , e_3 , e_4}= { black (e_1) , red (e_2),blue (e_3),green(e_4) } be a set of parameters. If A = {e_1 , e_2, e_3 ,e_4} ⊆ E. Let F_A (e_1)= { u_1 , u_2, u_3 , u_4} and F_A (e_2)= { u_1 , u_4} ,F_A (e_3)= { u_1 , u_3, u_4} ,F_A (e_4)= { u_4} then we write the soft set (F_A,E)= {(e_1,{ u_1 , u_2 , u_3 , u_4}), (e_2,{ u_1 , u_4}), (e_3,{ u_1 , u_3 , u_4}), (e_4,{ u_4})} over U which describe the "colour of the pens" which Mr. A is going to buy.

We may represent the fuzzy soft set in the following form :

U	e_1	e_2	e_3	e_4
u_1	1	1	1	0
u_2	1	0	0	0
u_3	1	0	1	0
u_4	1	1	1	1

2.2. Fuzzy soft set [6]

Let U be an initial universe, E be the set of all parameters and A⊆ E. A pair (F_A, E) is called a fuzzy set over U where F_A is a mapping given by, F_A :E⟶ P(U) Such that F_A (e) = φ if e∉A, Where φ is a null fuzzy set and $\tilde{P}$(U) denotes the collection of all subsets of U.

Example 2.2 Consider the example 2.1, here we cannot express with only two real numbers 0 and 1, we can characterized it by a membership function instead of crisp number 0 and 1, which associate with each element a real number in the interval [0,1].Then

(F_A,E) ={ F_A (e_1) ={(u_1 ,0.8),(u_2 ,0.6),(u_3 ,0.5), (u_4 ,0.2)},

F_A (e_2) = {(u1, 0.5), (u_4, 0.2)},

F_A (e_3) ={(u_1 ,0.6),(u_3 ,0.4)(u_4,0.8)},
F_A (e_4) = {(u_4, 0.4)}

is the fuzzy soft set representing the "colour of the pens" Which Mr. A is going to buy. We may represent the fuzzy soft set in the following form:

U	e_1	e_2	e_3	e_4
u_1	0.8	0.5	0.6	0
u_2	0.6	0	0	0
u_3	0.5	0.0	0.4	0
u_4	0.2	0.2	0.8	0.4

2.3 Fuzzy Soft Matrices (FSM) [5]

Let (F_A , E) be fuzzy soft set over U. Then a subset of U x E is uniquely defined by

R_A = {(u, e): e∈ A, u ∈ F_A (e)}, which is called relation form of (F_A, E) . The characteristic function of R_A is written by μ_{RA} : U x E ⟶ [0 , 1] , where μ_{RA}(u , e) ∈ [0,1] is the membership value of u ∈U for each e ∈U. If $\mu_{ij} = \mu_{RA}(u_i, e_j)$, we can define a matrix

$$[\mu_{ij}]_{mxn} = \begin{pmatrix} \mu_{11} & \mu_{12} \ \ldots\ldots & \mu_{1n} \\ \mu_{21} & \mu_{22} \ \ldots\ldots & \mu_{2n} \\ \ldots. & \ldots \quad \ldots & \ldots \\ \mu_{m1} & \mu_{m2}\ldots & \mu_{mn} \end{pmatrix}$$

Which is called an m x n soft matrix of the soft set (F_A,E) over U. Therefore we can say that a fuzzy soft set (F_A, E) is uniquely characterized by the matrix $[\mu_{ij}]_{m\times n}$ and both concepts are interchangeable.

Example 2.3

Assume that U = { u_1 , u_2 , u_3 , u_4, u_5, u_6} is a universal set and E = { e_1 , e_2 , e_3, e_4} is a set of all parameters. If A⊆ E = { e_1 , e_2 , e_3 , e_4 } and F_A (e_1)= { (u_1 ,.7), (u_2,.6) , (u_3,.8) , (u_4,.2),(u_5,.7), (u_6,.8)}

F_A (e_2)= { (u_1,.5) , (u_3,.8) , (u_4,.1) ,(u_5,.2), (u_6,.9)}
F_A (e_3)= { (u_1,.5) , (u_2,.7) , (u_4,.5) , (u_5,.6),(u_6,.7) }
F_A (e_4) = { (u_1,.9) , (u_6,.1) }

Then the fuzzy soft set (F_A ,E) is a parameterized family { F_A (e_1) , F_A (e_2) , F_A (e_3), F_A (e_4)} of all fuzzy sets over U. Hence the fuzzy soft matrix [μ_{ij}] can be written as

$$[\mu_{ij}] = \begin{bmatrix} 0.7 & 0.5 & 0.5 & 0.9 \\ 0.6 & 0.0 & 0.7 & 0.0 \\ 0.8 & 0.8 & 0.0 & 0.0 \\ 0.2 & 0.1 & 0.5 & 0.0 \\ 0.7 & 0.2 & 0.6 & 0.0 \\ 0.8 & 0.9 & 0.7 & 0.1 \end{bmatrix}$$

2.4 Row- Fuzzy Soft Matrix

A fuzzy soft matrix of order 1×*n* i.e., with a single row is called a row-fuzzy soft Matrix.

2.5 Column -Fuzzy Soft Matrix

A fuzzy soft matrix of order *m*×1 i.e., with a single column is called a column-fuzzy soft matrix.

3. INTUITIONISTIC FUZZY SOFT MATRIX THEORY

3.1 Intuitionistic Fuzzy Soft Set (IFSS)

Let U be an initial universe, E be the set of parameters and A⊆E. A pair (F_A,E) is called an intuitionistic fuzzy soft set (IFSS) over U, where F_A is a mapping given by F_A :E⟶ I^U ,where I^U denotes the collection of all intuitionistic fuzzy subsets of U.

Example 3.1:

Suppose that U = {u_1,u_2,u_3,u_4} be a set of four shirts and E={white(e_1),blue(e_2),green(e_3)} be a set of parameters. If A={e_1,e_2}∈E.

LetF_A(e1)={(u_1,0.3,0.7),(u_2,0.8,0.1),(u_3,0.4,0.2), (u_4, 0.6, 0.2)}

$F_A(e_2)$={(u_1,0.8,0.1),(u_2,0.9,0.1),(u_3,0.4,0.5), (u_4,0.2,0.3)}

then we write intuitionistic fuzzy soft set is

(F_A, E)={$F_A(e_1)$={(u_1,0.3,0.7),(u_2,0.8,0.1),(u_3,0.4,0.2), (u_4, 0.6, 0.2)}

$F_A(e_2)$={(u_1,0.8,0.1),(u_2,0.9,0.1),(u_3,0.4,0.5),(u_4,0.2,0.3)}}

We would represent this intuitionistic fuzzy soft set in matrix form as

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$$\begin{bmatrix} (.3,.7) & (.8,.1) & (.0,.0) \\ (.8,.1) & (.9,.1) & (.0,.0) \\ (.4,.2) & (.4,.5) & (.0,.0) \\ (.6,.2) & (.2,.3) & (.0,.0) \end{bmatrix}$$

3.2. Intuitionistic Fuzzy Soft Matrix (IFSM) [5]

Let U be an initial universe, E be the set of parameters and A⊆E. Let (F_A, E) be an intuitionistic fuzzy soft set (IFSS) over U. Then a subset of U×E is uniquely defined by

R_A= {(u, e): e∈A, u∈ F_A (e)} which is called relation form of (F_A,E). The membership and non-membership functions of are written by

μ_{R_A}: U×E→[0,1] and γ_{R_A} : U×E→[0,1] where

μ_{R_A} :(u,e) ∈ [0,1] and γ_{R_A} :(u,e) ∈[0,1] are the membership value and nonmembership value of u∈U for each e∈E.

If (u_{ij} ,v_i) = ($\mu_{R_A}(u_i ,e_j)$,$\gamma_{R_A}(u_i ,e_j)$) we can define a matrix

$$[(u_{ij}, v_{ij})]_{m\times n} = \begin{bmatrix} (\mu_{11},v_{11}) & (\mu_{12},v_{12}) & \ldots & (\mu_{1n},v_{1n}) \\ (\mu_{21},v_{21}) & (\mu_{22},v_{22}) & \ldots & (\mu_{2n},v_{2n}) \\ \ldots & \ldots & \ldots & \ldots \\ (\mu_{m1},v_{m1}) & (\mu_{m2},v_{m2}) & \ldots & (\mu_{mn},v_{mn}) \end{bmatrix}$$

Which is called an m×n IFSM of the IFSS (F_A, E) over U. Therefore, we can say that IFSS (F_A,E) is uniquely characterized by the matrix $[(\mu_{ij} ,v_{ij})]_{m\times n}$ and both concepts are interchangeable .The set of all m×n IFS matrices will be denoted by $IFSM_{m\times n}$.

Example 3.2. Let U ={ u_1 , u_2 , u_3 , u_4, u_5} is a universal set and E = { e_1 , e_2 , e_3 , e_4, e_5},is a set of parameters. If A = { e_1 , e_3 , e_4, e_5} ⊆ E and

F_A (e_1)= { (u_1,.8,.4) , (u_2,.8,.1) , (u_3,.5 , .5) , (u_4,.5,.4) ,(u_5,.2,.1) }

F_A (e_3)= {(u_1,.4,.6) ,(u_3,.2 ,.2),(u_4,1,0) , (u_5,.6,.2)}

F_A (e_4)= { (u_1,.6 ,.2),(u_2,1,0) ,(u_3,.8 ,.2), (u_4,.6,.3),(u_5,.7,.3) }

F_A (e_5)= { (u_1,.7 ,.8),(u_2,1,0) ,(u_3,.6 ,.5), (u_4,.5,.3) ,(u_5,.9,.2) }

Then the IFS set (F_A,E) is a parameterized family {$F_A(e_1)$, $F_A(e_2)$, $F_A(e_3)$, $F_A(e_4)$} of all IFS sets over U. Hence IFSM [(μ_{ij},)] can be written as

$$[(\mu_{ij},\gamma_{ij})]= \begin{bmatrix} (.8,.4) & (0,0) & (.4,.6) & (.6,.2) & (.7,.8) \\ (.8,.1) & (0,0) & (0,0) & (1,0) & (1\ ,\ 0) \\ (.5,.5) & (0,0) & (.2,.2) & (.8,.2) & (.6,.5) \\ (.5,.4) & (0,0) & (1\ ,0) & (.6,.3) & (.5,.3) \\ (.2,.1) & (0,0) & (.6,.2) & (.7,.3) & (.9,.2) \end{bmatrix}$$

***3**.3 Intuitionistic Fuzzy Soft Set Complement Matrix*:

Let A = [a] = [a_{ij}] IFSM $_{mxn}$, where a_{ij} = (μ_j (c_i),v_j (c_i)) for all i, j. Then A^C IFSM is called a Intuitionistic Fuzzy Soft Complement Matrix if A^C = [d_{ij}] $_{mxn}$, where d_{ij} =(v_j (c), μ_j (c)) for all i, j.

a Intuitionistic Fuzzy Soft Complement Matrix if A^C = [d_{ij}] mxn, where d_{ij} =(v_j (c_i), μ_j(c_i))∀ i, j.

3.4 Intuitionistic Fuzzy Soft Sub Matrix:

Let A = [a_{ij}] IFSM mxn, B = [b_{ij}] IFSM mxn, Then A is a intuitionistic fuzzy soft submatrix of B, denoted by $A\subseteq B$. if $\mu_A \le \mu_B$ and $v_A \ge v_B$ ∀ i, j.

3.5 Intuitionistic Fuzzy Soft Null (Zero) Matrix:

An intuitionistic fuzzy soft matrix of order mxn is called intuitionistic fuzzy soft null (zero) matrix. If all its elements are (0, 1). It is denoted by Φ.

3.6 Intuitionistic Fuzzy Soft Universal Matrix:

An intuitionistic fuzzy soft matrix of order mxn is called each intuitionistic fuzzy soft universal matrix if all its elements are (1, 0). It is denoted by U.

3.7 Intuitionistic Fuzzy Soft Equal Matrix:

A = [a_{ij}] IFSM mxn, B = [b_{ij}] IFSM mxn, Then A is equal to B, denoted by $A = B$. if $\mu_A = \mu_B$ and $v_A = v_B$ ∀ *i, j*.

3.8 Intuitionistic Fuzzy Soft Transpose Matrix:

Let A = [a_{ij}] IFSM mxn Then A^T is a intuitionistic fuzzy soft transpose matrix of A if A^T = [a_{ij}]

3.9 Intuitionistic Fuzzy Soft Rectangular Matrix:
Let A = $[a_{ij}]$ IFSM mxn, where $a_{ij} = (\mu_j (c_i), v_j (c_i))$. Then A is called a Intuitionistic Fuzzy Soft rectangular Matrix if m≠ n.

3.10 Intuitionistic Fuzzy Soft Upper Triangular Matrix:
Let A = $[a_{ij}]$ IFSM mxn, where $a_{ij} = (\mu_j (c_i), v_j (c_i))$. Then A is called a Intuitionistic Fuzzy Soft upper rectangular Matrix if m=n and a_{ij} =(0, 1) i>j.

3.11 Intuitionistic Fuzzy Soft Lower Triangular Matrix:
Let A= $[a_{ij}]$ IFSM mxn, where $a_{ij} = (\mu_j (c_i), v_j (c_i))$. Then A is called a Intuitionistic Fuzzy Soft lower rectangular Matrix if m=n and a_{ij} = (0, 1) i<j.

4. OPERATIONS ON INTUITIONISTIC FUZZY SOFT MATRIX THEORY

4.1 Addition and Subtraction of Intuitionistic Fuzzy Soft Matrix:
If A = $[a_{ij}]$ IFSM mxn, B = $[b_{ij}]$ IFSM mxn, then we define the addition and subtraction of Intuitionistic Fuzzy Soft Matrices of A and B as;
$A + B = \{\max [(\mu_A(a_{ij}), \mu_B(b_{ij})], \min[v_A(a_{ij}), v_B(b_{ij})]\} \forall$ i, j
$A - B = \{ \min[\mu_A(a_{ij}), \mu_B(b_{ij})], \max[v_A(a_{ij}), v_B(b_{ij})] \forall\}$ i, j.

4.2 Product of Intuitionistic Fuzzy Soft Matrix:
If A = $[a_{ij}]$ ∈ IFSM, B = $[b_{ij}]$ ∈ IFSM , then we define A*B, multiplication of A and B as
A*B = $[c_{ij}]$ mxp S = $\{\max \min[(\mu_A (a_{ij}), \mu_B (b_{ij})], \min \max[v_A (a_{ij}), v_B(b_{ij})\} \forall$ i, j.

4.3 Value Matrix:
Let $\tilde{A} = [(\mu_{ij}^A \ , v_{ij} \ )] \in$ IFSMm×n. Then Ã is said to be value of intuitionistic fuzzy soft matrix denoted by V(Ã) and is defined as $V(\tilde{A}) = [(\mu_{ij}{}^A - v_{ij}{}^A)]$ if i=1,2,3,…m, j=1,2,3,…n for all i and j.

4.4 Score Matrix :
If $A = [(\mu \ , v_{ij} \ )] \in$ IFSMm×n, $B = [(\mu_{ij}{}^B, v_{ij}{}^B)] \in$ IFSMm×n. Then A and B is said to be intuitionistic fuzzy soft score matrix denoted by $S(A ,B)$ and is defined as $S(A ,B) = V(\tilde{A}) - V(B)$.

4.5 Total Score
If $\tilde{A} = [(\mu_{ij}{}^A, v_{ij} \ )] \in$ IFSMm×n, $B = [(\mu_{ij}{}^B, v_{ij}{}^B)] \in$ IFSMm×n. Let the corresponding value matrix be V(Ã),V(B) and their score matrix is $S_{(A ,B)}$ .Then the total score for each ui in U is $S_i = (V(\tilde{A}) - V(B))$
$\sum_{j=1}^{n} = [\ {}^A - v_{ij}{}^A - (\mu_{ij}{}^B - v_{ij}{}^B)]$

5. ALGORITHM

Step 1: Input the intuitionistic fuzzy soft set (F_A,E), (G_B,E) and obtain the intuitionistic fuzzy soft matrices A,B corresponding to (F_A ,E) and (G_B,E) respectively.
Step 2: Write the intuitionistic fuzzy soft complement sets (F_A,E)°,(G_B,E)° and obtain the intuitionistic fuzzy soft matrices Ã° ,B̃° corresponding to (F_A,E)° and (G_B,E)° respectively.
Step 3: Compute (A-B), (A°-B °), V(A-B), V(A°-B °) and $S_{(A -B ,(A° -B °))}$.
Step 4: Compute the total score S_i for each u_i in U.
Step 5: Find S_k= max(S_i),then we conclude the best course uk has the maximum value, since uk is suitable for his son to continue his studies.
Step 6: If Sk has more than one value, then go to step (1) so as to repeat the process by reassessing the parameter for selecting the best course.

6. NEW TECHNOLOGY IN A DECISION MAKING PROBLEM

Suppose Mr. X is facing a problem for choosing the suitable course for his son among the available courses medical, engineering, humanities and computer application, which are denoted by u_1, u_2, $u_3$and u_4 respectively. He seeks advice from the different counseling agencies.
That agencies provided the information about the courses considering the parameters availability of seat, future prospects, affordability, and job security which are denoted by e_1,e_2,e_3, and e_4 respectively.
Let (F_A,E) and (G_B,E) be two intuitionistic fuzzy soft set representing the selection of courses for study from the universal set U = { u_1, u_2, u_3, u_4 } . Let E = { e_1,e_2,e_3, e_4 } be the set of parameters. The information provided by the counseling agencies and an intuitionistic fuzzy soft matrix is constructed on the basis of the parameters a follows

(F_A,E)= {{(e_1) = {(u_1, 0.7, 0.1) , (u_2, 0.4, 0.3), (u_3, 0.8, 0.1), (u_4,0.7, 0.3)}
F_A (e_2) = {(u_1, 0.6, 0.7) , (u_2, 0.4, 0.5), (u_3, 0.2, 0.6), (u_4,0.8, 0.2)}
F_A (e_2) = {(u_1, 0.5, 0.5) , (u_2, 0.7, 0.2), (u_3, 0.7, 0.1), (u_4,0.4, 0.7)}
F_A (e_4) ={(u_1, 0.6, 0.4) , (u_2, 0.7, 0.7), (u_3, 0.7, 0.9), (u_4,0.7, 0.2)}}

(G_B,E)={{G_B(e_1)={(u_1, 0.7, 0.2) , (u_2, 0.5, 0.4), (u_3, 0.4, 0.5), (u_4,0.7, 0.1)}
G_B (e_2)={(u_1, 0.6, 0.4) , (u_2, 0.7, 0.3), (u_3, 0.8, 0.2), (u_4,0.8, 0.6)}
G_B (e_3)={(u_1, 0.5, 0.3) , (u_2, 0.7, 0.9), (u_3, 0.5, 0.4), (u_4,0.3, 0.7)}
G_B (e_4)={(u_1, 0.5, 0.5) , (u_2, 0.8, 0.2), (u_3, 0.7, 0.2), (u_4,0.7, 0.5)}

These two intuitionistic fuzzy soft sets are represented by the following intuitionistic fuzzy soft matrices respectively.

$$A = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{array}{cccc} e_1 & e_2 & e_3 & e_4 \end{array} \\ \begin{bmatrix} (0.7,0.1) & (0.6,0.7) & (0.6,0.2) & (0.6,0.4) \\ (0.4,0.3) & (0.4,0.5) & (0.5,0.4) & (0.7,0.7) \\ (0.8,0.1) & (0.2,0.6) & (0.6,0.3) & (0.7,0.9) \\ (0.7,0.3) & (0.8,0.2) & (0.2,0.7) & (0.7,0.2) \end{bmatrix} \end{array}$$

$$B = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{array}{cccc} e_1 & e_2 & e_3 & e_4 \end{array} \\ \begin{bmatrix} (0.7,0.2) & (0.6,0.4) & (0.5,0.3) & (0.5,0.5) \\ (0.5,0.4) & (0.7,0.3) & (0.7,0.9) & (0.8,0.2) \\ (0.4,0.5) & (0.8,0.2) & (0.5,0.4) & (0.7,0.2) \\ (0.7,0.1) & (0.8,0.6) & (0.3,0.7) & (0.7,0.5) \end{bmatrix} \end{array}$$

Then the intuitionistic fuzzy soft complement matrices are

$$A^\circ = \begin{array}{c} \\ u1 \\ u2 \\ u3 \\ u4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} (0.1,0.7) & (0.7,0.6) & (0.2,0.6) & (0.4,0.6) \\ (0.3,0.4) & (0.5,0.4) & (0.4,0.5) & (0.7,0.7) \\ (0.1,0.8) & (0.6,0.2) & (0.3,0.6) & (0.9,0.7) \\ (0.3,0.7) & (0.2,0.8) & (0.7,0.2) & (0.2,0.7) \end{bmatrix} \end{array}$$

$$B^\circ = \begin{array}{c} \\ u1 \\ u2 \\ u3 \\ u4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} (0.2,0.7) & (0.4,0.6) & (0.3,0.5) & (0.5,0.5) \\ (0.4,0.5) & (0.3,0.7) & (0.9,0.7) & (0.2,0.8) \\ (0.5,0.4) & (0.2,0.8) & (0.4,0.5) & (0.2,0.7) \\ (0.1,0.7) & (0.6,0.8) & (0.7,0.3) & (0.5,0.7) \end{bmatrix} \end{array}$$

Then the subtraction matrices are

$$A-B = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} (0.7,0.2) & (0.6,0.7) & (0.5,0.5) & (0.5,0.5) \\ (0.4,0.4) & (0.4,0.5) & (0.7,0.2) & (0.7,0.7) \\ (0.4,0.5) & (0.2,0.6) & (0.5,0.4) & (0.7,0.9) \\ (0.70.3) & (0.4,0.6) & (0.3,0.7) & (0.7,0.5) \end{bmatrix} \end{array}$$

$$A^\circ-B^\circ = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} (0.1,0.7) & (0.4,0.6) & (0.3,0.5) & (0.4,0.6) \\ (0.3,0.5) & (0.3,0.7) & (0.2,0.7) & (0.2,0.8) \\ (0.1,0.8) & (0.2,0.8) & (0.1,0.7) & (0.2,0.7) \\ (0.1,0.7) & (0.2,0.8) & (0.7,0.4) & (0.2,0.7) \end{bmatrix} \end{array}$$

$$V(A-B) = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} 0.5 & -0.1 & 0.0 & 0.0 \\ 0.0 & -0.1 & 0.5 & 0.0 \\ -0.1 & -0.4 & 0.1 & -0.2 \\ 0.4 & -0.2 & -0.4 & 0.2 \end{bmatrix} \end{array}$$

$$V(A^\circ-B^\circ) = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} -0.6 & -0.2 & -0.2 & -0.2 \\ -0.2 & -0.4 & -0.5 & -0.6 \\ -0.7 & -0.6 & -0.6 & -0.5 \\ 0.6 & -0.6 & 0.3 & -0.5 \end{bmatrix} \end{array}$$

Calculate the score matrix $S_{(A-B),(A^\circ-B^\circ))}$ and total score for the best course for his son is

$$S_{(A-B,(A^\circ-B^\circ))} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \end{array} \begin{array}{c} \begin{matrix} e_1 & e_2 & e_3 & e_4 \end{matrix} \\ \begin{bmatrix} 1.1 & 0.1 & 0.2 & 0.2 \\ 0.2 & 0.3 & 0.1 & 0.6 \\ 0.6 & 0.2 & 0.7 & 0.3 \\ 1.0 & 0.4 & -0.7 & 0.7 \end{bmatrix} \end{array}$$

$$\text{Total score} = \begin{array}{c} S_1 \\ S_2 \\ S_3 \\ S_4 \end{array} \begin{bmatrix} 1.6 \\ 2.1 \\ 2.8 \\ 1.4 \end{bmatrix}$$

We know that S3 has the maximum value and Mr .X has the decision is in favour of selecting u_3 humanities for his son to study the course.

7. CONCLUSION :

In this paper, we have proposed the concept of intuitionistic fuzzy soft matrix and applied a new technology on the matrices. Finally a new efficient solution procedure has been developed to solve intuitionistic fuzzy soft set based on real life decision making problems, which will contain more than one decision and to study whether the technology put forth in this paper may emerge a noteworthy result in this field.

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