An Application of Interval Valued Fuzzy Soft Matrix in Decision Making Problem

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***Abstract* - Soft set Theory and Interval mathematics are mathematical tools for dealing with uncertainties. Both have rich potential for application in solving real life problems. In this paper, we introduce the definition of 'AND' and 'OR' operations of Interval valued fuzzy soft matrices with examples.Finally, we extend our approach in application of these matrices in decision making problem.**

***Keywords* - Soft set, fuzzy soft set, Interval valued fuzzy soft matrix, 'AND' and 'OR' operations of Interval valued fuzzy soft matrix, Interval valued fuzzy soft matrix decision making problem.**

I. INTRODUCTION

The concept of interval valued fuzzy matrix (IVFM) is one of the recent topics developed for dealing with the uncertainties present in most of our real life situations, the parameterization tool of interval valued fuzzy matrix enhances the flexibility of its applications. Most of our real life problems in medical sciences, engineering, management environment and social sciences often involve data which are not necessarily crisp. Precise and deterministic in character due to various uncertainties associated with these problems. Such uncertainties are usually being handled with the help of the topics like probability, fuzzy set, intuitionistic fuzzy sets, interval mathematics and rough sets etc. The concept of IVFM as a generalization of fuzzy matrix was introduced and developed by shyamal and pal [8], by extending the max. min operations on fuzzy algebra $\mathcal{F}$=[0.1], for elements a, b$\in\mathcal{F}$, a+b =max { a,b}and a. b = min {a,b}. Let $\mathcal{F}_{mn}$ be the set of all m n Fuzzy Matrices over the Fuzzy algebra with support [0,1], that is matrices whose entries are intervals and all the intervals are subintervals of the interval [0,1].

De et.al. [2]have studied sanchez`s [5,6] method of medical diagnosis using intuitionistic fuzzy set. Saikia et.al.[7]have extended the method in [2] using intuitionistic fuzzy soft set theory. In [1],Chetia and Das have studied sanchez`s approach of medical diagnosis through IVFSS obtaining an improvement of the same presented in De et .al.[2 and 7]. In our earlier work [3], we have represented an IVFM A = (a_{ij}) =([a_{ijL},a_{iju}]) where each a_{ij} is a subinterval of interval [0,1], as the Interval matrix A=[A_L,A_U] whose i j^{th} entry is the interval [a_{ijL},a_{ijU}], where the lower limit A_L=(a_{ijL}) and the upper limit A_U=(a_{ijU}) are fuzzy matrices such that $A_L \leq A_U$. By using this representation we have discussed the consistency of Interval valued fuzzy relational equations in [4]. In[13] P.Rajarajeswari and P.Dhanalakshmi have introduced interval valued fuzzy soft matrix, its types with examples and some new operations on the basis of weights.In [14], D.r. N.Sarala and M.Prabhavathi have proposed the union and intersection of interval valued fuzzy soft matrix and its medical diagnosis.

In this paper,We introduce the definition of 'AND' and 'OR' operation of interval valued fuzzy soft matrix with examples. Finally, we extend are approach is application of these matrices in decision making problems.

II. PRELIMINARIES

Soft set 2.1 [9]

Suppose that U is an initial Universe set and E is a set of parameters, let P(U) denotes the power set of U.A pair (F,E) is called a soft set over U where F is a mapping given by $F : E \to P(U)$. Clearly a soft set is a mapping from parameters to P(U)and it is not a set, but a parameterized family of subsets of the Universe.

Fuzzy soft set 2.2 [10]

Let U be an initial Universe set and E be the set of parameters, let $A \subseteq E$. A pair (F,A) is called fuzzy soft set over U where F is a mapping given by $F: A \to I^U$, where I^U denotes the collection of all fuzzy subsets of U.

Fuzzy soft Matrices 2.3 [12]

Let $U = \{c_1, c_2, c_3 \ldots c_m\}$ be the Universe set and E be the set of parameters given by $E = \{e_1, e_2, e_3 \ldots e_n\}$. Let $A \subseteq E$ and (F,A) be a fuzzy soft set in the fuzzy soft class (U,E). Then fuzzy soft set (F,A) in a matrix form as $A_{mxn} = [a_{ij}]_{mxn}$ or $A = [a_{ij}]$ i=1,2,…m, j=1,2,3,…n

$$\begin{cases} \mu_j(c_i) & \text{if } e_j \in A \\ 0 & \text{if } e_j \notin A \end{cases}$$

Where $a_{ij} = \mu_j(c_i)$ represents the membership of c_i in the fuzzy set $F(e_j)$.

Interval valued fuzzy soft set 2.4 [11]

Let U be an initial Universe set and E be the set of parameters, let $A \subseteq E$. A pair (F,A) is called Interval valued fuzzy soft set over U where F is a mapping given by $F: A \to I^U$, where I^U denotes the collection of all Interval valued fuzzy subsets of U.

Interval valued fuzzy soft matrix 2.5[13]

Let $U = \{c_1, c_2, c_3 \ldots c_m\}$ be the Universe set and E be the set of parameters given by $E = \{e_1, e_2, e_3 \ldots e_n\}$. Let $A \subseteq E$ and (F,A) be a interval valued fuzzy soft set over U, where F is a mapping given by $F: A \to I^U$, where I^U denotes the collection of all Interval valued fuzzy subsets of U. Then the Interval valued fuzzy soft set can expressed in matrix form as

$\tilde{A}_{mxn} = [a_{ij}]_{mxn}$ or $\tilde{A} = [a_{ij}]$ i= 1,2,…m, j=1,2,…n

$$\text{Where } a_{ij} = \begin{cases} [\mu_{jL}(c_i), \mu_{jU}(c_i)] & \text{if } e_j \in A \\ [0,0] & \text{if } e_j \notin A \end{cases}$$

$[\mu_{jL}(c_i), \mu_{ju}(c_i)]$ represents the membership of c_i in the Interval valued fuzzy set $F(e_j)$.

Note that if $\mu_{jU}(c_i) = \mu_{jL}(c_i)$ then the Interval- valued fuzzy soft matrix (IVFSM) reduces to an FSM

Example: 2.1

Suppose that there are four houses under consideration, namely the universes U= {h_1,h_2,h_3,h_4}, and the parameter set E={e_1,e_2,e_3,e_4} where e_i stands for "beautiful", "large", "cheap", and "in green surroundings" respectively. Consider the mapping F from parameter set A ={e_1,e_2} ⊆ E to all interval valued fuzzy subsets of power set U. Consider an interval valued fuzzy soft set (F,A) which describes the "attractiveness of houses" that is considering for purchase. Then interval valued fuzzy soft set (F,A) is

(F,A) ={ F(e_1)={(h_1,[0.6,0.8]),(h_2,[0.8,0.9]),(h_3,[0.6,0.7]),(h_4,[0.5,0.6])}

F(e_2)= {(h_1,[0.7,0.8]),(h_2,[0.6,0.7]),(h_3,[0.5,0.7]),(h_4,[0.8,0.9])}

We would represent this Interval valued fuzzy soft set in matrix form as

$$\begin{bmatrix} [0.6,0.8] & [0.7,0.8] & [0.0,0.0] & [0.0,0.0] \\ [0.8,0.9] & [0.6,0.7] & [0.0,0.0] & [0.0,0.0] \\ [0.6,0.7] & [0.5,0.7] & [0.0,0.0] & [0.0,0.0] \\ [0.5,0.6] & [0.8,0.9] & [0.0,0.0] & [0.0,0.0] \end{bmatrix}$$

Interval valued fuzzy soft Transpose Matrix 2.6

Let $\tilde{A} = [a_{ij}] \in$ IVFSM $_{mxn}$ where $a_{ij}= [\mu_{jL}(C_i),\mu_{jL}(C_i)]$ Then $\tilde{A}^T$ is interval valued fuzzy soft Transpose Matrix of

$\tilde{A}$ if $\tilde{A}^T= [a_{ij}]$ 1=1,2,…m,

j = 1,2,…n $\tilde{A}^T= [a_{ij}] \in$ IVFSM $_{mxn}$.

Multiplication of interval valued fuzzy soft matrices 2.7 [13]

If $\tilde{A} = [a_{ij}] \in$ IVFSM $_{mxn}$, $\tilde{B} = [b_{jk}] \in$ IVFSM $_{nxp}$, then we define $\tilde{A} * \tilde{B}$,multiplication of $\tilde{A}$and $\tilde{B}$ as

$\tilde{A} * \tilde{B} = [c_{ik}]_{mxp}$ = [max min (μ_{ALj},μ_{BLj}),max min (μ_{AUj},μ_{BUj})],∀ i,j,k

Example:2.3

Consider

$$\tilde{A} = \begin{bmatrix} [0.6,0.8] & [0.7,0.8] \\ [0.5,0.6] & [0.8,0.9] \end{bmatrix}_{2x2} \quad \text{and } \tilde{B} = \begin{bmatrix} [0.8,0.9] & [0.6,0.7] \\ [0.6,0.7] & [0.5,0.7] \end{bmatrix}_{2x2}$$

are two interval valued fuzzy soft matrices then product of these two matrices is

$$\tilde{A} * \tilde{B} = \begin{bmatrix} [0.6,0.8] & [0.6,0.7] \\ [0.6,0.7] & [0.5,0.7] \end{bmatrix}_{2x2}$$

Remark: $\tilde{A} * \tilde{B} \neq \tilde{B} * \tilde{A}$

Interval valued fuzzy soft complement matrix 2.8 [13]

Let $\tilde{A} = [a_{ij}] \in$ IVFSM $_{mxn}$, when $a_{ij} = [\mu_{jL}(c_i), \mu_{jU}(c_i)]$ then $\tilde{A}^C$ is called interval valued fuzzy soft complement if $\tilde{A}^C = [b_{ij}]_{mxn}$ where $b_{ij} = [1-\mu_{Ju}(c_i), 1-\mu_{jL}(c_i)], \forall ijj$.

Example: 2.4

Let $\tilde{A} = \begin{bmatrix} [0.6,0.8] & [0.7,0.8] \\ [0.5,0.6] & [0.8,0.9] \end{bmatrix}_{2x2}$

Be interval valued fuzzy soft matrix then complement of this matrix is

$\tilde{A}^C = \begin{bmatrix} [0.2,0.4] & [0.2,0.3] \\ [0.4,0.5] & [0.1,0.2] \end{bmatrix}_{2x2}$

Scalar multiple of interval valued fuzzy soft matrix 2.9

Let $\tilde{A} = [a_{ij}] \in$ IVFSM $_{mxn}$, when $a_{ij} = [\mu_{jL}(c_i), \mu_{jU}(c_i)]$.Then Scalar multiple of interval valued fuzzy soft matrix.A by s scalar K is defined by $K\tilde{A} = [a_{ij}]_{mxn}$where $O \leq K \leq 1$.

Let $\tilde{A} = \begin{bmatrix} [0.6,0.8] & [0.7,0.8] \\ [0.5,0.6] & [0.8,0.9] \end{bmatrix}_{2x2}$

Be an interval valued fuzzy soft matrix then the Scalar multiple of this matrix by K = 0.5 is

$K\tilde{A} = \begin{bmatrix} [0.3,0.4] & [0.35,0.4] \\ [0.25,0.3] & [0.4,0.45] \end{bmatrix}_{2x2.}$.

III. ‘AND’ AND ‘OR’ OPERATIONS OF INTERVAL FUZZY SOFT MATRICES

In this section, we define the ‘AND’ and ‘OR’ operations of interval valued fuzzy soft matrices with examples and its properties.

Definition: 3.1

If $\tilde{A} = [a_{ij}] \in \text{IVFSM}_{mxn}$, $\tilde{B} = [b_{ij}] \in \text{IVFSM}_{mxn}$,

Then we define $\tilde{A} \square \tilde{B}$, “OR” operation of $\tilde{A}$and $\tilde{B}$ as.

$\tilde{A} \square \tilde{B} = [c_{ij}]_{mxn}$.

$= [\max(\mu_{AL},\mu_{BL}), \max(\mu_{AU},\mu_{BU})]$ for all i and j.

Example: 3.1

Consider $\tilde{A} = \begin{bmatrix} [0.6,0.8] & [0.,50.6] \\ [0.8,0.9] & [0.7,0.9] \end{bmatrix}_{2x2}$ and $\tilde{B} = \begin{bmatrix} [0.8,0.9] & [0.6,0.7] \\ [0.6,0.7] & [0.5,0.7] \end{bmatrix}_{2x2}$

are two interval valued fuzzy soft matrices than ‘OR’ operation of these two is

$\tilde{A}$□ $\tilde{B}$ = $\begin{bmatrix} [0.8,0.9] & [0.6,0.7] \\ [0.8.0.9] & [0.7,0.9] \end{bmatrix}_{2x2}$

Definition: 3.2

If $\tilde{A} = [a_{ij}] \in IVFSM_{mxn}$, $\tilde{B} = [b_{ij}] \in IVFSM_{mxn}$,

Then we define $\tilde{A}$□ $\tilde{B}$, “AND” operation of $\tilde{A}$and $\tilde{B}$ as.

$\tilde{A}$□ $\tilde{B}$ = $[c_{ij}]_{mxn}$.

= [min (μ_{AL},μ_{BL}), min (μ_{AU},μ_{BU})] for all i and j.

Example: 3.2

If $\tilde{A} = \begin{bmatrix} [0.6,0.8] & [0.,50.6] \\ [0.8,0.9] & [0.7,0.9] \end{bmatrix}_{2x2}$ and $\tilde{B} = \begin{bmatrix} [0.8,0.9] & [0.6,0.7] \\ [0.6,0.7] & [0.5,0.7] \end{bmatrix}_{2x2}$

are two interval valued fuzzy soft matrices than ‘AND’ operation of these two is

$\tilde{A}$□ $\tilde{B}$ = $\begin{bmatrix} [0.6,0.8] & [0.5,0.6] \\ [0.6.0.7] & [0.5,0.7] \end{bmatrix}_{2x2}$

Proposition: 3.1 [commutative law]

Let A = $[a_{ij}]$, B = $[b_{ij}] \in IVFSM_{mxn}$, Then

(i) $\tilde{A}$□ $\tilde{B}$ =$\tilde{B}$□$\tilde{A}$
(ii) $\tilde{A}$□ $\tilde{B}$ =$\tilde{B}$□ $\tilde{A}$

Proof:

Let A=$[a_{ij}]$ = [μ_{AL},μ_{AU}]

(i) $\tilde{A}$□ $\tilde{B}$ = [max (μ_{AL},μ_{BL}), max (μ_{AU},μ_{BU})]
=[max (μ_{BL},μ_{AL}), max (μ_{BU},μ_{AU})
= $\tilde{B}$ □$\tilde{A}$
(ii) $\tilde{A}$□ $\tilde{B}$ = [min (μ_{AL},μ_{BL}), min (μ_{AU},μ_{BU})]
=[min (μ_{BL},μ_{AL}), min (μ_{BU},μ_{AU})]
= $\tilde{B}$ □$\tilde{A}$

Proposition: 3.2 [Associativity law]

Let A = $[a_{ij}]$, B = $[b_{ij}]$ and C =$[c_{ij}] \in IVFSM_{mxn}$, Then

(i) ($\tilde{A}$□ $\tilde{B}$) □ C□ =$\tilde{A}$□($\tilde{B}$□ C□)
(ii) ($\tilde{A}$□ $\tilde{B}$)□ C□ =$\tilde{A}$□($\tilde{B}$□ C□)

Proof:

(i) ($\tilde{A}$□ $\tilde{B}$) □ C□ =[max (μ_{AL},μ_{BL}), max (μ_{AU},μ_{BU})] □(μ_{CL},μ_{CU})
=[max (μ_{AL},μ_{BL} μ_{CL}), max (μ_{AU},$\mu_{BU,}$ μ_{CU})]

$=(\mu_{AL},\mu_{AU})\square[\max(\mu_{BL}\ \mu_{CL}), \max(\mu_{BU,}\ \mu_{CU})]$

$=\tilde{A}\square(\tilde{B}\square\ C\square)$

(ii) $(\tilde{A}\square\ \tilde{B})\square\ \ C\square = [\min(\mu_{AL},\mu_{BL}), \min(\mu_{AU},\mu_{BU})]\square\ (\mu_{CL},\mu_{CU})$

$=[\min(\mu_{AL},\mu_{BL}\ \mu_{CL}), \min(\mu_{AU},\mu_{BU,}\ \mu_{CU})]$

$=(\mu_{AL},\mu_{AU})\square\ [\min(\mu_{BL}\ \mu_{CL}), \min(\mu_{BU,}\ \mu_{CU})]$

$=\tilde{A}\square(\tilde{B}\square\ C\square)$

Proposition: 3.3 [Idempotency law]

Let A = $[a_{ij}] \in IVFSM_{mxn}$, Then

(i) $\tilde{A}\square\ \tilde{A} = \tilde{A}$

(ii) $\tilde{A}\square\tilde{A} = \tilde{A}$

Proof:

(i) $\tilde{A}\square\ \tilde{A} = [\max(\mu_{AL},\mu_{AL}), \max(\mu_{AU},\mu_{AU})]$

$=(\mu_{AL},\mu_{AU})$

$= \tilde{A}$

(ii) $\tilde{A}\square\ \tilde{A} = [\min(\mu_{AL},\mu_{AL}), \min(\mu_{AU},\mu_{AU})]$

$=(\mu_{AL},\mu_{AU})$

$= \tilde{A}$

Proposition: 3.4 [Demorgon's law]

Let A = $[a_{ij}]$, B = $[b_{ij}] \in IVFSM_{mxn}$, Then

(i) $(\tilde{A}\square\ \tilde{B})^C = \tilde{A}^C\square\ \tilde{B}^C$

(ii) $(\tilde{A}\square\ \tilde{B})^C = \tilde{A}^C\square\ \tilde{B}^C$

Proof:

(i) $(\tilde{A}\square\ \tilde{B})^C = [\ \max(\mu_{AL},\mu_{BL}), \max(\mu_{AU},\mu_{BU})]^{\ C}$

$= \{1-\max(\mu_{AU},\mu_{BU}), 1-\max(\mu_{AL},\mu_{BL})\ \}$

$=\{\min(1-\mu_{AU}, 1-\mu_{BU}), \min(1-\mu_{AL}, 1-\mu_{BL})$

$= \tilde{A}^C\square\ \tilde{B}^C$

(ii) $(\tilde{A}\square\ \tilde{B})^C = [\ \min(\mu_{AL},\mu_{BL}), \min(\mu_{AU},\mu_{BU})]^{\ C}$

$= \{1-\min(\mu_{AU},\mu_{BU}), 1-\min(\mu_{AL},\mu_{BL})\ \}$

$=\{\max(1-\mu_{AU}, 1-\mu_{BU}), \max(1-\mu_{AL}, 1-\mu_{BL})\}$

$= \tilde{A}^C\square\ \tilde{B}^C$

IV. INTERVAL VALUED FUZZY SOFT MATRIX IN DECISION MAKING

In this section, We proposed the definition of interval valued fuzzy soft matrix in decision problem.

Value Matrix : 4.1

Let A = $[a_{ij}] \in IVFSM_{mxn}$, where aij = (μ_{AL}, μ_{AU}).

Then we define the value matrix of Interval valued fuzzy soft matrix is □ (A) = $[a_{ij}]$ = $[\mu_{AL} - \mu_{AU}]$.

Score matrix:4.2

If A = $[a_{ij}] \in IVFSM_{mxn}$,B = $[b_{ij}] \in IVFSM_{mxn}$

Then we define score matrix of A and B as $S_{(A,B)}$ = $[d_{ij}]_{mxn}$. Where □ $[d_{ij}]$ = □ (A)-□(B).

Total Score: 4.3

Let A = $[a_{ij}] \in IVFSM_{mxn}$,B = $[b_{ij}] \in IVFSM_{mxn}$

Let the corresponding value matrices be □ (A),□ (B) and their score matrix is $S_{(A,B)}$ = $[d_{ij}]_{mxn}$then we define Total score for each C_i in U is $S_i = \sum_{j=1}^{n} d_{ij}$.

V. METHODOLOGY

Suppose U is a set of candidates appearing in an interview for appointment is manager post in a company. Let E is a set of parameters related to managerial level of candidates. We construcet IVFSS (F,E) over Urepresent the selection of candidate by field expert X, where F is mapping F: E $\rightarrow$ IF^U,IF^U is the collection of all interval valued fuzzy subsets of U. We further construct another IVFSS (G,E) over U represent the selection of candidate by field expert Y, where G is mapping G : E $\rightarrow$ IF^U,IF^U is the collection of all interval valued fuzzy subsets of U. The matrices A and B corresponding to the interval valued fuzzy soft sets (F,E) and (G,E) are constructed, we compute the complement $(F,E)^C$ and $(G,E)^C$ and their matrices A^C and B^Ccorresponding to $(F,E)^C$ and $(G,E)^C$respectively. Compute Ã□ B̃ which is the maximum membership of nor selection of candidates by the judges using def. (4.1) compute □ (Ã□ B̃),□ ($\tilde{A}^C$□ $\tilde{B}^C$)S (A□ B),(A^C□ B^C) and the total score S_i for each candidates in U finally find S_j = max (S_i), then conclude than the candidate Cj has selected by the judges. If $S_j$has more than are value the process is repealted by reassessing the parametes.

VI. ALGORITHM

Step: 1: Inputthe interval valued fuzzy soft set (F,E),(G,E) and obtain the interval valued fuzzy soft matrices A,B corresponding to (F,E) and (G,E) respectively.

Step: 2:Write the interval valued fuzzy soft complement set $(F,E)^C$,$(G,E)^C$ and obtain value for the interval valued fuzzy soft matrix A^C,B^C corresponding to $(F,E)^C$ and $(G,E)^C$ respectively.

Step: 3: Compute (Ã□ B̃), ($\tilde{A}^C$□ $\tilde{B}^C$),□ (Ã□ B̃),□ ($\tilde{A}^C$□ $\tilde{B}^C$) ,$S_{((A□ B),(A^C □ B^C))}$.

Step: 4: Compute the total score S_i for each C_i in ∪.

Step: 5: Find C for which max (S_i). Then we conclude that the candidates $C_i$is selected for the post. Incase max $S_i$occurs for more than one value, Then repeat the process by reassessing. The parameter.

VII. CASE STUDY

Let (F,E) and (G,E) be two interval valued fuzzy soft set representing the selection of four candidates form the universal set U = $\{C_1,C_2,C_3,C_4\}$ by the expert X and Y. Let E = $\{e_1,e_2,e_3\}$ be the set of parameters which stand for confident, presence of mind and willingness to take risk.

$(F,E) = F(e_1)= \{\langle C_1,[0.7,0.8]\rangle, \langle C_2,[0.5,0.6]\rangle, \langle C_3,[0.1,0.3]\rangle, \langle C_4,[0.4,0.6]\rangle\}$

$F(e_2)= \{\langle C_1,[0.6,0.7]\rangle, \langle C_2,[0.4,0.6]\rangle, \langle C_3,[0.5,0.6]\rangle, \langle C_4,[0.7,0.9]\rangle\}$

$F(e_3)= \{\langle C_1,[0.5,0.7]\rangle, \langle C_2,[0.7,0.8]\rangle, \langle C_3,[0.6,0.8]\rangle, \langle C_4,[0.5,0.7]\rangle\}$

$(G,E) = G(e_1)= \{\langle C_1,[0.6,0.9]\rangle, \langle C_2,[0.6,0.8]\rangle, \langle C_3,[0.2,0.4]\rangle, \langle C_4,[0.6,0.7]\rangle\}$

$G(e_2)= \{\langle C_1,[0.6,0.9]\rangle, \langle C_2,[0.5,0.5]\rangle, \langle C_3,[0.6,0.8]\rangle, \langle C_4,[0.8,0.9]\rangle\}$

$G(e_3)= \{\langle C_1,[0.5,0.5]\rangle, \langle C_2,[0.8,0.9]\rangle, \langle C_3,[0.7,0.8]\rangle, \langle C_4,[0.5,0.6]\rangle\}$

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

$$\tilde{A} = \begin{matrix} \\ C1 \\ C2 \\ C3 \\ C4 \end{matrix} \begin{matrix} e_1 & e_2 & e_3 \\ \left[\begin{matrix} [0.7,0.8] & [0.6,0.7] & [0.5,0.7] \\ [0.5,0.6] & [0.4,0.6] & [0.7,0.8] \\ [0.1,0.3] & [0.5,0.6] & [0.6,0.8] \\ [0.4,0.6] & [0.7,0.9] & [0.5,0.7] \end{matrix}\right] \end{matrix} \quad \tilde{B} = \begin{matrix} \\ C1 \\ C2 \\ C3 \\ C4 \end{matrix} \begin{matrix} e_1 & e_2 & e_3 \\ \left[\begin{matrix} [0.7,0.8] & [0.6,0.7] & [0.5,0.7] \\ [0.5,0.6] & [0.4,0.6] & [0.7,0.8] \\ [0.1,0.3] & [0.5,0.6] & [0.6,0.8] \\ [0.4,0.6] & [0.7,0.9] & [0.5,0.7] \end{matrix}\right] \end{matrix}$$

Then the interval valued fuzzy soft complement matrices are

$$\tilde{A}^C = \begin{matrix} \\ C1 \\ C2 \\ C3 \\ C4 \end{matrix} \begin{matrix} e_1 & e_2 & e_3 \\ \left[\begin{matrix} [0.2,0.3] & [0.3,0.4] & [0.3,0.5] \\ [0.4,0.5] & [0.4,0.6] & [0.2,0.3] \\ [0.7,0.9] & [0.4,0.5] & [0.2,0.4] \\ [0.4,0.6] & [0.1,0.3] & [0.3,0.5] \end{matrix}\right] \end{matrix} \quad \tilde{B}^C = \begin{matrix} \\ C1 \\ C2 \\ C3 \\ C4 \end{matrix} \begin{matrix} e_1 & e_2 & e_3 \\ \left[\begin{matrix} [0.1,0.4] & [0.1,0.4] & [0.5,0.5] \\ [0.2,0.4] & [0.5,0.5] & [0.1,0.2] \\ [0.6,0.8] & [0.2,0.4] & [0.1,0.3] \\ [0.3,0.4] & [0.1,0.2] & [0.4,0.5] \end{matrix}\right] \end{matrix}$$

Then the 'OR' operation matrices are

$$\tilde{A}\square\,\tilde{B} = \begin{matrix} & e_1 & e_2 & e_3 \\ C1 & [0.7,0.8] & [0.6,0.7] & [0.5,0.7] \\ C2 & [0.5,0.6] & [0.4,0.6] & [0.7,0.8] \\ C3 & [0.1,0.3] & [0.5,0.6] & [0.6,0.8] \\ C4 & [0.4,0.6] & [0.7,0.9] & [0.5,0.7] \end{matrix} \qquad \tilde{A}^{C}\square\,\tilde{B}^{C} = \begin{matrix} & e_1 & e_2 & e_3 \\ C1 & [0.2,0.4] & [0.3,0.4] & [0.5,0.5] \\ C2 & [0.4,0.5] & [0.5,0.6] & [0.2,0.3] \\ C3 & [0.7,0.9] & [0.4,0.5] & [0.2,0.4] \\ C4 & [0.4,0.6] & [0.1,0.3] & [0.4,0.5] \end{matrix}$$

$$\square(\tilde{A}\square\,\tilde{B}) = \begin{matrix} & e_1 & e_2 & e_3 \\ C1 & -0.2 & -0.3 & -0.2 \\ C2 & -0.2 & -0.1 & -0.1 \\ C3 & -0.2 & -0.2 & -0.1 \\ C4 & -0.1 & -0.1 & -0.2 \end{matrix} \qquad \square(\tilde{A}^{C}\square\,\tilde{B}^{C}) = \begin{matrix} & e_1 & e_2 & e_3 \\ C1 & -0.2 & -0.2 & -0.0 \\ C2 & -0.1 & -0.1 & -0.1 \\ C3 & -0.2 & -0.1 & -0.2 \\ C4 & -0.2 & -0.2 & -0.1 \end{matrix}$$

Calculate the scrore matrix and the total score for selection.

$$S_{((A\square B),(A^{C}\square B^{C}))} = \begin{matrix} & e_1 & e_2 & e_3 \\ C1 & 0 & -0.1 & -0.2 \\ C2 & -0.1 & 0 & 0 \\ C3 & 0 & -0.1 & 0.1 \\ C4 & 0.1 & 0.1 & -0.1 \end{matrix}$$

$$\text{Total score} = \begin{matrix} C1 \\ C2 \\ C3 \\ C4 \end{matrix} \begin{pmatrix} -0.3 \\ -0.1 \\ 0 \\ 0.1 \end{pmatrix}$$

We see that the first candidate has the maximum value and thus conclude that from both expert's opinion, candidate C_4 is selected for the post.

VIII. CONCLUSION

In this paper, We proposed interval valued fuzzy soft matrices in application of these matrices in decision making problems. A case study have been taken to exhibit the simplicity of the technique.

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