Intuitionistic Fuzzy Soft Matrices, Compliments and Their Relations with Comprehensive Study of Medical Diagnosis

Muhammad Naveed Jafar, Faizullah, Shamraiza Shabbir, Syeda Maryam Fatima Alvi, Lubna Shaheen
Lahore Garrison University, Lahore 54000 Lahore Pakistan

Abstract: Decision making in any field is such a big issue, soft set helps to resolve such problems. In this article, it is aimed to diagnose the patients suffering with different disease using intuitionistic soft set theory we have employed compliments of IFS and its relations to diagnose the patients suffering with different diseases. Finally, we purposed a case study for the better understanding.

Keywords: Fuzzy Soft Set (FSS), Intuitionistic Fuzzy Soft Set (IFSS), Fuzzy Soft Matrices (FSM), Intuitionistic Soft Matrices (IFSM).

Introduction

In daily life the different fields of the world like economics business and medical etc, we are dealing with the uncertain data. Different theories are presented to solve these data. Which are probability, fuzzy set, intuitionistic fuzzy, rough set etc. Molodstov[13] said these theories have their own problems. In 1999 Molodstov[13] introduced a new theory which is called a soft set. This was a new theory that describes uncertainty and vengeance. This theory is used in many fields such as economics and medical etc and then, later Maji et al [9] introduced a new theory is known as fuzzy soft set based on that theory. Maji et al[9] introduced the concept of FSS as well as some properties which includes Intersection and union and complement FSS and De Morgan law etc and Ahmad and Kharal [1] made these much better. Ahmad Introduce Arbitrary fuzzy soft Intersection and union and convince De Morgan Law and De Morgan Inclusion into the fuzzy soft set. Then Majumdar et al [12] presented a theory is called fuzzy soft sets and then later Maji et al [10] introduced a new theory is called intuitionistic fuzzy soft set.

Matrices play a very important role in the computer field, Medical and Engineering etc. sometimes the classical Matrix theory fails to resolve uncertain data. And then later yang et al[20] introduced the concept of Fuzzy soft matrix and introduce a matrix that put on fuzzy soft set. and then Burah et al[2] and Neog et al [14] introduced fuzzy soft matrix and also presented an application. [4] Chetia et al introduced a intuitionistic fuzzy soft matrices.


[3] (Cagman and Enginogiti) 2012 defined fuzzy soft matrices and also constructed a decision making problem. The application of similarity between two fuzzy soft set which are based on distance was introduced by [18] (Rajeshwari and Dhanlakshmi 2012)[15] Neog bra & Sut 2012 enlighten the notations related to fuzzy soft matrices. In this paper using the definition of INFSS and solve an application in medical diagnosis.

Preliminaries

In this category, we define soft set and fuzzy soft set and intuitionistic soft set and also explain of its different types.

Soft set [5]

Suppose U be a universe set and E be a set of values. Suppose P(U) indicates the power set of U as A ≤E. A set (F_A, E) known as soft set Under Uin which F_A is processed by F_A: E →P(U) such like F_A(e)=φ if e∅A

Example 3.1

Let S= {S_1, S_2, S_3, S_4} be N set of four varieties of mobiles and N=[high quality (n_1), medium quality(n_2), low quality (n_3)] be a set of parameters if A= {n_1, n_2} ≤E . let f_A (n_1) ={S_2, S_3} and f_A(n_2) = {S_1, S_3} f_A (n_3) = {S_1, S_2, S_4}. then we write the soft set.
In this part we describe the fuzzy soft matrices based on different reference function

\[ S \in \mathcal{F}_N \] in the fuzzy set \( A \) the product of \( \text{fuzzy} \) and \( \text{membership} \) function \( \delta_{i,j}^A = \alpha_{i,j}^A \cdot \rho_{i,j}^A \) gives the fuzzy membership value of \( s_k \).

Product Of Fuzzy Soft Set[5]

Suppose \( A = [a_{i,j}^A]_{ij=1}^p \cdot [s_{i,k}^A]_{ik=1}^q \) in which \( \alpha_{i,j}^A \) and \( \rho_{i,j}^A \) act as fuzzy citations membership and fuzzy citation membership function of \( \omega_i \) so that \( \delta_{i,j}^A = \alpha_{i,j}^A \cdot \rho_{i,j}^A \) gives the fuzzy membership value of \( s_k \).

<table>
<thead>
<tr>
<th>S</th>
<th>High Quality ((\eta_1))</th>
<th>Medium Quality ((\eta_2))</th>
<th>Low Quality ((\eta_3))</th>
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<tbody>
<tr>
<td>( \widehat{s}_1 )</td>
<td>0</td>
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<tr>
<td>( \widehat{s}_2 )</td>
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<tr>
<td>( \widehat{s}_3 )</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>( \widehat{s}_4 )</td>
<td>1</td>
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</table>

Fuzzy soft subset

For two fuzzy soft set \( (\mathcal{F}_A, N) \) and \( (\mathcal{G}_B, N) \) over Acommon universe \( S \) we have \( (\mathcal{F}_A, N) \subseteq (\mathcal{G}_B, N) \) and if \( A \subseteq B \) and \( \forall \ n \in A, \mathcal{F}_A(n) \) is \( \hat{A} \) fuzzy subset of \( G_B(n) \).

Fuzzy Soft Matrices Relied Upon References Function

In this part we describe the fuzzy soft matrices based on different reference function

Fuzzy soft set [5]

Suppose \( S \) is a universal set and \( N \) set of given values. Suppose \( S \subseteq N \). A set of \( (\mathcal{F}_A, N) \) known as fuzzy softest by \( S \) in which \( F_A \) is processed by \( F_A: N \rightarrow I \) indicate the collection of fuzzy subset under \( S \) is also known as FSS.

Examine the example 3.1, now, we are not considering these two distinct value 0 and 1 only. we can deal it by a membership function in place of these values 0and 1, that are affiliated each document with a distinct value over the period \([0,1]\). Then

\[
\begin{align*}
(\mathcal{F}_A, N) &= (\{ \widehat{s}_1, \{ \widehat{s}_2, \{ \widehat{s}_3, \widehat{s}_4 \} \} \} \subseteq \mathcal{F}_N \}, \{ \widehat{s}_2, \{ \widehat{s}_3, \widehat{s}_4 \} \} \subseteq \mathcal{F}_N \}, \{ \widehat{s}_3, \widehat{s}_4 \} \subseteq \mathcal{F}_N \}\}
\end{align*}
\]

Is the fuzzy soft set? we can examine the fuzzy soft set in the following way

This set is represented the “Quality of mobile “which is Mr. Shabbir buying. we are represented the fuzzy soft set in following below the table:

Fuzzy soft matrices (FSM)

Suppose \( s^\circ = \{ s_1, s_2, s_3, \ldots, s_q \} \) the universal set of parameters are given by \( X = \{ \eta_1, \eta_2, \eta_3, \ldots, \eta_q \} \) the fuzzy soft set \( (\mathcal{F}_A, X) \) express the matrix \( A = [a_{i,j}^A]_{ij=1}^p \) or define by \([a_{i,j}^A]_{ij=1}^p \), \( k = 1, 2, 3, 4, \ldots, p \), \( i = 1, 2, 3, 4, \ldots, q \) and \([a_{i,j}^A] = [\alpha_{i,j}^A, \rho_{i,j}^A] \) where \( \alpha_{i,j}^A \) and \( \rho_{i,j}^A \) explain the fuzzy membership function . and fuzzy reference function respectively of \( s_k \) in the fuzzy set \( A \) (\( n \)) so that \( \delta_{i,j}^A = \alpha_{i,j}^A \cdot \rho_{i,j}^A \) gives the fuzzy membership value of \( s_k \).

Product Of Fuzzy Soft Set[5]

Suppose \( A = [a_{i,j}^A]_{ij=1}^p \cdot [s_{i,k}^A]_{ik=1}^q \) in which \( \alpha_{i,j}^A \) and \( \rho_{i,j}^A \) act as fuzzy citations membership and fuzzy citation membership function of \( \omega_i \) so that \( \delta_{i,j}^A = \alpha_{i,j}^A \cdot \rho_{i,j}^A \) gives the fuzzy membership value of \( \omega_i \).

And suppose \( B = [b_{j,k}]_{kj=1}^p \cdot [b_{j,k}]_{kj=1}^p \) in which \( \alpha_{j,k}^B \) and \( \rho_{j,k}^B \) act as fuzzy citations membership and fuzzy citation function of \( \omega_j \) so that \( \delta_{j,k}^B = \alpha_{j,k}^B \cdot \rho_{j,k}^B \) gives \( \hat{A} \) fuzzy membership value of \( \omega_j \), then assign \( \hat{A} \). \( \hat{B} \) the product of \( \hat{A}, \hat{B} = [d_{k,l}]_{lk=1}^p \).

For \( j = 1, 2, 3, 4, \ldots, p \)

Intuitionistic fuzzy soft set (IFSS)[6]

Suppose \( S \) a whole set and \( N \) is a group of parameters set suppose \( \hat{A} \subseteq N \), \( \hat{A} \) set \( (\hat{F}, \hat{A}) \) called intuitionistic fuzzy soft set under \( S \). Which \( \hat{F} \) is mapped for \( \hat{F}: \hat{A} \rightarrow \hat{I} \) where \( \hat{I} \) is all the collection intuitionistic soft set.
The idea of intuitionistic fuzzy soft matrices is used to diagnose those people who are suffering in these conditions; for all a, b, c, d ∈ [0, 1]. These characteristics are defined with the given conditions; for all a, b, c, d ∈ [0, 1].

Is the intuitionistic fuzzy soft set? we can examine the intuitionistic fuzzy soft set in the following way

<table>
<thead>
<tr>
<th>S</th>
<th>High Quality (n₁)</th>
<th>Medium Quality (n₂)</th>
<th>Low Quality(n₃)</th>
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<tbody>
<tr>
<td>Ĥ₁</td>
<td>(0.6,0.2)</td>
<td>(0.4,0.5)</td>
<td>(0.7,0.2)</td>
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<tr>
<td>Ĥ₂</td>
<td>(0.7,0.2)</td>
<td>(0.3,0.4)</td>
<td>(0.4,0.3)</td>
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<tr>
<td>Ĥ₃</td>
<td>(0.4,0.3)</td>
<td>(0.4,0.4)</td>
<td>(0.4,0.5)</td>
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<tr>
<td>Ĥ₄</td>
<td>(0.6,0.2)</td>
<td>(0.5,0.2)</td>
<td>(0.5,0.2)</td>
</tr>
</tbody>
</table>

Intuitionistic soft matrix (ISM)[7]
Suppose S be a universal set, N is the parameters and A⊆N. Suppose (𝓕_A, N) be an intuitionistic fuzzy soft set (IFSS) by S. The subset of SXN is defined by

$$R_{ₐ} = \{(\alpha, \eta): \eta \in A, \exists \Sigma \alpha \}$$. 

This relation is membership function and non-membership function is written by

$$\mu_{ₐ}: S \times N \rightarrow [0,1] \text{ and } V_{ₐ}: S \times N \rightarrow [0,1]$$

where

$$\mu_{ₐ}(\alpha, \eta) \in [0,1] \text{ and } V_{ₐ}(\alpha, \eta) \in [0,1]$$

in membership value and non-membership value of $\alpha \in S$ and $\eta \in$.

if $$(\mu_{惚, vi}) = \mu_{ₐ}(\alpha_i, \eta_i) \cdot V_{ₐ}(\alpha_i, \eta_i)$$ the matrix is given that

$$\begin{pmatrix}
(\mu_{11, vi1})&(\mu_{12, vi2})&\ldots&(\mu_{1n, vi1}) \\
(\mu_{21, vi1})&(\mu_{22, vi2})&\ldots&(\mu_{2n, vi1}) \\
(\mu_{31, vi1})&(\mu_{32, vi2})&\ldots&(\mu_{3n, vi1}) \\
(\mu_{m1, vi1})&(\mu_{m2, vi2})&\ldots&(\mu_{mn, vi1})
\end{pmatrix}$$

Product of Intuitionistic Fuzzy Soft Matrices
If $S=[a_{i}] \in$ intuitionistic matrices of order n×p , $fwrite=[b_{i}] \in$ intuitionistic matrices p×q , then we show $S^{*} fwrite$ , multiplication of $S$ and $fwrite$ as

$$S^{*} fwrite = \left[\begin{array}{c}
\text{max-min} (\mu_{hi}, \mu_{ji}), \text{min-max} (V_{hi}, V_{ji})
\end{array}\right], \forall i, j$$

Triangular Norm
Triangular norms related, monotonic and commutative, two specified functions t that design from $[0,1] \times [0,1]$ into $[0,1]$. These characteristics are defined with the given conditions ; for all a,b,c,d € [0,1].

Triangular Co-norms
Triangular co-norms are related, monotonic and commutative pointed function S which design from $[0,1] \times [0,1]$ into $[0,1]$. These characteristics are defined with the given conditions; for all a, b, c, d € [0,1].

Membership Value Matrix [19]
The membership value matrix interested at the matrix $Â$ like $MV(Â) = \mu_{hi} Â$, in which $z_{hi} Â = \mu_{hi} Â - V_{hi} Â$ for all $i=1,2,3,4,5,\ldots,n$ , $j=1,2,3,4,5,\ldots,\min$ which $u_i$ in the intuitionistic fuzzy soft set .

Application of Intuitionistic Fuzzy Soft Matrices in Medical Analysis
In this segment, we are describing the problem that support IFSM in medical analysis

Effect of liver inflammation and pyrexia in medical analysis
In these categories, different climates and environmental features causing several diseases for the diagnosis of different diseases, drugs are available. The liver inflammation caused by bacterial infections and chemical inflammatory agent. It effects our different organs of the body Such as kidney, gallbladder and causes jaundice. It also causes portal hypertension. Pyrexia known as chronic fever. It damages our brain especially cerebral part and leads to abnormality. The idea of intuitionistic fuzzy soft matrices is used to diagnose those people who are suffering in these diseases. Nowadays intuitionistic fuzzy soft matrices aroused in decision-making problems.
IFSM in medical analysis

Suppose S is a set of symptoms of some side effect due to liver inflammation and pyrexia. D is the side effect of diseases related to these symptoms and P is the set of patients characterized the set of symptoms presenting in the set S. We make a fuzzy soft set \( (F_A, D) \) over S. A relation matrix \( \mathcal{A} \) gets from the fuzzy soft set \( (F_A, D) \). We assign the matrix as symptoms diseases matrix.

Likewise, its complement \( (F_A, D)^c \) gives another relation matrix \( \mathcal{A}^c \) called non symptoms disease matrix. We said the matrices \( \mathcal{A} \) and \( \mathcal{A}^c \) as medical analysis of fuzzy soft set. In addition to, we construct another fuzzy soft set \( (F_B, S) \) over P. This fuzzy soft set gives the relation matrix B known as patient-symptoms matrix, and its complement \( (F_B, S)^c \) gives the relation matrix \( B^c \) known as non-symptoms matrix then using definition 3.6 above. Now we get two new relation matrices \( Z_1 = \mathcal{A} \cdot \mathcal{A}^c \) and \( Z_2 = \mathcal{A} \cdot \mathcal{A}^c \) known as symptoms patient disease and patient symptoms non disease matrix appropriately. In a same way, we get the relation matrix \( Z_3 = \mathcal{B} \cdot \mathcal{B}^c \) and \( Z_4 = \mathcal{B} \cdot \mathcal{B}^c \) known the patient non symptoms disease matrix and patient non symptoms non disease matrix respectively.

Now
\[
Z_1 = \mathcal{A} \cdot \mathcal{A}^c, \quad Z_2 = \mathcal{A} \cdot \mathcal{A}^c
\]

And using definition 3.1 we find the membership value
\[
MV(Z_1), \quad MV(Z_2), \quad MV(Z_3), \quad MV(Z_4)
\]

We compute the diagnosis score \( (S_{z_1}) \) and \( (S_{z_2}) \) for and against the diseases appriately like,
\[
(S_{z_1}) = \rho(Z_1) = \delta(Z_1) - \delta(Z_2)
\]

And
\[
(S_{z_2}) = \rho(Z_2) = \delta(Z_3) - \delta(Z_4)
\]

Then if \( max(Z_1(p, d)) \) \( - \) \( Z_2(p, d) \) appear for exactly \( (p, d) \) only.

Now we would be able to accept that diagnosis hypothesis for patient \( P_i \) is the disease \( d_k \). In this way there is connection in which hypothesis is repeated for patient \( P_i \) by assuming the symptoms.

Algorithm
1. Input the fuzz soft set \( (F_A, D) \) and calculate the \( (F_A, D)^c \) calculate the related matrices \( \mathcal{A} \) and \( \mathcal{A}^c \).
2. Input the fuzzy soft set \( (F_B, S) \). Calculate the resembling matrices \( \mathcal{B} \) and \( \mathcal{B}^c \)
3. Calculate \( Z_1 = \mathcal{A} \cdot \mathcal{A}^c, \quad Z_2 = \mathcal{A} \cdot \mathcal{A}^c \)
4. Calculate the related membership value matrix \( MV(Z_1), \quad MV(Z_2), \quad MV(Z_3), \quad MV(Z_4) \)
5. Calculate the analysis score \( Z_1 \) and \( Z_2 \)
6. Ascertain \( S_i = max(Z_1(p, d)) \) \( - \) \( Z_2(p, d) \), we determine that the patient \( P_i \) is suffering from the disease \( d_k \).
7. Suppose if \( S_i \) has up to one value then go to step1 and repeate the process by reassessing the symptoms for the patient.

Case study

Let there are three patients Ibrar, Riasat, Rizwan admit in a hospital. The symptoms are fever, Nausea, cerebral problem. Let the possible diseases related to the above symptoms be pyrexia and liver inflammation. Now, take \( M = \{p_1, p_2, p_3\} \) is the universal set. Which is \( p_1 \) , \( p_2 \) and \( p_3 \) represented patients Ibrar, Riasat, Rizwan respectively. Next, we consider the set \( S = \{n_1, n_2, n_3\} \) as universal set where \( n_1 \), \( n_2 \) and \( n_3 \) represented the symptoms fever, Nausea, cerebral respectively and the set \( D = \{d_1, d_2\} \) where \( d_1 \) and \( d_2 \) resented the parameters pyrexia, liver inflammation respectively. Let the fuzzy soft set \( (F, D) \) by \( S \), where \( F: D \rightarrow \mathcal{F} (S) \), gives an approximation result two disease and their symptoms.

Let, \( (F_A, D) \)
\[
\begin{align*}
F_A(d_1) &= \{ (n_1, 0.7, 0.2), (n_2, 0.4, 0.5), (n_3, 0.5, 0.3) \} \\
F_A(d_2) &= \{ (n_1, 0.5, 0.3), (n_2, 0.3, 0.6), (n_3, 0.6, 0.2) \}
\end{align*}
\]

The Complement \( (F_A, D)^c \) is \( (F_A, D)^c \)
\[
\begin{align*}
F_A(d_1)^c &= \{ (n_1, 0.8, 0.7), (n_2, 0.5, 0.4), (n_3, 0.7, 0.5) \} \\
F_A(d_2)^c &= \{ (n_1, 0.7, 0.5), (n_2, 0.4, 0.3), (n_3, 0.8, 0.6) \}
\end{align*}
\]

We are representing the fuzzy soft set \( (F_A, D) \) and \( (F_A, D)^c \) given the following matrices \( \mathcal{A} \) and \( \mathcal{A}^c \).

\[
\begin{align*}
d_1 & \quad d_2 \\
\end{align*}
\]

\[
\begin{align*}
d_1 & \quad d_2 \\
\end{align*}
\]
Again we take $P=\{\beta_1, \beta_2, \beta_3\}$ is the set where $\beta_1$ and $\beta_2$ and $\beta_3$ represent the patients respectively and $S=\\{\gamma_1, \gamma_0, \gamma_3\}$ as the set of parameters ,where $\gamma_1, \gamma_0$ and $\gamma_3$ represent the symptoms fever, cough , cerebral problem.

Let $(F_0, S)$ fuzzy soft set , where $F_0$ is a mapping $F_0: S \rightarrow 2^P$, gives the collection of patients and their symptoms.

Let $(F_0, S)$

$f_0(\gamma_1)=\{(\beta_1, 0.6, 0.3), (\beta_2, 0.7, 0.2), (\beta_3, 0.5, 0.4)\}$

$f_0(\gamma_2)=\{(\beta_1, 0.3, 0.6), (\beta_2, 0.4, 0.5), (\beta_3, 0.2, 0.7)\}$

$f_0(\gamma_3)=\{(\beta_1, 0.5, 0.4), (\beta_2, 0.6, 0.2), (\beta_3, 0.6, 0.3)\}$

We are representing the fuzzy soft set $(F_0, S)$ given the following matrices $B$ is known as symptoms patient matrix.

$$
\begin{align*}
\beta = & \begin{bmatrix}
\beta_1 & \beta_2 & \beta_3 \\
(0.6,0.3) & (0.7,0.2) & (0.5,0.4) \\
(0.3,0.6) & (0.4,0.5) & (0.6,0.2) \\
(0.5,0.4) & (0.2,0.7) & (0.6,0.3) \\
\end{bmatrix}
\end{align*}
$$

Complement of $(F_0, S)$ i.e. $(F_0, S)^{\circ}$ is given by

$$(F_0, S)^{\circ} = \begin{align*}
\hat{F}_0(\gamma_1)= & \{(\beta_1, 0.7, 0.6), (\beta_2, 0.8, 0.7), (\beta_3, 0.6, 0.5)\} \\
\hat{F}_0(\gamma_2)= & \{(\beta_1, 0.4, 0.3), (\beta_2, 0.5, 0.4), (\beta_3, 0.3, 0.2)\} \\
\hat{F}_0(\gamma_3)= & \{(\beta_1, 0.6, 0.5), (\beta_2, 0.8, 0.6), (\beta_3, 0.7, 0.6)\}
\end{align*}$$

We are representing the fuzzy soft set $(F_0, S)$ given the following matrices $B^{\circ}$ is known as non-symptoms patient matrix

$$
\begin{align*}
\hat{B}^{\circ} = & \begin{bmatrix}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7,0.6) & (0.8,0.7) & (0.6,0.5) \\
(0.4,0.3) & (0.5,0.4) & (0.7,0.6) \\
(0.6,0.5) & (0.3,0.2) & (0.7,0.6) \\
\end{bmatrix}
\end{align*}
$$

Thus we have

$$
\begin{align*}
\hat{Z}_1 &= \hat{B} \hat{A} = & \begin{bmatrix}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6,0.3) & (0.3,0.6) & (0.5,0.4) \\
(0.7,0.2) & (0.4,0.5) & (0.6,0.2) \\
(0.5,0.4) & (0.2,0.7) & (0.6,0.3) \\
\end{bmatrix}
\end{align*}
$$

$$
\begin{align*}
\hat{Z}_1 &= \gamma_1 \hat{A} = & \begin{bmatrix}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6,0.3) & (0.3,0.6) & (0.5,0.4) \\
(0.7,0.2) & (0.4,0.5) & (0.6,0.2) \\
(0.5,0.4) & (0.2,0.7) & (0.6,0.3) \\
\end{bmatrix}
\end{align*}
$$

$$
\begin{align*}
\hat{Z}_2 &= \hat{B} \hat{A}^{\circ} = & \begin{bmatrix}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6,0.3) & (0.3,0.6) & (0.5,0.4) \\
(0.7,0.2) & (0.4,0.5) & (0.6,0.2) \\
(0.5,0.4) & (0.2,0.7) & (0.6,0.3) \\
\end{bmatrix}
\end{align*}
$$

$$
\begin{align*}
\hat{Z}_2 &= \gamma_1 \hat{A}^{\circ} = & \begin{bmatrix}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6,0.3) & (0.3,0.6) & (0.5,0.4) \\
(0.7,0.2) & (0.4,0.5) & (0.6,0.2) \\
(0.5,0.4) & (0.2,0.7) & (0.6,0.3) \\
\end{bmatrix}
\end{align*}
$$
\[ Z_3 = \beta^\circ, \text{Å} \]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7,0.6) & (0.4,0.3) & (0.6,0.5) \\
(8,0.7) & (0.5,0.4) & (0.8,0.6) \\
(0,6,0.5) & (0,3,0.2) & (0,7,0.6) \\
\end{array}
\]

\[
\begin{array}{cccc}
n_1 & n_2 & n_3 \\
(0,7,0.2) & (0,5,0.3) \\
(0,4,0.5) & (0,3,0.6) \\
(0,5,0.3) & (0,6,0.2) \\
\end{array}
\]

\[ Z_4 = \beta^\circ, \text{Å}^2 = \]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7,0.6) & (0.4,0.3) & (0.6,0.5) \\
(8,0.7) & (0.5,0.4) & (0.8,0.6) \\
(0,6,0.5) & (0,3,0.2) & (0,7,0.6) \\
\end{array}
\]

\[
\begin{array}{cccc}
n_1 & n_2 & n_3 \\
(0,8,0.7) & (0,7,0.5) & (0,6,0.6) \\
(0,7,0.5) & (0,6,0.5) & (0,6,0.5) \\
\end{array}
\]

\[ Z_4 = \beta^\circ, \text{Å}^2 = \]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7,0.4) & (0,7,0.3) \\
(8,0.4) & (0,8,0.4) \\
(0,7,0.4) & (0,7,0.3) \\
\end{array}
\]

The memberships of \(Z_1\) and \(Z_2\) and \(Z_3\) and \(Z_4\) is \(MV(Z_1)\) and \(MV(Z_2)\) and \(MV(Z_3)\) and \(MV(Z_4)\)

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6 - 0.3) & (0.5 - 0.3) \\
(0.7 - 0.2) & (0.6 - 0.2) \\
(0.6 - 0.3) & (0.6 - 0.3) \\
\end{array}
\]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6 - 0.5) & (0.6 - 0.5) \\
(0.7 - 0.5) & (0.7 - 0.5) \\
(0.6 - 0.5) & (0.6 - 0.5) \\
\end{array}
\]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.6 - 0.5) & (0.6 - 0.5) \\
(0.7 - 0.5) & (0.7 - 0.5) \\
(0.6 - 0.5) & (0.6 - 0.5) \\
\end{array}
\]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7 - 0.5) & (0.6 - 0.5) \\
(0.7 - 0.5) & (0.6 - 0.5) \\
(0.6 - 0.5) & (0.6 - 0.5) \\
\end{array}
\]

\[
\begin{array}{cccc}
\hat{\beta}_1 & \hat{\beta}_2 & \hat{\beta}_3 \\
(0.7 - 0.5) & (0.6 - 0.5) \\
(0.7 - 0.5) & (0.6 - 0.5) \\
(0.6 - 0.5) & (0.6 - 0.5) \\
\end{array}
\]
The selection by the consumer in medical diagnosis helps us for identifications. We reach at the conclusion that the patients Ibraris suffering with diseases liver inflammation and Riasat suffering with disease is Pyrexia and Rizwan is suffering with disease liver inflammation. The result shows better approximation as than other soft relation.

### References


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