Fuzzy Soft Matrices Applied on Acne

R. Divya1 And Dr. S. Subramanian2

1. Research Scholar Department of Mathematics, PRIST University, Thanjavur, Tamilnadu, India.

2. Department of Mathematics, PRIST University, Thanjavur, Tamilnadu, India.

Abstract:

In this paper, we define fuzzy soft matrices and their basic properties. We then define fuzzy soft matrices which are matrix representations of the fuzzy soft sets. The purpose of this paper is to define different hyper of matrices in fuzzy soft set theory, we have introduced here some new operations on these matrices and discussed here all these definitions and operations by appropriate example. In this work, we define soft matrices and their operations which are more functional to make theoretical studies in the soft set theory.
We describe soft matrix products, and their properties. We finally constructed a soft max–min decision making method which can be successfully applied to the problems that contain uncertainties.

Key Words:

Soft set, fuzzy soft set (FSS), Fuzzy Soft Matrices (FSM), Fuzzy Soft Complement Matrices, Null Set, Fuzzy Soft Class, Acne.

I.Introduction:

Molodtsov [1] also described the concept of "Soft Set Theory" having Parameterizations tools for dealing with uncertainties. Researchers on soft set theory have received much attention in recent years. Magi and Roy [3,4] first introduced soft set into decision making problems. Maji et al., [2] introduced the concept of fuzzy soft sets by combining soft sets and fuzzy sets. Cagman and Enginoglu [5] defined soft matrices which were a matrix representation of the soft sets and constructed a soft max – min decision making method. Cagman and Enginoglue [6] defined fuzzy soft matrices and constructed a decision making problem. Borah et al.,[7] extended fuzzy soft matrix theory and its application. Maji and Roy[8] presented a novel method of object from an imprecise multi – observer data to deal with decision making based on fuzzy soft sets.

II. Preliminaries:

Definition (2.1):

Soft Set:

Let U be the initial universe set, and let E be the set of parameters. Let □(□) refers to the power set of U. A pair (□□, □) is referred to as a soft set over U, where □□ is a mapping,

$$□_□ \quad □ \; □ \rightarrow □(□)$$

In other words, a soft set over U is a parameterized subset family of the Universe U.

Definition (2.2):

Fuzzy Soft Set:

Let U be an initial universe, E be the set of all parameters and □ □ □. A pair (□, □) is called a fuzzy soft set over U where □ □ □ → □(□) is a mapping from A into (□), Where P(U) denotes the collection of all subsets of U.

Definition (2.3):
Fuzzy soft Class:

Let U be an initial set of universes, and let E be the set of attributes.
The Pair (U, E) then denotes the set of all fuzzy soft sets on U with E attributes and is called a fuzzy soft pair.

Definition (2.4):
Fuzzy Soft Subset:

For two fuzzy soft sets $(□_□, □)$ and $(□_□, □)$ Over a common universe U, we have $(□_□, □)$ □ $(□_□, □)$ if □ □ □ and for all □ □ □, $□_□(□)$ is a fuzzy soft subset of $□_□(□)$, i.e., $(□_□, □)$ is a fuzzy soft subset of $(□_□, □)$.

Definition (2.5):
Fuzzy soft complement set:

The complement of fuzzy soft set $(□_□, □)$ denoted by $(□_□, □)$ is defined by,

$$(□_□, □)^{\circ} = (□_□^{\circ}, □)$$

Where $□_□^{\circ} : □ \to □^□$ Is a mapping given by $□_□^{\circ}(□) = [□(□)]^{\circ}$ for all □ □ □.

Definition (2.6):
Fuzzy Soft Null Set:

A fuzzy soft set $(□_□, □)$ over U is said to be null fuzzy soft set with represent to the parameter denoted by Ø, if $□_□(□) = □$ for all e ∈ E

Definition (2.7):
Fuzzy Soft Matrix:

Let $□ = \{□_1, □_2, □_3, □_4, \ldots □_□$ be the universal set and E be the set of parameters given by $□ = \{1, □_1, □_2, □_3, □_4, \ldots □_□$ then the fuzzy soft set $(□_□, □)$ can be expressed in matrix form as or simply by $[□_{□□}{}^□]$, $□ = 1,2,3, \ldots □; □ = 1,2,3, \ldots □$ and $[□_{□□}{}^□] = [(□_{□□}{}^□, □_{□□}{}^□)]$ Where $□_{□□}{}^□$ and $□_{□□}{}^□$ represent the fuzzy membership function U in the fuzzy set $□_□(□_□)$ so that gives the fuzzy membership value of U.

We shall identify a fuzzy soft matrix and use these two concepts interchangeably. The set of all $m \times n$ fuzzy soft matrices over U will be denoted by $□□□_{□\times□}$ for usual fuzzy sets with fuzzy reference function 0, it is obvious to see that $□_{□□}{}^□ = [(□_{□□}{}^□, 0)]$ for all i, j .

Definition (2.8):
Membership value function:

The membership value of the matrix corresponding to the matrix □ as $□□(□) = [□_{□□}{}^□]_{□\times□}$ where $□_{□□} = □_{□□}{}^□ - □_{□□}{}^□$ for all $□ = 1,2,3, \ldots □, □ = 1,2,3, \ldots □$
Where $□_{□□}{}^□$ and $□_{□□}{}^□$ represent the fuzzy membership function and fuzzy reference function of U in the fuzzy set $□_□(□_□)$.

Definition (2.9):
Fuzzy Soft Complement Matrix:

Let $□ = [□_{□□}{}^□]_{□\times□}$, then complement of □ is denoted by $□ = [(□_{□□})]$ where $□_{□□} = 1 - □_{□□}{}^□$ for all i and j.

Definition (2.10):
Addition of Fuzzy Soft Matrices:

Let $U = \{u_1, u_2, u_3, u_4, \ldots u_m\}$ be the universal set and E be the set of parameters given by $E = \{e_1, e_2, e_3, e_4, \ldots e_n\}$. Let the set of all $m \times n$ fuzzy soft matrices over U be $FSM_{m\times n}$.

Let $\tilde{A}, \tilde{B} \in FSM_{m\times n}$

Where,
$\tilde{A} = [a_{ij}^{\,}]_{m\times n}, [a_{ij}] = [a_{ij}^{L}, a_{ij}^{U}]$ and

$\tilde{B} = [b_{ij}]_{m\times n}, [b_{ij}] = [b_{ij}^{L}, b_{ij}^{U}]$ to avoid degenerate case, we assume that.
$\min[(a_{ij}^{L}, a_{ij}^{U})] \geq \max[(b_{ij}^{L}, b_{ij}^{U})]$ for all i and j.

we defined the operation addition (+) between $\tilde{A}$ and $\tilde{B}$ as $\tilde{A} + \tilde{B} = \tilde{C}$ where $\tilde{C} = [c_{ij}]_{m\times n}$
$c_{ij} = (\max(a_{ij}, b_{ij}), \min(a_{ij}, b_{ij}))$ and subtraction (-) between $\tilde{A}$ and $\tilde{B}$ As $\tilde{A} - \tilde{B} = \tilde{C}$
where $= [c_{ij}]_{m\times n}$, $c_{ij} = (\min(a_{ij}, b_{ij}), \max(a_{ij}, b_{ij}))$

Definition (2.11)
Score Matrix:

Let $\tilde{A}, \tilde{B} \in FSM_{m\times n}$. Let the corresponding membership value matrices be

$MV(\tilde{A}) = [a_{ij}]_{m\times n}$ and $(\tilde{B}) = [b_{ij}]_{m\times n}$, $i = 1,2,3, \ldots m$; $j = 1,2,3,4, \ldots n$

Then the Score matrix $S_{(A,B)}$ would be defined as

$$S_{(A,B)} = [d_{ij}]_{m\times n} \text{ where } d_{ij} = a_{ij} - b_{ij}$$

Definition (2.12):
Total Score Matrix:

Let $\tilde{A}, \tilde{B} \in FSM_{m\times n}$. Let the corresponding membership value matrices be $MV(\tilde{A}) = [a_{ij}]_{m\times n}$ respectively and the score matrix be.

$$S(A, B) = MV_{A} - MV_{B}$$

$i = 1,2,3, \ldots m$; $j = 1,2,3,4, \ldots n$.

Then the total score for each u, in U would be calculated by the formula.

$$S = \sum[a_{ij} - b_{ij}] = \sum[(a_{ij}^{L}, a_{ij}^{U}) - (b_{ij}^{L}, b_{ij}^{U})]$$

Definition (2.13):
Acne:

Acne also known as pimples is a skin condition that occurs when your hair follicles become plugged with oil and dead skin cells. It often causes whiteheads, blackheads or pimples, and usually appears on the face, forehead, chest, upper back and shoulders. Acne is most common among teenagers, though it affects people of all ages.

III. Algorithm:

1. Input the fuzzy soft matrices (F_A, E) and (F_B, E) Also write the fuzzy soft matrices.

   $\tilde{A}$ and $\tilde{B}$ commensurate to (F_A, E) and (F_B, E) respectively.

2. Write the fuzzy soft matrices $(F_A, E)^{c}$ and $(F_B, E)^{c}$ Also write the fuzzy soft matrices

   $\tilde{A}$ and $\tilde{B}$ corresponding to $(F_A, E)^{c}$ and $(F_B, E)^{c}$ respectively.

3. Compute □ − □ and □□(□ − □)
4. Compute □ − □ and □□(□ − □)
5. Compute the score matrix $□_{((□-□),(□-□))}$
6. Compute the total score $□_□$ for such $□_□$ in □.
7. Find $□_□$ = □□□($□_□$)
8. If $□_□$ has more than one value, then go step (1) and repeat the process by reassessing the parameters.

IV. Case Study:

Consider 4 Patients are denoted by the set P and the set of □ = $□_1, □_2, □_3, □_4$ and the set of symptoms,

□ = { □h□□h□□□□, □□□□□h□□□□, □□□□□ □□□ □□□□□, □□□□□ □□□□□ □□□□□□□□ □□□□□ □□□□□ □h□ □□□□, □□□□□□□□□ □□□□□ □□□□□ □h□ □□□□ }

Let the set of diseases □ = {□□□□□ 1, □□□□□ 2, □□□□□ 3, □□□□□ 4}

Step 1:

$(□_□, □) = (□_□, □_1) = \{(□_1, 0.6, 0.0), (□_2, 0.8, 0.0)(□_3, 0.5, 0.0), (□_4, 0.3, 0.0)\}$

$(□_□, □_2) = \{(□_1, 0.9, 0.0), (□_2, 0.7, 0.0)(□_3, 0.4, 0.0), (□_4, 0.7, 0.0)\}$

$(□_□, □_3) = \{(□_1, 0.6, 0.0), (□_2, 0.8, 0.0)(□_3, 0.6, 0.0), (□_4, 0.3, 0.0)\}$

$(□_□, □_4) = \{(□_1, 0.8, 0.0), (□_2, 0.2, 0.0)(□_3, 0.4, 0.0), (□_4, 0.5, 0.0)\}$

$(□_□, □) = (□_□, □_1) = \{(□_1, 0.8, 0.0), (□_2, 0.9, 0.0)(□_3, 0.6, 0.0), (□_4, 0.3, 0.0)\}$

$(□_□, □_2) = \{(□_1, 0.2, 0.0), (□_2, 0.4, 0.0)(□_3, 0.5, 0.0), (□_4, 0.7, 0.0)\}$

$(□_□, □_3) = \{(□_1, 0.9, 0.0), (□_2, 0.7, 0.0)(□_3, 0.6, 0.0), (□_4, 0.2, 0.0)\}$

$(□_□, □_4) = \{(□_1, 0.7, 0.0), (□_2, 0.6, 0.0)(□_3, 0.5, 0.0), (□_4, 0.3, 0.0)\}$

Step 2:

$$\tilde{A}^{\circ} = \begin{array}{c} \\ \end{array}\begin{matrix} d_1 & d_2 & d_3 & d_4 \end{matrix}$$

$$\tilde{A}^{\circ} = \begin{bmatrix} (1, 0.6) & (1, 0.8) & (1, 0.5) & (1, 0.3) \\ (1, 0.9) & (1, 0.7) & (1, 0.4) & (1, 0.7) \\ (1, 0.6) & (1, 0.8) & (1, 0.6) & (1, 0.3) \\ (1, 0.8) & (1, 0.2) & (1, 0.4) & (1, 0.5) \end{bmatrix}$$

$$\widetilde{B}^{\circ} = \begin{array}{c} \\ \\ \\ \\ \end{array}\begin{matrix} d_1 & d_2 & d_3 & d_4 \\ \end{matrix}$$

$$\widetilde{B}^{\circ} = \begin{bmatrix} (1, 0.8) & (1, 0.9) & (1, 0.6) & (1, 0.3) \\ (1, 0.2) & (1, 0.4) & (1, 0.5) & (1, 0.7) \\ (1, 0.9) & (1, 0.7) & (1, 0.6) & (1, 0.2) \\ (1, 0.7) & (1, 0.6) & (1, 0.5) & (1, 0.3) \end{bmatrix}$$

Step 3:

$$\widetilde{A} - \widetilde{B} = \begin{bmatrix} (0.6, 0.0) & (0.8, 0.0) & (0.5, 0.0) & (0.3, 0.0) \\ (0.2, 0.0) & (0.4, 0.0) & (0.4, 0.0) & (0.7, 0.0) \\ (0.6, 0.0) & (0.7, 0.0) & (0.6, 0.0) & (0.2, 0.0) \\ (0.7, 0.0) & (0.2, 0.0) & (0.4, 0.0) & (0.3, 0.0) \end{bmatrix}$$

$$\mu\nu(\widetilde{A} - \widetilde{B}) = \begin{pmatrix} 0.6 & 0.8 & 0.5 & 0.3 \\ 0.2 & 0.4 & 0.4 & 0.7 \\ 0.6 & 0.7 & 0.6 & 0.2 \\ 0.7 & 0.2 & 0.4 & 0.3 \end{pmatrix}$$

Step 4:

$$\widetilde{A}^{\circ} - \widetilde{B}^{\circ} = \begin{bmatrix} (1, 0.8) & (1, 0.9) & (1, 0.6) & (1, 0.3) \\ (1, 0.9) & (1, 0.7) & (1, 0.5) & (1, 0.7) \\ (1, 0.9) & (1, 0.8) & (1, 0.6) & (1, 0.3) \\ (1, 0.8) & (1, 0.6) & (1, 0.5) & (1, 0.5) \end{bmatrix}$$

$$\mu\nu\left(\widetilde{A}^{\circ} - \widetilde{B}^{\circ}\right) = \begin{pmatrix} 0.2 & 0.1 & 0.4 & 0.7 \\ 0.1 & 0.3 & 0.5 & 0.3 \\ 0.1 & 0.2 & 0.4 & 0.7 \\ 0.2 & 0.4 & 0.5 & 0.5 \end{pmatrix}$$

Step 5:

$$S\left(\mu\nu(\widetilde{A} - \widetilde{B}) - \mu\nu\left(\widetilde{A}^{\circ} - \widetilde{B}^{\circ}\right)\right)$$

$$= \left(\begin{matrix} 0.4 & 0.7 & 0.1 & -0.4 & 0.7 \\ 0.1 & 0.1 & -0.1 & 0.4 & 0.4 \\ 0.5 & 0.5 & 0.2 & -0.5 & 0.5 \\ 0.5 & -0.2 & -0.1 & -0.2 & 0.5 \end{matrix}\right)$$

Step 6:

$$\text{Total Score} = \begin{pmatrix} 0.7 & \square_1 \\ 0.4 & \square_2 \\ 0.5 & \square_3 \\ 0.5 & \square_4 \end{pmatrix}$$

V. Conclusion:

We see that Patient $\square_1$ suffering more than others. We represent new operations handling fuzzy soft matrices. According to these operations we established new results on fuzzy soft matrices. Finally, a problem based on decision making theory is solved by an algorithm which we presented in this paper.

Reference:

[1]. B. Ahmad and A.Kharal, on fuzzy soft sets, advances in fuzzy systems, (2009), 1-6

[2]. https://medlineplus.gov/hemorrhoids.html

[3]. https://www.ayurvedacollege.com/articles/students/turmeric

[4]. Krass imij Atanassor. Intuitionistic fuzzy sets, Theory and Application, Physica – Verlag, wyrzburg(1999)

[5]. Molodtsor Dmitri. Soft set Theory, First Result, Computers and Mathematics with Applications, 37 (1999) 19 -31

[6]. Manash jyoti Borach, Tridiv Jyoti Neog, Dusmanta Kumar Sut, fuzzy soft matrix theory and its international journal of modern engineering Research 2012; 2(2) :121-127

[7]. Y.B. Jun and (H. Park, Applications of soft sets in ideal theory of BCK / BCI – algebras, Information sciences, 178(2008), 2466- 2475

[8]. Y.B. Jun, K.J. Lee, J. Zhan, Soft P- ideals of Soft BCI – algebras, computers and mathematics with application, 58 (2009), 2060- 2068.

[9]. Yong yang, Chenli Ji, Fuzzy soft matrices and Their applications. AICI part I, LNA17002,2011, 618 -627.

[10]. Zedeh La. Fuzzy sets information and control. 1965; 8. 338-353

Dr. T. Geetha "Fuzzy Soft Matrices Applied In Yoga On Hemorrhoid "International Journal of Engineering Science Invention (IJESI), vol. 07, no. 10, 2018, pp 32-36

AUTHORS PROFILE:

1) Dr. S. Subramanian M.Sc.,M.Phil.,Ph.D., Assiatant Professor Department Of Mathematics , PRIST Deemed to be University, Thanjavur – 613 403, Tamilnadu, India. Contact No: (+91) 94867 05264 Email ID: mathsspmanian@gmail.com

2) Ms.R.Divya M.Sc.,B.Ed.,M.Phil., PRIST Deemed to be University, Thanjavur – 613403, Tamilnadu, India. Contact No: (+91) 9789163178 Email ID: divyadeepan.v@gmail.com. She has 1 year teaching experience in Dharmambal Ramaswamy Arts And Science College. Her current research focuses in the area of Fuzzy Matrix in Medical Diagnosis.