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FUZZY SOFT MATRIX IN MEDICAL APPLICATION

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ABSTRACT

In this paper the patients having symptoms of typhoid like paratyphoid fever, Salmonella paratyphoid bacteria have been collected. The awareness for the different types of symptoms Malaise, headache, sore throat, cough, abdominal pain, constipation in the field of medical diagnosis can be made using fuzzy soft matrix here the fuzzy soft matrix is applied in the proposed algorithms are used to finding typhoid affected patients based on the algorithms to identify the disease affected member and rectify the disease.

KERWORDS: fuzzy soft set, fuzzy soft matrix, typhoid treatment.

1. INTRODUCTION

The main concept of fuzzy set theory was introduced by Zadeh .L.A ([10]). It was explained by Molodtsov .D ([5]). Fuzzy set considered as general mathematical and it is not clearly defined the object. The theory was developed into several basic notations of soft set theory Maji P.K ([3]) developed the theory again. In ([3]) Maji and in ([4]) Majumdar .P extended fuzzy soft matrix and its medical application. In fuzzy gentle matrix theory accordingly ([6]) proposed new definitions for fuzzy set and its kinds. In ([2]) Hornick .R.B pathogenesis of typhoid fever and we are going see medicine for typhoid disease. Also extended and implemented some operations on it.

2. PRELIMINARIES

In this section, to recall some basic notion of fuzzy soft set theory and fuzzy soft matrices.

2.1 DEFINITION

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⊆EA pair (F, E) is called a soft set over U, where F_A is mapping given by F:E→P(U) such that F(e)= ψ if $\notin A$ here P is called approximate function of the soft set (F,E). The set F(e) is called e-approximate value set which consist of related objects of the parameter e∈ F.

EXAMPLE 1

Let U= {u_1, u_2, u_3, u_4} be set of four varieties of cloths and E={High Quality(e1), Medium Quality(e2), Low Quality(e3)} be the set of parameters. If E= {e1, e2} ⊆E. Let F(e1)={u_1,u_2,u_3,u4}and F(e2)={(e1,{u_1,u_2,u_3,u_4}),(e2{u_1,u_2,u_3)} over U which describe the "Quality of cloths" which may represent the soft set in the following form

TABLE 1

U	e1	e2	e3
u_1	1	1	0
u_2	1	1	0
u_3	1	1	0
u_4	1	0	0

2.2 DEFINITION

Let U be an initial universe set and E be a set of parameters. Let A ⊆E. A pair (F,A) is called a fuzzy soft set (FSS) over U, where F is a mapping given by F:AI^u, where I^u denotes the collection of all fuzzy subset of U.

2.2.1 DEFINITION

A pair (F, A) is called a fuzzy soft set over U where F: A→ $\tilde{p}$(U) is a mapping from A into $\tilde{p}$(U).

2.2.2 DEFINITION

Let U be universe and E a set of attributes. Then the pair (U, E) denotes the collection of all fuzzy soft sets on U with attributes from E, and is called a fuzzy soft class.

2.2.3 DEFINITION

The complement of a fuzzy soft set in a soft (F,A) is denotes by $(F,A)^C$ and is defined by $(F,A)^c=(F^c, A)$ where F^c: A → $\tilde{p}$(U) is mapping given by $F^c(\alpha)=[F(\alpha)]^c$, $\forall\ \alpha \in$A.

EXAMPLE 2

Consider the example 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)=F(e1)={(u_1,0.3),(u_2,0.4),(u_3,0.2),(u_4,0.5)},F(e2)={(u_1,0.6),(u_2,0.7),(u_3,0.8)}. Is the fuzzy soft set representing the " Quality of cloths " which Mrs. John is going to buy we may represent the fuzzy soft in the following

TABLE 2

U	e1	e2	e3
u_1	0.3	0.6	0.0
u_2	0.4	0.7	0.0
u_3	0.2	0.8	0.0
u_4	0.5	0.0	0.0

2.3 DEFINITION

Let (F,E) be a fuzzy soft set over U. T hen a subset U× E is uniquely define by R_A={(u ,e): e∈A, u∈F_A(e)} which is called a relation form of (F,E). Now the characteristic of R_A is written by, μ_{RA}: U× E→ [0,1] such that μ_{RA}(u ,e) is the membership value of the object u∈ U for each e∈ E. If [μi j]= $\mu_{RA}(u_i,e_j)$, we can define a matrix

$$[\mu i\ j]_{mxn}=\begin{bmatrix} \mu 11 & \mu 12 & \dots \mu 1n \\ \mu 21 & \mu 22 & \dots \mu 2n \\ \mu m1 & \mu m2 & \dots \mu mn \end{bmatrix}$$

Which is called a fuzzy soft matrix of order m×n corresponding to the fuzzy soft set (F_A,E) over U

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2.3.1 DEFINITION

Let A=[ai j]$_{mxn}$, B=[bi j]$_{mxn}$ be two fuzzy soft matrix. Then A is fuzzy soft sub matrix of B, denoted by A$\tilde{\subseteq}$B , if $a_{ij} \leq b_{ij}$, ∀ i,j.

3. METHODOLOGY

Let us assume that there is a set of m patients P={p_1,p_2,p_3,…p_m} with the set of n symptoms S={s_1,s_2,s_3,…s_n} related to a set of k disease D={d_1,d_2,d_3,…d_k}. We apply fuzzy soft set technology to application which patient is suffering from what disease are paratyphoid fever, salmonella typhoid bacteria have been collected we construct a fuzzy soft set (F,P) over S where F is mapping F:P→ IF^S is the collection of all fuzzy subsets of S. This fuzzy soft set gives a relation matrix B called symptom-disease matrix where each element denote the weight of the symptoms for a certain diseases. Compute A^c. B^c which is the maximum membership of non occurrence of symptoms of the disease.

4. ALGORITHM

1. Input fuzzy soft sets (G,S) and (F,D) then obtain the fuzzy soft matrix A, B corresponding to (G,D) and (F,D) respectively.
2. Write the fuzzy soft complement of $(G,S)^c$, $(F,D)^c$ and obtain the fuzzy soft matrix A^c ,B^c
3. Find P for which max (S_i) for each patients p_i. Then the patients p_i is suffering from disease D_j.
4. The disease affected the member and rectifying the disease.

5. CASE STUDY

Let results for $P=\{p_1,p_2,p_3\}$ as the universal set where P is represents Ravi, Ram and Surya with the symptoms $S=\{s_1,s_2,s_3\}$ as the set of symptoms where S represents are sore throat, headache, cough and let the possible diseases relating above the symptoms $D=\{d_1,d_2,d_3\}$ be paratyphoid fever, typhoid fever, salmonella paratyphoid .

STEP1

(G,S) over P. Where G is a mapping $G:S\rightarrow I^P$, gives a collection of an approximation of patient symptoms in the hospital.

$(G,S)=G(s_1)=\{(p_1,0.1,0.2), (p_2,0.5,0.4),(p_3,0.3,0.6)\},G(s_2)=\{(p_1,0.5,0.4),(p_2,0.2,0.3),(p_3,0.5,0.1)\}$

$G(s_3)=\{(p_1,0.3,0.6),(p_2,0.5,0.1),(p_3,0.6,0.2)\}$.

$$A=\begin{array}{c} \\ p1 \\ p2 \\ p3 \end{array}\begin{array}{c} \begin{array}{ccc} s1 & s2 & s3 \end{array} \\ \begin{pmatrix} (0.1,0.2) & (0.5,0.4) & (0.3,0.6) \\ (0.5,0.4) & (0.2,0.3) & (0.5,0.1) \\ (0.3,0.6) & (0.5,0.1) & (0.6,0.2) \end{pmatrix} \end{array}$$

(F,D) over S . Where F is a mapping $F:D\rightarrow I^P$, gives a collection of an approximation value of fuzzy soft medical knowledge of the three diseases and their symptoms.

$(F,D) =F(d_1)=\{(s_1,0.5,0.3), (s_2,0.8,0.1),(s_3,0.2,0.3)\}$, $F(d_2)=\{(s_1,0.1,0.6), (s_2,0.4,0.3),(s_3,0.3,0.6)\}$,

$F(d_3)=\{(s_1,0.7,0.1), (s_2,0.5,0.2),(s_3,0.4,0.5)\}$.

$$B=\begin{array}{c} \\ s1 \\ s2 \\ s3 \end{array}\begin{array}{c} \begin{array}{ccc} d1 & d2 & d3 \end{array} \\ \begin{pmatrix} (0.5,0.3) & (0.1,0.6) & (0.7,0.1) \\ (0.8,0.1) & (0.4,0.3) & (0.5,0.2) \\ (0.2,0.5) & (0.3,0.6) & (0.4,0.5) \end{pmatrix} \end{array}$$

STEP 2

$$A^c=\begin{array}{c} \\ p1 \\ p2 \\ p3 \end{array}\begin{array}{c} \begin{array}{ccc} s1 & s2 & s3 \end{array} \\ \begin{pmatrix} (0.2,0.1) & (0.4,0.5) & (0.6,0.3) \\ (0.4,0.5) & (0.3,0.2) & (0.1,0.5) \\ (0.6,0.3) & (0.1,0.5) & (0.2,0.6) \end{pmatrix} \end{array}$$ and

$$B^c=\begin{array}{c} \\ s1 \\ s2 \\ s3 \end{array}\begin{array}{c} \begin{array}{ccc} d1 & d2 & d3 \end{array} \\ \begin{pmatrix} (0.3,0.5) & (0.6,0.1) & (0.1,0.7) \\ (0.1,0.8) & (0.3,0.4) & (0.2,0.5) \\ (0.5,0.2) & (0.6,0.3) & (0.5,0.4) \end{pmatrix} \end{array}$$

STEP 3

$$A.B=\begin{array}{c} \\ p1 \\ p2 \\ p3 \end{array}\begin{array}{c} \begin{array}{ccc} d1 & d2 & d3 \end{array} \\ \begin{pmatrix} (0.5,0.3) & (0.4,0.4) & (0.5,0.2) \\ (0.5,0.3) & (0.3,0.3) & (0.5,0.3) \\ (0.5,0.1) & (0.4,0.3) & (0.4,0.2) \end{pmatrix} \end{array}$$

$$A^c.B^c=\begin{array}{c} \\ p1 \\ p2 \\ p3 \end{array}\begin{array}{c} \begin{array}{ccc} d1 & d2 & d3 \end{array} \\ \begin{pmatrix} (0.5,0.3) & (0.6,0.1) & (0.5,0.4) \\ (0.3,0.5) & (0.4,0.4) & (0.2,0.5) \\ (0.3,0.5) & (0.6,0.3) & (0.2,0.5) \end{pmatrix} \end{array}$$

d1 d2 d3

$$V(A,B)=\begin{matrix}p1\\p2\\p3\end{matrix}\begin{pmatrix}0.2 & 0.0 & 0.3\\0.2 & 0.0 & 0.2\\0.4 & 0.1 & 0.2\end{pmatrix}$$

$$V(A^c,B^c)=\begin{matrix}&d1&d2&d3\\p1\\p2\\p3\end{matrix}\begin{pmatrix}0.2 & 0.5 & 0.1\\-0.2 & 0.0 & -0.3\\-0.2 & 0.3 & -0.3\end{pmatrix}$$

STEP 4

$$S=\begin{matrix}&d1&d2&d3&\text{MAX}\\p1\\p2\\p3\end{matrix}\begin{pmatrix}0.0 & -0.5 & 0.2\\0.4 & 0.0 & 0.5\\0.6 & -0.3 & 0.5\end{pmatrix}\begin{matrix}0.2\\0.5\\0.6\end{matrix}$$

STEP 5

The above matrix on p1 and p2 suffering from d3 like paratyphoid fever and p3 typhoid fever.

6 .CASE STUDY WITH THORY

Typhoid fever, also known as typhoid, is a disease caused by salmonella serotype typhoid bacteria. And the treatment of week in 1-2 weeks after ingestion, and duration usually7-10 days after antibiotic treatment begins. Risk of factors are work in or travel to areas where typhoid fever is established, drink water polluted by sewage that contains salmonella typhoid. And the best treatment of Antibiotic , hydration , surgery in extreme cases.

7. CONCLUSION

In this paper, the theory of fuzzy soft matrix in the field of medical application is identified. Some new concept such a fuzzy soft matrix based on reference function have been enhanced. The typhoid fever affected person should be given for a awareness about symptoms of the affected body. Future work is required to study whether the notion put forward in this paper.

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