13th International Conference on Recent Trends in Engineering Science and Management
School of Electronics and Communication Engineering, REVA University, Bangalore ICRTESM-18
23rd-24th April 2018 www.conferenceworld.in ISBN: 978-93-87793-13-2

INCONSISTENT DATA USING NEUTROSOPHIC LOGIC TO DISEASE DIAGNOSIS FOR PREVENTION

Soumitra De[1] , Jaydev Mishra[2]

[1] *(CSE Department, College of Engineering and Management, Kolaghat, India)*

[1] *(CSE Department, College of Engineering and Management, Kolaghat, India)*

ABSTRACT

I have introduced a new approach for treatment of human disease using Neutrosophic logic and data. Any neutrosophic data is based on indeterminacy membership along with truth and false membership values which is not available in other fuzzy and vague data. I have focused to solve the real problem of a patient whether suffering from blood cancer or not through the different laboratory report with neutrosophic data and applying same medicine on different patient.

Keywords* : *Neutrosophic Logic, Neutrosophic Data, New Approach of Neutrosophic Concept.

I. INTRODUCTION

Uncertain data could be caused by difficulties in mathematical modeling. The fuzzy sets [1, 2, 3] and vague set [4, 5, 6, 7] are applied in various problems in real life. The vague set is used for the real problems of truth and false membership values. It does not handle the indeterminacy based problems. Smarandache [8, 9, 10] first time proposed the neutrosophic logic of imprecise data. A lot of literature found in this regard in [11, 12, 13, 14]. We are introduced an approach using neutrosophic data based on different laboratory report to take actual decision about the patient whether suffering from blood cancer or not. Then apply different medicines with different medicine dose on the different patients based on the suffering patient's disease condition. Truth membership is 1 means patient suffering from disease and false membership is 0 means patient is free from disease. Here I focused to find the similarity measures between two neutrosophic data using similarity measure formula to get the closeness value w.r.t 1 to determine the patient disease status and recognize the patient for treatment.

II. NEUTROSOPHIC SET

A neutrosophic set N is given by:

truth membership $t_n \rightarrow [0,1]$,

false membership $f_n \rightarrow [0,1]$ and

indeterminacy membership function $I_n \to [0,1]$ such that $t_n+f_n \leq 1$ and $t_n + f_n + i_n \leq 2$ and is represented as $N = \{< n, [t_n , i_n , f_n] >\}$.

III. SIMILARITY MEASURE OF TWO NEUTROSOPHIC VALUES

In this paper, we have mentioned a similarity measure formula using neutrosophic data to measure closeness between two neutrosophic values which is given below.

Similarity Measure (S.M.) between two neutrosophic values:

Let x and y be any two neutrosophic values such that $x=[t_x, i_x, f_x]$ and $y=[t_y, i_y, f_y]$ where $0\leq t_x \leq 1$, $0\leq i_x \leq 1$, $0\leq f_x \leq 1$ and $0\leq t_y \leq 1$, $0\leq i_y \leq 1$, $0\leq f_y \leq 1$ with $0\leq t_x+f_x\leq 1$, $0\leq t_y+f_y\leq 1$, $t_x+i_x+f_x \leq 2$, $t_y+i_y+f_y\leq 2$.

Let $SE(x, y)$ denote the similarity measure between x and y .

Then,

$$SE(x,y)=\sqrt{\left(1-\frac{\left|(t_x-t_y)-(i_x-i_y)-(f_x-f_y)\right|}{3}\right)\left(1-\left|(t_x-t_y)+(i_x-i_y)+(f_x-f_y)\right|\right)}$$

IV. NEW APPROACH USING NEUTROSOPHIC CONCEPT

4.1 New Approach of Neutrosophic Concept

Step1: Consider different patients who are expecting to suffer blood cancer disease.

***Step 2*:** Collect their laboratory reports from different laboratory with neutrosophic data.

Step 3: Applying similarity measure formula to find the closeness value between two neutrosophic data.

Step 4: Similarity measure value indicates patient suffers from blood cancer with %.

Step 5: Similarity measure value 1 means 100% suffers and 0 means not suffer.

Step 6: Depends on percentage of suffering medicine will be different for a patient along with dose.

4.2 Problem

I have taken neutrosophic data about different laboratory report of different patients to determine which patient is suffering from blood cancer disease and what percentages. It will help to the doctor to prescribe proper medicine with accurate dose for treatment purpose as per percentage of disease spread.

Patient(P)	Neutrosophic Data as per different pathological laboratory (t, i, f)
P_1	(0.73,0.09,0.12)

P_2	(0.645,0.02,0.09)
P_3	(0.85,0.071,0.11)
P_4	(0.51,0.06,0.17)
P_5	(0.78,0.074,0.19)

Table 1. Problem data

4.3 Solution

Patient (P) is suffering from blood cancer with neutrosophic value [1, 0, 0], here truthness value is 1. Other patient is from suffering or not from blood cancer; it depends on the similarity measure values between P and any other of the patient (P_1 to P_5).

Let us consider the two neutrosophic data P and P1

Here, $t_x = 1, i_x = 0, f_x = 0, t_y = .73, i_{y=}.09, f_y = .12$

Then

$$S.M.(P,P_1) = \sqrt{\left(1-\frac{|(1-.73)-(0-.09)-(0-.12)|}{3}\right)\ \left(1-|(1-.73)+(0-.09)+(0-.12)|\right)}$$
$$= \sqrt{\left(1-\frac{.48}{3}\right)\times(1-.06)} = \sqrt{0.7896} = 0.888$$

Here closeness value is .888

Again for P and P_2

$$S.M.(P,P_2) = \sqrt{\left(1-\frac{|(1-.645)-(0-.02)-(0-.09)|}{3}\right)\ \left(1-|(1-.645)+(0-.02)+(0-.09)|\right)}$$
$$= \sqrt{\left(1-\frac{.465}{3}\right)\times(1-.245)} = \sqrt{0.637975} = 0.798$$

Here closeness value is .798

Again for P and P_3

$$S.M.(P,P_3) = \sqrt{\left(1-\frac{|(1-.85)-(0-.071)-(0-.11)|}{3}\right)\ \left(1-|(1-.85)+(0-.071)+(0-.11)|\right)}$$
$$= \sqrt{\left(1-\frac{.331}{3}\right)\times(1-.031)} = \sqrt{0.86202} = 0.928$$

The closeness value is .928

Again for P and P_4

$$S.M.(P,P_4)=\sqrt{\left(1-\frac{|(1-.51)-(0-.06)-(0-.17)|}{3}\right)\ \left(1-|(1-.51)+(0-.06)+(0-.17)|\right)}$$
$$=\sqrt{\left(1-\frac{.72}{3}\right)\times(1-.26)}\ =\sqrt{0.5624}=0.7499$$

The closeness value is .7499

Again for P and P_5

$$S.M.(P,P_5)=\sqrt{\left(1-\frac{|(1-.78)-(0-.074)-(0-.19)|}{3}\right)\ \left(1-|(1-.78)+(0-.074)+(0-.19)|\right)}$$
$$=\sqrt{\left(1-\frac{.484}{3}\right)\times(1-.044)}\ =\sqrt{0.80175}=0.895$$

The closeness value is .895

So, according to closeness value of the two neutrosophic data (where one data is fixed means patient is fully suffering from blood cancer disease other is not fixed and it changes lab to lab), I must say that patient (P_3)is suffering maximum 92.8% of blood cancer then patient (P_5) 89.5% , patient (P_1) 88.8% , patient(P_2)79.8% and patient (P_4) 74.99% chances to suffer from blood cancer disease.

V. CONCLUSION

A new approach of inconsistent data based on different pathological report has been used to check the disease and percentage of disease (blood cancer) has been spread in human body. In different application field, the neutrosophic logic is used in a database for handling inconsistent data. My approach has been used to diagnosis a blood cancer disease in different patients on the basis of different pathological laboratory report based on neutrosophic data. After that applying proper medicine with actual dose by the doctor for their treatment This approach should not be applicable on fuzzy and vague data related problems because these two type of data unable to handle indeterminacy membership value of a inconsistent data.

REFERENCES

[1] K.V.S.V.N. Raju and A.K. Majumdar, "Fuzzy functional dependencies and lossless join decomposition of fuzzy relational database system",Vol.13,No.2,pp.129-166,1988.

[2] M. I. Sözat and A. Yazici "A complete axiomatization for fuzzy functional and multivalued dependencies in fuzzy database relations", Fuzzy Sets and Systems, Vol. 117, No. 2, pp.161-181, 2001.

[3] O. Bahar and A Yazici., "Normalization and Lossless Join Decomposition of Similarity-Based Fuzzy Relational Databases", International Journal of Intelligent Systems, Vol. 19, No. 10, pp. 885-917, 2004.

[4] F. Zhao, Z. M. Ma and L. Yan, "A Vague Relational Model and Algebra", Fourth International Conference on Fuzzy Systems and Knowledge Discovery (FSKD 2007), Vol. 1, pp. 81-85, 2007.

[5] F. Zhao and Z. M. Ma, "Vague Query Based on Vague Relational Model", AISC 61, pp. 229-238, Springer- Verlag Berlin Heidelberg, 2009.

[6] J. Mishra , S. Ghosh, "A New Functional Dependency in a Vague Relational Database Model",

International Journal of Computer Applications (IJCA), Vol. 39, No. 8, pp. 29-33, 2012.

[7] J. Mishra , S. Ghosh, "Uncertain Query Processing using Vague Sets or Fuzzy Set: Which one is Better?",

International Journal of Computers, Communications and Control (IJCCC), Vol. 9, No. 6, pp. 730-740, 2014.

[8] F. Smarandache, "First International Conference on Neutrosophy, Neutrosophic Probability, Set, and Logic", University of New Mexico, Vol. 1, No. 3, 2001.

[9] F. Smarandache (2002a), "A Unifying Field in Logics: Neutrosophic Logic, in Multiple-Valued Logic", International Journal, Vol. 8, No. 3, pp.385-438, 2002.

[10] F. Smarandache, "Definitions Derived from Neutrosophics, Multiple-Valued Logic" , International Journal, Vol. 8, No. 5-6, pp.591-604, 2002.

[11] M. Arora and R. Biswas, "Deployment of Neutrosophic technology to retrieve answers for queries posed in natural language", in 3rd International Conference on Computer Science and Information Technology ICCSIT 2010, Vol. 3, pp. 435-439, 2010.

[12] M. Arora, R. Biswas and U.S. Pandy, "Neutrosophic Relational Database Decomposition", International Journal of Advanced Computer Science and Applications, Vol. 2, No. 8, pp.121-125, 2011.

[13] S. Broumi, "Generalized Neutrosophic Soft Set", International Journal of Computer Science, Engineering and Information Technology, Vol. 3, No. 2, pp. 17–30, 2013.

[14] I. Deli and S. Broumi, "Neutrosophic soft relations and some properties, Annals of Fuzzy Mathematics and Informatics", Vol. 9, No. 1, pp. 169–182, 2015.