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An Approach to Similarity Measure between Neutrosophic Soft Sets

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Abstract: In this paper, we have defined different types of similarity measures between Neutrosophic Soft (NS) sets and studied some of their properties. Finally we have solve a real life problem by using similarity measure of neutrosophic soft sets.

Keywords: Neutrosophic set, Soft Set, Neutrosophic Soft set, Similarity Measure, Neutrosophic Soft Similarity Measure.

1. Introduction

Theory of probability, fuzzy sets, rough sets, vague sets etc. are the some established theories in the world to solve the problems related to uncertainty. Molodtstov introduced the Soft Set theory [32] as a parametric tool to deal the uncertain data of many mathematical problems. Later Maji, Roy and Biswas [24, 25] have further studied the theory of soft sets. Gradually research in soft set theory (SST) are grown up in many areas like algebra, entropy calculation, solving decision making problems etc. [27 - 30], for example). Prof. Florentine Smarandache [34] introduced the neutrosophic logic and sets. In this logic, every statement consists a degree of truth (T), a degree of indeterminacy (I) and a degree of falsity (F) and all of these degrees lie between, the non-standard unit intervals. Works on soft sets and neutrosophic sets are progressing very rapidly [10, 11, 19, 21, 28, 29, 30, 31, 32, 33]. In 2013, P.K. Maji introduced the theory of Neutrosophic Soft (NS) sets [26]. Similarity measure technique is a well-known process to compare two sets. Similarity measure on Fuzzy sets, Soft sets, Neutrosophic sets etc. are done by several authors in their papers [14, 15, 16, 17, 18, 19, 22]. In this paper we have tried to build up the theory of similarity measures between two NS sets. We organized the paper in the following manner. In Section 2, we have given some preliminary definitions and results. We have given a similarity measure of NS in Section 3. In Section 4 and Section 5 are devoted on weighted similarity measure of NS sets and measuring distances of NS sets respectively. We have discussed Distanced Based Similarity Measure of NS sets in Section 6. A real life application of similarity measure of two NS sets are shown in Section 8. Section 9 is the conclusion of our paper.

2. Preliminaries

Neutrosophic sets has several applications in different areas of physical systems, biological systems etc. and even in daily life problems. Most of the preliminary ideas can be easily found in any standard reference say [1—11, 31, 34, 35] .However we will discuss some definitions and terminologies regarding neutrosophic sets which will be used in the rest of the paper.

Definition 1 *[34] Let X be a universal set. A neutrosophic set A on X is characterized by a truth membership function t_A, an indeterminacy function i_A and a falsity function f_A, where t_A, i_A, f_A: → $[0,1]$, are functions and $\forall x \in X, x = x(t_A(x), i_A(x), f_A(x)) \in A$ is a single valued neutrosophic element of A.*

Definition 2 *[25] Suppose U be an initial universal set and let E be a set of parameters. Let $P(U)$ denote the power set of U and $A \subseteq E$. A pair (F, A) is called a soft set over U if and only if F is a mapping given by $F: A \rightarrow P(U)$.*

Example 3 *As an illustration, consider the following example. Suppose a soft set (F, E) describes choice of places which the authors are going to visit with his family. Consider U = the set of places under consideration $= \{x_1, x_2, x_3, x_4, x_5\}$. E = {desert, forest, mountain, sea beach} = $\{e_1, e_2, e_3, e_4\}$. Let $F(e_1) = \{x_1, x_2\}$, $F(e_2) = \{x_1, x_2, x_3\}$, $F(e_3) = \{x_4\}$, $F(e_4) = \{x_2, x_5\}$. So, the soft set (F, E) is a family $\{F(e_i); i = 1, \ldots, 4\}$ of U* .In 2012, P.K. Maji gives the idea of Neutrosophic Soft Set in his paper [26] as follows:

Definition 4 *[26] Let U be an initial universe set and E be a set of parameters. Consider $A \subseteq E$. Let $N(U)$ denotes the set of all neutrosophic sets of U. The collection (F, A) is termed to be the soft neutrosophic set over U, where F is a mapping given by $F: A \rightarrow N(U)$.*

Example 5 Let X and E be the set of buses and condition of buses i.e. the set of parameters respectively. Each parameter is either a neutrosophic word or sentence involving neutrosophic words. Consider E = {beautiful, eco-friendly, costly, good seating arrangement}. Now, to define a NS set means to sort out beautiful buses, eco-friendly buses etc. Suppose, there are four buses in the universe X given by $U = \{h_i;\ i = 1,2,3,4\}$ and the set of parameters $E = \{e_i;\ i = 1,2,3,4\}$, where e_1 stands for the parameter beautiful, e_2 stands for the parameter eco-friendly, e_3 stands for the parameter costly and the parameter e_4 stands for good seating arrangement. Let

$$\begin{aligned}
\text{F (beautiful)} &= \{(h_1, 0.4, 0.7, 0.3), (h_2, 0.3, 0.6, 0.2), (h_3, 0.4, 0.4, 0.2), (h_4, 0.6, 0.5, 0.4)\},\\
\text{F (eco - friendly)} &= \{(h_1, 0.6, 0.7, 0.8), (h_2, 0.5, 0.5, 0.1), (h_3, 0.2, 0.3, 0.6)\},\\
\text{F (costly)} &= \{(h_2, 0.3, 0.3, 0.4), (h_3, 0.5, 0.4, 0.8), (h_4, 0.8, 0.7, 0.8)\},\\
\text{F (good - seating arrangement)} &= \{(h_1, 0.4, 0.1, 0.4), (h_2, 0.3, 0.7, 0.4), (h_4, 0.9, 0.6, 0.8)\}.
\end{aligned}$$

Then (F, E) is a neutrosophic soft set (NSS) over X.

The most of the terminologies regarding Neutrosophic soft set can be found in [26]. Thus it is our request to follow the paper [26] thoroughly for terminologies, operations etc of NS set. Several authors have defined Similarity measure between two fuzzy sets. Prof. Chen have given the following definition of Similarity measure based on a matching function S.

Definition 6 *[12] Suppose A and B are two fuzzy sets with membership functions μ_A and μ_B respectively. Then the similarity measure between A and B is denoted by $S(A, B)$ and*

$$S(A,B)=\frac{\vec{A}.\vec{B}}{\vec{A^2}\vee\vec{B^2}}$$

where $\vec{A}=(\mu_A(x_1),\mu_A(x_2),,\ldots,\mu_A(x_n))$ *and* $\vec{B}=(\mu_B(x_1),\mu_B(x_2),..,\mu_B(x_n))$.

Prof P. Majumdar have defined similarity measure for two soft sets in his paper [27]. For details on similarity measures on two Soft sets, one can follow [27].

3. Similarity measure of two NS sets

Consider the NS set (F,E) over the set. Now we will express the NS set (F,E) as a NS soft matrix M as follows:

$$M=\begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4)\\ h_1 & (0.4,0.7,0.3) & (0.6,0.7,0.8) & (0,0,0) & (0.4,0.1,0.4)\\ h_2 & (0.2,0.3,0.6) & (0.5,0.5,0.1) & (0.3,0.3,0.4) & (0.3,0.7,0.4)\\ h_3 & (0.4,0.4,0.2) & (0.2,0.3,0.6) & (0.5,0.4,0.8) & (0,0,0)\\ h_4 & (0.6,0.5,0.4) & (0,0,0) & (0.8,0.7,0.8) & (0.9,0.6,0.8)\end{bmatrix}$$

Then with the above interpretation the NS set (F,E) is represented by the matrix M and we write

(F,E) = M. Clearly, the complement of (F,E), i.e. $(F,E)^C$ will be represented by another matrix M^C

where

$$M^C=\begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4)\\ h_1 & (0.3,0.7,0.4) & (0.8,0.7,0.6) & (0,0,0) & (0.4,0.1,0.4)\\ h_2 & (0.6,0.3,0.2) & (0.1,0.5,0.5) & (0.4,0.3,0.3) & (0.4,0.7,0.3)\\ h_3 & (0.2,0.4,0.4) & (0.6,0.3,0.2) & (0.8,0.4,0.5) & (0,0,0)\\ h_4 & (0.4,0.5,0.6) & (0,0,0) & (0.8,0.7,0.8) & (0.8,0.6,0.9)\end{bmatrix}$$

Hence for any given matrix representation *M,* we can retrieve the NS set (*F, E*) and also vice versa in an obvious way. Henceforth, we will denote each column of membership matrix by the vector $\overrightarrow{F(e_i)}$ or simply by $\overrightarrow{F(e_i)}$

i.e. here $\overrightarrow{F(e_1)}$ = {(0.3, 0.7, 0.4), (0.6, 0.3, 0.2), (0.2, 0.4, 0.4), (0.4, 0.5, 0.6)} in M. Now we will define a similarity measure between two NS sets (F_1,E_1) and (F_2,E_2) over U. We try to formulate with the help of a matching function S.

Definition 7 The similarity between NS sets (F_1,E_1) and (F_2,E_2) is defined by

$$S(F_1,F_2)=\frac{\sum_i\overrightarrow{F_1(e_i)}.\overrightarrow{F_2(e_i)}}{\sum_i[\overrightarrow{F_1(e_i)^2}\vee\overrightarrow{F_2(e_i)^2}]}$$

provided,

(i) $E_1=E_2$

(ii) $\sum_i\overrightarrow{F_1(e_i)}.\overrightarrow{F_2(e_i)}=\sum_i(t_{F_1(e_i)}.t_{F_2(e_i)}+i_{F_1(e_i)}.i_{F_2(e_i)}+f_{F_1(e_i)}.f_{F_2(e_i)})$

(iii) $\sum_i[\overrightarrow{F_1(e_i)^2}\vee\overrightarrow{F_2(e_i)^2}]=\sum_i(t_{F_1(e_i)^2}\vee t_{F_2(e_i)}+i_{F_1(e_i)^2}\vee i_{F_2(e_i)^2}+f_{F_1(e_i)^2}\vee f_{F_2(e_i)^2})$

If $E_1\neq E_2$, $E=E_1\cap E_2\neq\emptyset$, then we will consider $\overrightarrow{F_1(e_1)}=(0,0,0)$ for $e_1\in E_1\backslash E$ and $\overrightarrow{F_2(e_2)}=(0,$

$0,0)$ for $e_2 \in E_2 \setminus E$. Then the similarity measure $S(F_1, F_2)$ is obtained from Definition 7.

Remark 8 *If $E_1 \cap E_2 = \emptyset$, then we have* $S(F_1, F_2) = 0$.

The following lemmas are quite obvious:

Lemma 9 *Suppose (F_1, E_1) and (F_2, E_2) be two NS sets over the same finite universe. Then we have the following:*

$(i)\ S(F_1, F_2) = S(F_2, F_1)$ $(ii)\ 0 \le S(F_1, F_2) \le 1$ $(iii)\ S(F_1, F_1) = 1$

Lemma 10 *Suppose $(F_1, E), (F_2, E), (F_3, E)$ be three NS sets such that $(F_1, E) \subseteq (F_2, E) \subseteq (F_3, E)$ then, $S(F_1, F_3) \le S(F_2, F_3)$.*

Example 11 *Consider another NS set (G, E) over the same universe U, where $E = \{e_1, e_2, e_3, e_4\}$ whose NS matrix representation N is as following:*

$$N = \begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4) \\ h_1 & (0.3, 0.7, 0.3) & (0.6, 0.1, 0.8) & (0.5, 0.1, 0.5) & (0.4, 0.5, 0.4) \\ h_2 & (0.4, 0.4, 0.9) & (0, 0, 0) & (0.3, 0.3, 0.4) & (0.3, 0.7, 0.4) \\ h_3 & (0.2, 0.6, 0.2) & (0.2, 0.6, 0.6) & (0, 0, 0) & (0.4, 0.2, 0.8) \\ h_4 & (0.6, 0.5, 0.4) & (0.3, 0.9, 0.5) & (0.8, 0.7, 0.8) & (0.3, 0.7, 0.4) \end{bmatrix}$$

Then we have $S(F, G) = 0.22147$.

4. Weighted Similarity measure between two NS sets

Definition 12 *Suppose $U = \{u_1, u_2, \ldots, u_n\}$ be the universe and w_i be the weight of u_i and $w_i \in [0, 1]$, but not all zero, $1 \le i \le n$. Suppose (F_1, E) and (F_2, E)be two NS sets over U. We define their weighted similarity as follows*

$$W(F_1, F_2) = \frac{\sum_i w_i\ \overrightarrow{F_1(e_i)}.\ \overrightarrow{F_2(e_i)}}{\sum_i w_i\ [\overrightarrow{F_1(e_i)^2} \vee \overrightarrow{F_2(e_i)^2}}$$

provided,

(i) $E_1 = E_2$

(ii) $\sum_i \overrightarrow{F_1(e_i)}.\ \overrightarrow{F_2(e_i)} = \sum_i (t_{F_1(e_i)}.\ t_{F_2(e_i)} + i_{F_1(e_i)}.\ i_{F_2(e_i)} + f_{F_1(e_i)}.f_{F_2(e_i)})$

(iii) $\sum_i [\overrightarrow{F_1(e_i)^2} \vee \overrightarrow{F_2(e_i)^2}] = \sum_i (t_{F_1(e_i)^2} \vee t_{F_2(e_i)} + i_{F_1(e_i)^2} \vee i_{F_2(e_i)^2} + f_{F_1(e_i)^2} \vee f_{F_2(e_i)^2})$

Example 13 *Consider the two NS sets (F, E) and (G, E) in Example 11. We assign weights to the elements $\{u_i, i = 1, \ldots, 4\}$ of X i.e.*

$w(u_1) = 0.3, w(u_2) = 0.1, w(u_3) = 0.4,\ w(u_4) = 0.7$.

Then we have $W(F, G) = 0.13864$.

Definition 14 *Consider the set of all NS sets $N_1(U)$ over the set U. Suppose $(F_1, E), (F_2, E) \in N_1(U)$. If $S(F_1, F_2) \ge \alpha, \alpha \in (0, 1)$, then the two NS sets (F_1, E) and (F_2, E) are said to be α-similar and we denote the similarity relation between two aforesaid sets as $(F_1, E) \cong_\propto (F_2, E)$.*

It can be easily seen that similarity is an equivalence relation.

Lemma 15 $\cong\propto$ *is a reflexive as well as symmetric relation but not an equivalence relation.*

From Lemma 9, we can easily see that $\underset{c}{\cong\propto}$ is a reflexive as well as symmetric relation. To see that $\cong\propto$ is not a transitive relation, we consider the following example:

$$N = \begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4) \\ h_1 & (0.3,0.7,0.4) & (0.8,0.7,0.8) & (0.1,0.1,0.2) & (0.6,0.2,0.8) \\ h_2 & (0,0,0) & (0,0,0) & (0.5,0.6,0.1) & (0,0,0) \\ h_3 & (0.4,0.5,0.2) & (0.4,0.1,0.2) & (0,0,0) & (0.4,0.2,0.8) \\ h_4 & (0.8,0.4,0.8) & (0.6,0.3,0.1) & (0.5,0.6,0.5) & (0.1,0.8,0.8) \end{bmatrix}$$

Example 16 *Consider a NS set* (H, E) *over the same universe, where* $E = \{e_1, e_2, e_3, e_4\}$ *who's NS matrix representation N is as above. Then* $S(G, F) = 0.22147, S(F, H) = 0.88609, S(G, H) = 0.54576.$

Definition 17 *Suppose* (F_1, E_1) *and* (F_2, E_2) *be two NS sets over the set . Then the two NS sets* (F_1, E_1) *and* (F_2, E_2) *are said to be significantly similar if*

$$S(F_1, F_2) > 1/2$$

Example 18 $S(F, H)$ *is significantly similar whereas* $S(F, G)$ *is not similar.*

5. Two sets and their measuring distances.

Throughout this section, we will consider $\boldsymbol{U}$ to be finite, namely $\boldsymbol{U} = \{\boldsymbol{h}_1, \boldsymbol{h}_2, \ldots, \boldsymbol{h}_n\}$ and universal parameter set $\boldsymbol{E} = \{\boldsymbol{e}_1, \boldsymbol{e}_2, \ldots, \boldsymbol{e}_m\}$. Now for any NS set $(\boldsymbol{F}, \boldsymbol{A}) \epsilon \boldsymbol{N}(\boldsymbol{U})$, $\boldsymbol{A}$ is a subset of $\boldsymbol{E}$. Consider an extension of the NS set $(\boldsymbol{F}, \boldsymbol{A})$ to the NS set $(\widehat{\boldsymbol{F}}, \boldsymbol{E})$ where $\widehat{\boldsymbol{F}}(e_i)\{\boldsymbol{h}_j\} = \varphi$ where $\boldsymbol{e}_i \notin \boldsymbol{A}$. Now onwards we will take the parameter subset of any NS set over $\boldsymbol{N}(\boldsymbol{U})$ to be the same as the parameter set $\boldsymbol{E}$ without loss of generality.

Definition 19: *For two NS sets* $(\hat{F}, E)$ *and* $(\hat{G}, E)$,

(i) The mean Hamming distance $D^S(F, G)$ between two NS sets is defined as follows

$$D^S(F,G) = \frac{1}{m}\{\sum_{i=1}^m \sum_{j=1}^n |F(e_i)(x_j) - G(e_i)(x_j)|\}$$

$$= \frac{1}{m}\left\{\sum_{i=1}^m \sum_{j=1}^n \left|t_{F(e_i)(x_j)} - t_{G(e_i)(x_j)}\right| + \left|i_{F(e_i)(x_j)} - i_{G(e_i)(x_j)}\right| + \left|f_{F(e_i)(x_j)} - f_{G(e_i)(x_j)}\right|\right\}$$

(ii) The normalized Hamming distance $L^S(F, G)$ is defined as follows:

$$L^S(F,G) = \frac{1}{mn}\{\sum_{i=1}^m \sum_{j=1}^n |F(e_i)(x_j) - G(e_i)(x_j)|\}$$

$$= \frac{1}{mn}\left\{\sum_{i=1}^m \sum_{j=1}^n \left|t_{F(e_i)(x_j)} - t_{G(e_i)(x_j)}\right| + \left|i_{F(e_i)(x_j)} - i_{G(e_i)(x_j)}\right| + \left|f_{F(e_i)(x_j)} - f_{G(e_i)(x_j)}\right|\right\}$$

(iii) The Euclidean distance $E^S(F, G)$ is defined as follows:

$$E^S(F,G) = \sqrt{\frac{1}{m}\{\sum_{i=1}^m \sum_{j=1}^n |F(e_i)(x_j) - G(e_i)(x_j)|^2\}}$$

$$= \sqrt{\frac{1}{m}\left\{\sum_{i=1}^m \sum_{j=1}^n \left|t_{F(e_i)(x_j)} - t_{G(e_i)(x_j)}\right|^2 + \left|i_{F(e_i)(x_j)} - i_{G(e_i)(x_j)}\right|^2 + \left|f_{F(e_i)(x_j)} - f_{G(e_i)(x_j)}\right|^2\right\}}.$$

(iv) The normalized Euclidean distance Q^S (F, G) is defined as follows:

$$Q^S(F,G) = \sqrt{\frac{1}{mn}\left\{\sum_{i=1}^{m}\sum_{j=1}^{n}|F(e_i)(x_j) - G(e_i)(x_j)|^2\right\}}$$

$$= \sqrt{\frac{1}{mn}\left\{\sum_{i=1}^{m}\sum_{j=1}^{n}\left|t_{F(e_i)(x_j)} - t_{G(e_i)(x_j)}\right|^2 + \left|i_{F(e_i)(x_j)} - i_{G(e_i)(x_j)}\right|^2 + \left|f_{F(e_i)(x_j)} - f_{G(e_i)(x_j)}\right|^2\right\}}$$

Example 20 *Consider the two NS sets (F, E) and (G, E) in Example 11. Then we have the following:*

(i) $D^S(G, H) = 2.8$.

(ii) $L^S(F, G) = 1.67$.

(iii) $E^S(F, G) = 1.09$.

(iii) $Q^S(F, G) = 0.544$.

The following result is quite obvious.

Lemma 21 *For any two NS sets (F, E) and (G, E) of $N(U)$, the following inequalities hold.*

(i) $D^S(F, G) \leq n$.

(ii) $L^S(F, G) \leq 1$.

(iii) $E^S(F, G) \leq \sqrt{n}$.

(iv) $Q^S(F, G) \leq 1$.

The following theorem can also be easily proved.

Theorem 22 *The functions* D^S, L^S, E^S, Q^S: $N(U) \longrightarrow R^+$ given by Definition 19 respectively are metrics, where R^+ is the set of all nonnegative numbers.

6. Distance based similarity measure of NS sets

We have defined several types of distances between a pair of NS sets (F, E) and (G, E) over the set $N(U)$ in the previous section. Now using these distances we can also define similarity measures for NS sets. In the following, we now define a similarity measure based on Hamming Distance.

$$S'(F,G) = \frac{1}{1 + D^S(F,G)}$$

Also we can define another similarity measure as: $S'(F,G) = e^{-\alpha D^S(F,G)}$, where α is a positive real number (parameter) called the steepness measure. Similarly using Euclidian distance, similarity measure can be defined as follows:

$$S''(F,G) = \frac{1}{1 + E^S(F,G)}$$

Also we can define another similarity measure as: $S''(F,G) = e^{-\alpha E^S(F,G)}$, where α is a positive real number (parameter) called the steepness measure.

Lemma 23 *For a pair of NS sets* (F, E) *and* (G, E) *over the set* $N(U)$, *the following holds:*

$(i)\ 0 \leq S'(F, G) \leq 1.$

(ii) $S'(F, G) = S'(G, F)$.

(iii) $S'(F, G) = 1 \Longleftrightarrow (F, G) = (G, F)$.

The proof of the above lemma easily follows from definition.

7. Comparison between $S(F, G)$ and $S'(F, G)$:

Suppose $S_{M,N}$ denote the similarity measure between two NS sets (F, E) and (G, E) whose membership matrices are M and N. Now we compare the properties of the two measures of similarity of NS sets discussed here. Although most of the properties are common between them but some of these are different. Here we have the following:

(i) $Common\ Properties: S_{M,N} = S_{N,M}, 0 \leq S_{M,N} \leq 1, S_{M,N} = 1\ if\ M = N.$

(ii) $Distinct\ Property: S_{M,N} = 1 \Longrightarrow M = N.$

8. A real life application

The process of measuring similarity between two Neutrosophic soft sets can be applied to solve real life situations. A particular disease occurs to a patient or not can be easily determined by us using similarity measure. To see, consider the following problem: India is a polio-effected country in the last century. After taking several measurement by Govt of India, WHO declares India as a Polio-Free Nation from 2015. It is seen in the past that several situations like high population, literacy factor, socio-economic background, Govt initiative etc. are quite responsible for polio disease. Suppose U be the set of only three elements h_1, h_2, h_3 where h_1, h_2, h_3 denotes symptoms of the high growth of polio disease, average growth of polio disease, and low growth of polio disease.

We have tried to formulate the problem in terms of NS sets. . Here we list the set of parameters E is the factors which are responsible for polio disease. Suppose $E = \{e_1, e_2, e_3, e_4\}$ where e_1, e_2, e_3, e_4 denotes high population, literacy factor, socio-economic background, Govt initiative of a Murshidabad District, West Bengal, India. Now consider a NS matrix P of a neutrosophic set (F, E) of a polio effected patient X_1 based on the data available from a Govt. report [33] as follows:

$$P = \begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4) \\ h_1 & (0.7, 0.2, 0.3) & (0.6, 0.1, 0.3) & (0.8, 0.3, 0.5) & (0.7, 0.2, 0.4) \\ h_2 & (0.6, 0.3, 0.2) & (0.1, 0.5, 0.5) & (0.4, 0.3, 0.3) & (0.4, 0.7, 0.3) \\ h_3 & (0.2, 0.6, 0.7) & (0.2, 0.4, 0.4) & (0,1,0) & (0.3, 0.2, 0.7) \end{bmatrix}$$

Here the entry $F(e_1)(h_1)$ in the matrix P denotes the positive impact, the uncertainties impact, and negative impact of high population to positive growth of polio symptoms respectively. Consider two persons Rajibul and Rupam, both live in Bhagabangola village of Murshidabad District but belongs to different category. Both of them have polio disease symptoms with some positive, average, low growth rate. Let we denote both Rajibul and Rupam's health condition with two NS set (G, E) and (H, E) over U whose NS matrices Q, S respectively are given below:

$$Q=\begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4) \\ h_1 & (0.8,0.3,0.5) & (0.7,0.4,0.3) & (0.8,0.6,0.7) & (1,0,0) \\ h_2 & (0.2,0.5,0.6) & (0.1,0.1,0.8) & (0.4,0.1,0.5) & (0.3,0.3,0.4) \\ h_3 & (0,0,0) & (0.1,0.3,0.3) & (1,1,0) & (0,0,0) \end{bmatrix}$$

$$S=\begin{bmatrix} * & F(e_1) & F(e_2) & F(e_3) & F(e_4) \\ h_1 & (0.8,0.4,0.8) & (0.6,0.3,0.1) & (0.5,0.6,0.5) & (0.7,0.2,0.4) \\ h_2 & (0,0,0) & (0,1,1) & (0.3,0.1,0.1) & (0.2,0.5,0.4) \\ h_3 & (0.2,0.6,0.2) & (0.2,0.6,0.6) & (0,0,0) & (0.4,0.2,0.8) \end{bmatrix}$$

After calculating similarity measure, we have $S(F,G) = 0.64, S(F,H) = 0.69$. From this result we can conclude that Rajibul and Rupam both have the chances to be effected by polio disease. Both of their symptoms are significantly similar to a natural polio effected person. Beside this, Rupam's condition is more significantly similar than Rajibul condition since$S(F,G) = 0.64 < S(F,H) = 0.69$.

9. Conclusion

To deal with uncertain real life situations, Molodtstov gave the concept of soft set theory in his paper [32]. Later on Prof P.K. Maji introduced NSS theory and have shown the properties and application of NSS ([26]). In this paper we have defined similarity measure properties of two NS sets and studied some of its important properties and applied it in a decision making problem. In future, we will study some another applications of similarity measures of two NS sets and will try to solve the uncertainty using NS similarity measure technique. One may try to solve many realistic health diagnosis problem using the similarity measure technique between NS sets.

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Conflicts of Interest

The authors declare no conflict of interest.

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