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Application Of Neutrosophic Sets Based On Neutrosophic Negative Score Function in Medical Diagnosis

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Abstract. Medical diagnosis is the process of determining which illness or disease is causing an individual's symptoms and warning signs. It is most commonly referred to as analysis, with the clinical environment implied. The evidence required for discovery is typically acquired from a clinical study and an examination of the individual seeking medical treatment. The major purpose of this research is to use topology to establish a methodical technique for decision making difficulties in order to select the appropriate attributes and alternatives for neutrosophic negative score function. In addition, we use a neutrosophic topological space based on attributes and alternatives, as well as graphical representation, to apply a neutrosophic negative score function in medical diagnosis problems.

Keywords: Neutrosophic set, Neutrosophic topology, Neutrosophic topological spaces, Neutrosophic negative score function.

1. Introduction

Zadeh [41] as part of logic and set hypothesis was the first to introduce the concept of a fuzzy set between intervals in mathematics. Chang's [10] general topology framework, that utilisesfuzzy topological space, was created with a fuzzy set. Adlassnig [6] used fuzzy set theory to formalise medical interactions and fuzzy logic to create a framework for automated analysis. This theory has been used in the areas of artificial intelligence, probability, science, control structures, and financial concerns [16, 20, 26].

In 1983, Atanassov [7] developed an intuitionistic fuzzy set with membership and non-membership values. Coker [14] created intuitionistic fuzzy topological spaces from intuitionistic fuzzy sets. De et al. [15] were the first to develop the applications of intuitionistic fuzzy sets in medical diagnosis. Several researchers [8,17,27] investigated intuitionistic fuzzy sets in medical diagnostics further.

Smarandache [23, 24] offered the notions of neutrosophy and neutrosophic set at the beginning of the 21^{th} century and has a wide range of consistent applications in computer science, information systems, applied mathematics, artificial intelligence, mechanics, medicine, dynamic, management science, and electrical & electronics, etc [1–4,36,37]. Salama and Alblowi, [21,22] in 2012, developed neutrosophic set and neutrosophic crisp set in a neutrosophic topological space. Recently, Vadivel and authors [29,30,33–35] presented various open sets and mappings in neutrosophic topological spaces. Smarandache [24] described the single valued Neutrosophic set on three portions (T-Truth, F-Falsehood, I-Indeterminacy) Neutrosophic sets, which Wang et al. [38] worked on. In decision making problems, Majumdar and Samanta [18] described various similarity measures of single valued neutrosophic sets. Several researchers have recently proposed numerous similarity measures and single-valued neutrosophic sets in medical diagnostics [5, 9, 11–13, 19, 28, 39, 40]. Vadivel and authors [31, 32] discussed an applications using neutrosophic score function in mobile networking and material selection problems.

The methodical strategy for decision making issues to identify the appropriate qualities and alternatives for neutrosophic negative score function by employing topology is defined in this work. In addition, we use neutrosophic topological spaces to apply a neutrosophic negative score function in medical diagnosis problems based on their features and alternatives.

2. **Preliminaries**

Definition 2.1. [21] Let T be a non-empty set. A neutrosophic set (briefly, N_seus) L is an object having the form $L = \{\langle t, \mu_L(t), \sigma_L(t), \nu_L(t)\rangle : t \in T\}$ where $\mu_L, \sigma_L, \nu_L \to [0,1]$ denote the degree of membership, indeterminacy, non-membership functions respectively of each element $t \in T$ to the N_seus L and $0 \leq \mu_L(t) + \sigma_L(t) + \nu_L(t) \leq 3$ for each $t \in T$.

Definition 2.2. [21] Let T be a non-empty set & the N_seus's L & K in the form $L = \{\langle t, \mu_L(t), \sigma_L(t), \nu_L(t)\rangle : t \in T\}$, $K = \{\langle t, \mu_K(t), \sigma_K(t), \nu_K(t)\rangle : t \in T\}$, then

(i) $0_{N_s} = \langle t, 0, 0, 1\rangle$ and $1_{N_s} = \langle t, 1, 1, 0\rangle$,

(ii) $L \subseteq K$ iff $\mu_L(t) \leq \mu_K(t)$, $\sigma_L(t) \leq \sigma_K(t)$ & $\nu_L(t) \geq \nu_K(t) : t \in T$,

(iii) $L = K$ iff $L \subseteq K$ and $K \subseteq L$,

(iv) $1_{N_s} - L = \{\langle t, \nu_L(t), 1 - \sigma_L(t), \mu_L(t)\rangle : t \in T\} = L^c$,

(v) $L \cup K = \{\langle t, \max(\mu_L(t), \mu_K(t)), \max(\sigma_L(t), \sigma_K(t)), \min(\nu_L(t), \nu_K(t))\rangle : t \in T\}$,

(vi) $L \cap K = \{\langle t, \min(\mu_L(t), \mu_K(t)), \min(\sigma_L(t), \sigma_K(t)), \max(\nu_L(t), \nu_K(t))\rangle : t \in T\}$.

Definition 2.3. [21] A neutrosophic topology (briefly, N_seuty) on a non-empty set T is a family Γ_{N_s} of neutrosophic subsets of T satisfying

(i) $0_{N_s}, 1_{N_s} \in \Gamma_{N_s}$.

(ii) $L_1 \cap L_2 \in \Gamma_{N_s}$ for any $L_1, L_2 \in \Gamma_{N_s}$.

(iii) $\bigcup L_x \in \Gamma_{N_s}, \forall \ L_x : x \in T \subseteq \Gamma_{N_s}$.

Then (T, Γ_{N_s}) is called a neutrosophic topological space (briefly, $N_seutysp$) in T. The Γ_{N_s} elements are called neutrosophic open sets (briefly, N_seuos) in T. A N_seus C_{N_s} is called a neutrosophic closed sets (briefly, N_seucs) iff its complement $C^c_{N_s}$ is N_seuos.

Definition 2.4. [25] The Neutrosophic Negative Score Function (briefly, $N_seuNeScFu$) on $s : L \to [0, 1]$ is defined by

$$s(\mu_L, \sigma_L, \nu_L) = \frac{1 - \mu_L + \sigma_L + \nu_L}{3}$$

that represents the average of positiveness of the neutrosophic components μ_L, σ_L, ν_L.

3. Neutrosophic Negative Score Function

In this section, we provide a neutrosophic scoring function that is based on a methodical approach to solving a decision-making problem with neutrosophic information. In the decision-making situation, the following vital stages are recommended as the precise technique to deal with selecting the appropriate qualities and alternative based on neutrosophic negative score function.

Step 1: Problem field selection:

Consider multi-attribute decision making problems with m attributes $At_1, At_2, \cdots, At_m$ and n alternatives $\tau_1, \tau_2, \cdots, \tau_n$ and p attributes $\nu_1, \nu_2, \cdots, \nu_p$, $(n \leq p)$.

	τ_1	τ_2	.	.	.	τ_n
At_1	(b_{11})	(b_{12})	.	.	.	(b_{1n})
At_2	(b_{21})	(b_{22})	.	.	.	(b_{2n})
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
At_m	(b_{m1})	(b_{m2})	.	.	.	(b_{mn})

	At_1	At_2	.	.	.	At_m
ν_1	(e_{11})	(e_{12})	.	.	.	(e_{1m})
ν_2	(e_{21})	(e_{22})	.	.	.	(e_{2m})
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
ν_p	(e_{p1})	(e_{p2})	.	.	.	(e_{pm})

Here all the attributes b_{ij} and e_{ki} are neutrosophic numbers, where $(i = 1, 2, \ldots, m, j = 1, 2, \ldots, n$ and $k = 1, 2, \ldots, p)$.

Step 2: From neutrosophic topologies for τ_j and ν_k:

(i) $\tau^*_j = \tau \cup \tau^* \cup \tau^{**}$, where $\tau = \{1_{N_s}, 0_{N_s}, b_{1j}, b_{2j}, \cdots b_{mj}\}$, $\tau^* = \{b_{1j} \cup b_{2j}, b_{2j} \cup b_{3j}, \cdot, b_{m-1j} \cup b_{mj}\}$ and $\tau^{**} = \{b_{1j} \cap b_{2j}, b_{2j} \cap b_{3j}, \cdot, b_{m-1j} \cap b_{mj}\}$.

(ii) $\nu_j^* = \nu \cup \nu^* \cup \nu^{**}$, where $\nu = \{1_{N_s}, 0_{N_s}, e_{k1}, e_{k2}, \cdots e_{km}\}$, $\nu^* = \{e_{k1} \cup e_{k2}, e_{k2} \cup e_{k3}, \cdot, e_{km-1} \cup e_{km}\}$ and $\nu^{**} = \{e_{k1} \cap e_{k2}, e_{k2} \cap e_{k3}, \cdot, e_{km-1} \cap e_{km}\}$.

Step 3: Find neutrosophic negative score functions:

Neutrosophic negative score functions (shortly, $N_seuNeScFu$) of $\tau, \tau^*, \tau^{**}, \nu, \nu^*, \nu^{**}, \tau_j$ and ν_k are defined as follows.

(i) $N_seuNeScFu(\tau) = \frac{1}{3(m+2)}\left[\sum_{i=1}^{m+2}[1-\mu_i+\sigma_i+\gamma_i]\right]$, $N_seuNeScFu(\tau^*) = \frac{1}{3q}\left[\sum_{i=1}^{q}[1-\mu_i+\sigma_i+\gamma_i]\right]$, where q is the number of element of τ^* and $N_seuNeScFu(\tau^{**}) = \frac{1}{3r}\left[\sum_{i=1}^{r}[1-\mu_i+\sigma_i+\gamma_i]\right]$, where r is the number of element of τ^{**}. For $j = 1, 2, \cdots, n$,

$$N_seuNeScFu(\tau_j) = \begin{cases} N_seuNeScFu(\tau) & \text{if } N_seuNeScFu(\tau^*) = 0; N_seuNeScFu(\tau^{**}) = 0 \\ \frac{1}{2}\left[N_seuNeScFu(\tau) + N_seuNeScFu(\tau^*)\right] & \text{if } N_seuNeScFu(\tau^{**}) = 0 \\ \frac{1}{3}\left[N_seuNeScFu(\tau) + N_seuNeScFu(\tau^*) + N_seuNeScFu(\tau^{**})\right] & \text{otherwise} \end{cases}$$

(ii) $N_seuNeScFu(\nu) = \frac{1}{3(m+2)}\left[\sum_{i=1}^{m+2}[1-\mu_i+\sigma_i+\gamma_i]\right]$, $N_seuNeScFu(\nu^*) = \frac{1}{3s}\left[\sum_{i=1}^{s}[1-\mu_i+\sigma_i+\gamma_i]\right]$, where s is the number of element of ν^* and $N_seuNeScFu(\nu^{**}) = \frac{1}{3t}\left[\sum_{i=1}^{t}[1-\mu_i+\sigma_i+\gamma_i]\right]$, where t is the number of element of ν^{**}. For $k = 1, 2, \cdots, p$,

$$N_seuNeScFu(\nu_k) = \begin{cases} N_seuNeScFu(\nu) & \text{if } N_seuNeScFu(\nu^*) = 0; N_seuNeScFu(\nu^{**}) = 0 \\ \frac{1}{2}\left[N_seuNeScFu(\nu) + N_seuNeScFu(\nu^*)\right] & \text{if } N_seuNeScFu(\nu^{**}) = 0 \\ \frac{1}{3}\left[N_seuNeScFu(\nu) + N_seuNeScFu(\nu^*) + N_seuNeScFu(\nu^{**})\right] & \text{otherwise} \end{cases}$$

Step 4: Final Decision

Arrange neutrosophic negative score values for the alternatives $\tau_1 \geq \tau_2 \geq \cdots \geq \tau_n$ and the attributes $\nu_1 \geq \nu_2 \geq \cdots \geq \nu_p$. Choose the attribute ν_p for the alternative τ_1 and ν_{p-1} for the alternative τ_2 etc. If $n < p$, then ignore ν_k, where $k = 1, 2, \cdots, n-p$.

4. Numerical Example

Medical diagnosis has expanded the number of data available to medical professionals as a result of new medical advancements, which also includes vulnerabilities. The path towards grouping multiple sets of symptoms under a single term of a disease is a particularly tough issue in medical diagnosis. In this section, we demonstrate the usefulness and application of the neutrosophic negative score function technique to a medical diagnosis problem.

Step 1: Problem field selection:

Consider the following tables giving informations when consulted physicians about five patients, Patient 1 (shortly, Pat_1), Patient 2 (shortly, Pat_2), Patient 3 (shortly, Pat_3), Patient 4 (shortly, Pat_4) and Patient 5 (shortly, Pat_5) and symptoms are Weight gain (shortly, Wg), Tiredness (shortly, Td), Myalgia (shortly, Ml), Swelling of legs (shortly, Sl) and Mensus Problem (shortly, Mp). We need to find the patient and to find the disease such as Lymphedema, Insomnia, Hypothyroidism, Menarche, Arthritis of the patient. The data in Table 1 and Table 2 are explained by the membership, the indeterminacy and the non-membership functions of the patients and diseases respectively.

Patients / Symptoms	Pat_1	Pat_2	Pat_3	Pat_4	Pat_5
Wg	(0.9,0.1,0)	(0.8,0,0.2)	(0,0.1,0.9)	(0.1,0,0.7)	(0.3,0.2,0.5)
Td	(0,0.3,0.7)	(0.1,0.2,0.7)	(0.8,0.1,0.2)	(0.1,0.1,0.8)	(0.6,0.5,0.3)
Ml	(0.3,0.1,0.6)	(0.8,0,0.3)	(0.3,0.1,0.6)	(0.2,0.1,0.6)	(0.3,0.4,0.4)
Sl	(0.9,0,0.1)	(0.4,0.2,0.5)	(0.2,0.2,0.7)	(0.4,0.2,0.5)	(0.4,0.6,0.3)
Mp	(0.2,0.1,0.7)	(0.3,0.2,0.5)	(0.4,0.3,0.2)	(0.9,0,0.1)	(0.7,0.4,0.5)

TABLE 1. Neutrosophic values for patients

Symptoms / Disease	Wg	Td	Ml	Sl	Mp
Lymphedema	(0,0.2,0.8)	(0.2,0.2,0.1)	(0.7,0.2,0.1)	(0.9,0,0.1)	(0.2,0.6,0.4)
Insomnia	(0,0.1,0.9)	(0.9,0,0.1)	(0.2,0,0.8)	(0.2,0.4,0.1)	(0.2,0.1,0.7)
Hypothyroidism	(0.9,0.1,0.1)	(0.1,0.1,0.8)	(0,0.1,0.9)	(0.1,0.4,0.3)	(0.2,0.6,0.4)
Menarche	(0.6,0.3,0.1)	(0.1,0.1,0.8)	(0.2,0.4,0.1)	(0.2,0.5,0.3)	(0.9,0,0.2)
Arthritis	(0,0.1,0.8)	(0.1,0.4,0.6)	(0.9,0.1,0.1)	(0.1,0.3,0.5)	(0.3,0.1,0.6)

TABLE 2. Neutrosophic values for diseases

Step 2: From neutrosophic topologies for (τ_j) and (ν_k):

(i) $\tau_1^* = \tau \cup \tau^* \cup \tau^{**}$, where

$\tau = \{(0,0,1),(1,1,0),(0.9,0.1,0),(0,0.3,0.7),(0.3,0.1,0.6),(0.9,0,0.1),(0.2,0.1,0.7)\}$,

$\tau^* = \{(0.9,0.3,0),(0.3,0.3,0.6),(0.9,0.3,0.1),(0.2,0.3,0.7),(0.9,0.1,0.1)\}$ and

$\tau^{**} = \{(0,0.1,0.7),(0,0,0.7),(0.3,0,0.6),(0.2,0,0.7)\}$.

(ii) $\tau_2^* = \tau \cup \tau^* \cup \tau^{**}$, where

$\tau = \{(0,0,1),(1,1,0),(0.8,0,0.2),(0.1,0.2,0.7),(0.8,0,0.2),(0.4,0.2,0.5),(0.3,0.2,0.5)\}$,

$\tau^* = \{(0.8,0.2,0.2),(0.8,0.2,0.3)\}$ and

$\tau^{**} = \{(0.1,0,0.7),(0.4,0,0.5),(0.3,0,0.5)\}$.

(iii) $\tau_3^* = \tau \cup \tau^* \cup \tau^{**}$, where

$\tau = \{(0,0,1),(1,1,0),(0,0.1,0.9),(0.8,0.1,0.2),(0.3,0.1,0.6),(0.2,0.2,0.7),(0.4,0.3,0.2)\}$,

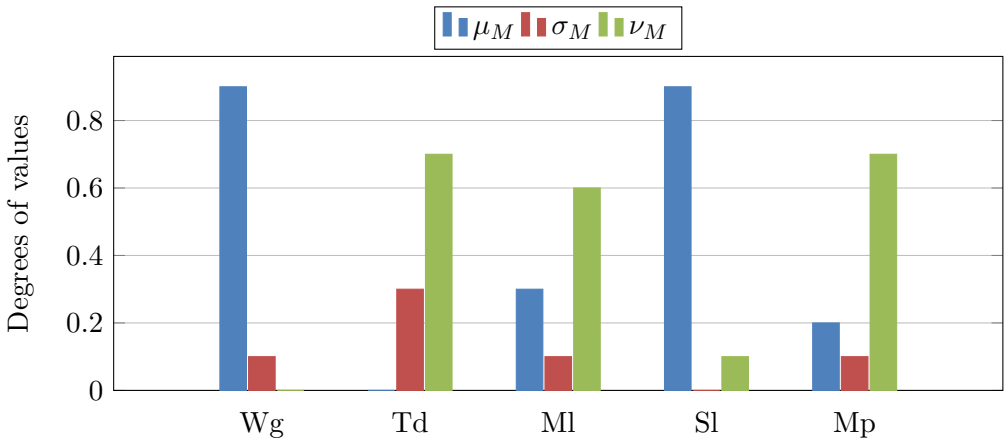

FIGURE 1. Neutrosophic values for Patient 1

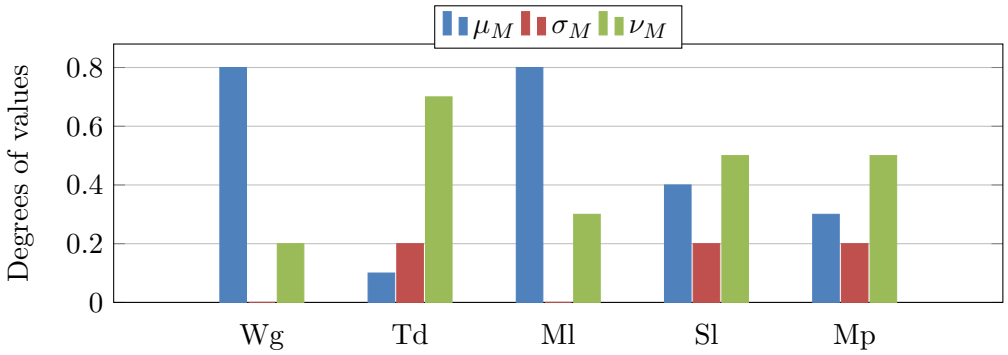

FIGURE 2. Neutrosophic values for Patient 2

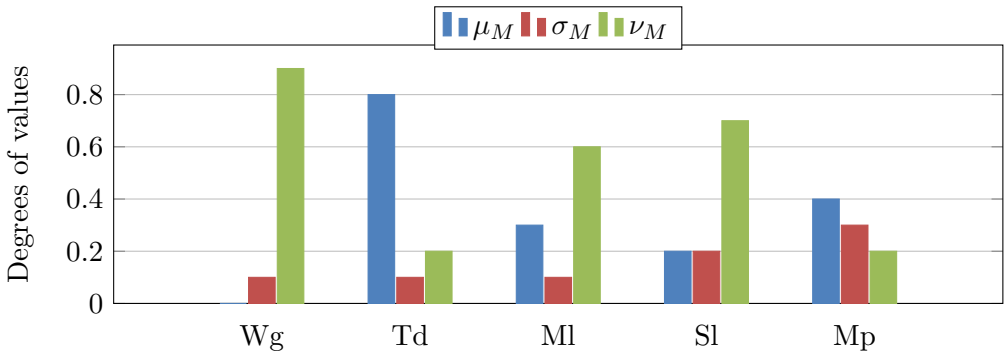

FIGURE 3. Neutrosophic values for Patient 3

$\tau^* = \{(0.8, 0.2, 0.2), (0.8, 0.3, 0.2), (0.3, 0.2, 0.6)\}$ and

$\tau^{**} = h\{(0.2, 0.1, 0.7), (0.4, 0.1, 0.2)\}$.

(iv) $\tau_4^* = \tau \cup \tau^* \cup \tau^{**}$, where

$\tau = \{(0, 0, 1), (1, 1, 0), (0.1, 0, 0.7), (0.1, 0.1, 0.8), (0.2, 0.1, 0.6), (0.4, 0.2, 0.5), (0.9, 0, 0.1)\}$,

$\tau^* = \{(0.1, 0.1, 0.7), (0.9, 0.1, 0.1), (0.9, 0.2, 0.1)\}$ and

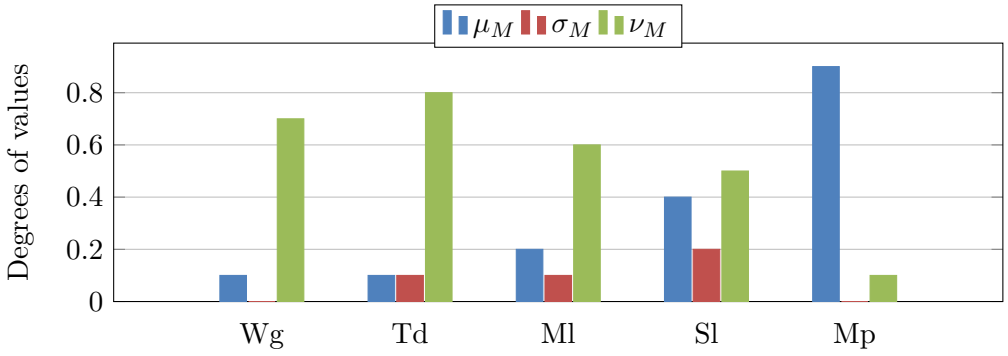

FIGURE 4. Neutrosophic values for Patient 4

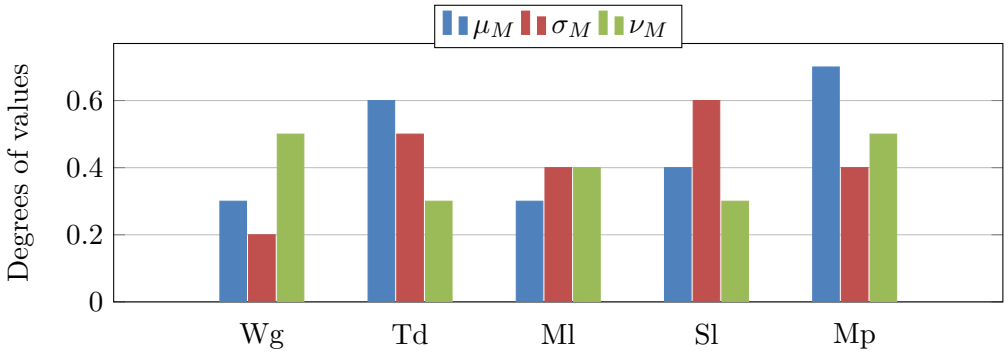

FIGURE 5. Neutrosophic values for Patient 5

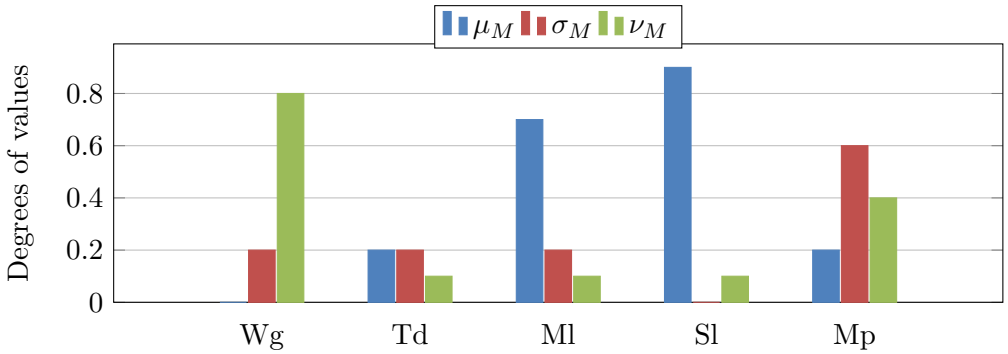

FIGURE 6. Neutrosophic values for Lymphedema

$\tau^{**} = \{(0.1, 0, 0.8), (0.2, 0, 0.6), (0.4, 0, 0.5)\}$.

(v) $\tau_5^* = \tau \cup \tau^* \cup \tau^{**}$, where $\tau = \{(0, 0, 1), (1, 1, 0), (0.3, 0.2, 0.5), (0.6, 0.5, 0.3), (0.3, 0.4, 0.4), (0.4, 0.6, 0.3), (0.7, 0.4, 0.5)\}$,

$\tau^* = \{(0.6, 0.6, 0.3), (0.7, 0.5, 0.3), (0.7, 0.4, 0.4), (0.7, 0.6, 0.3)\}$ and

$\tau^{**} = \{(0.4, 0.5, 0.3), (0.6, 0.4, 0.5), (0.3, 0.4, 0.5), (0.4, 0.4, 0.5)\}$.

(i) $\nu_1^* = \nu \cup \nu^* \cup \nu^{**}$, where

$\nu = \{(0, 0, 1), (1, 1, 0), (0, 0.2, 0.8), (0.2, 0.2, 0.1), (0.7, 0.2, 0.1), (0.9, 0, 0.1), (0.2, 0.6, 0.4)\}$,

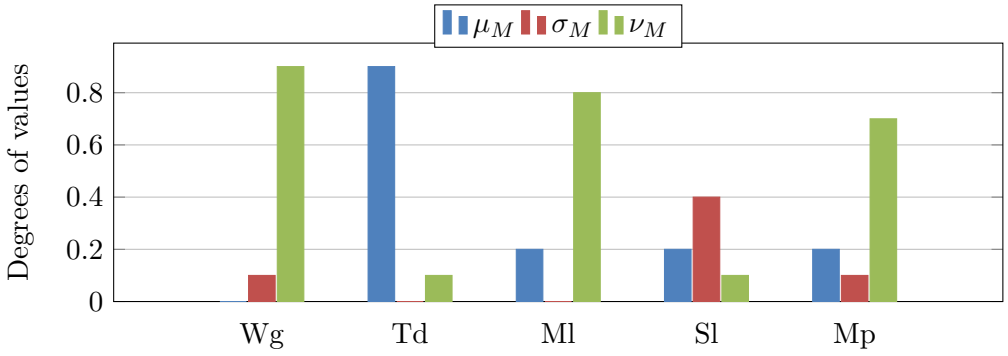

FIGURE 7. Neutrosophic values for Insomnia

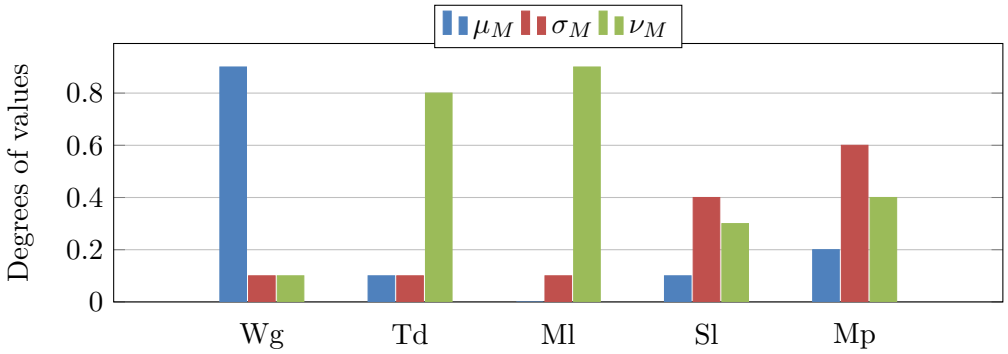

FIGURE 8. Neutrosophic values for Hypothyroidism

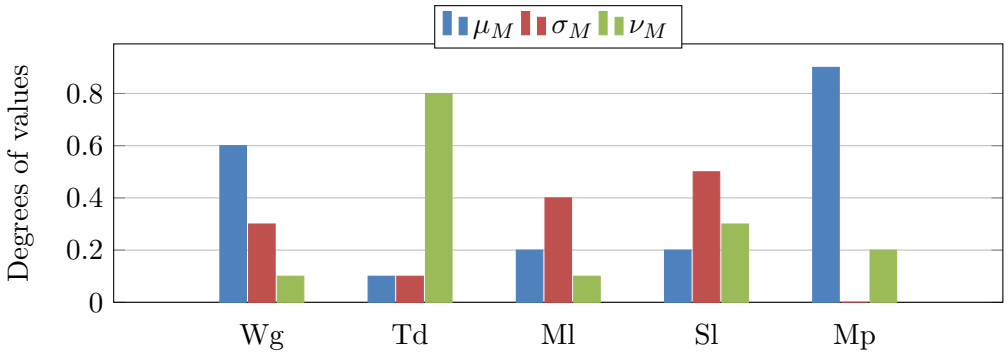

FIGURE 9. Neutrosophic values for Menarche

$\nu^* = \{(0.9, 0.2, 0.1), (0.2, 0.6, 0.1), (0.7, 0.6, 0.1), (0.9, 0.6, 0.1)\}$ and

$\nu^{**} = \{(0, 0, 0.8), (0.2, 0.2, 0.1), (0.2, 0, 0.1), (0.2, 0.2, 0.4), (0.7, 0, 0.1), (0.2, 0, 0.4)\}$.

(ii) $\nu_2^* = \nu \cup \nu^* \cup \nu^{**}$, where

$\nu = \{(0, 0, 1), (1, 1, 0), (0, 0.1, 0.9), (0.9, 0, 0.1), (0.2, 0, 0.8), (0.2, 0.4, 0.1), (0.2, 0.1, 0.7)\}$,

$\nu^* = \{(0.9, 0.1, 0.1), (0.2, 0.1, 0.8), (0.9, 0.4, 0.1)\}$ and

$\nu^{**} = \{(0, 0, 0.9), (0.2, 0, 0.1), (0.2, 0, 0.7)\}$.

(iii) $\nu_3^* = \nu \cup \nu^* \cup \nu^{**}$, where

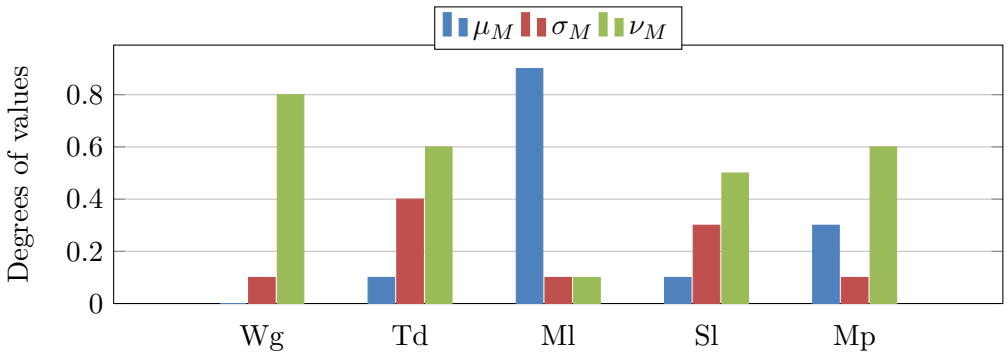

FIGURE 10. Neutrosophic values for Arthritis

$\nu = \{(0,0,1),(1,1,0),(0.9,0.1,0.1),(0.1,0.1,0.8),(0,0.1,0.9),(0.1,0.4,0.3),(0.2,0.6,0.4)\}$,
$\nu^* = \{(0.9,0.4,0.1),(0.9,0.6,0.1),(0.2,0.6,0.3)\}$ and
$\nu^{**} = \{(0.1,0.1,0.3),(0.2,0.1,0.4),(0,0.1,0.9),(0.1,0.4,0.4)\}$.

(iv) $\nu_4^* = \nu \cup \nu^* \cup \nu^{**}$, where
$\nu = \{(0,0,1),(1,1,0),(0.6,0.3,0.1),(0.1,0.1,0.8),(0.2,0.4,0.1),(0.2,0.5,0.3),(0.9,0,0.2)\}$,
$\nu^* = \{(0.6,0.4,0.1),(0.6,0.5,0.1),(0.9,0.3,0.1),(0.9,0.1,0.2),(0.2,0.5,0.1),(0.9,0.4,0.1),(0.9,0.5,0.2)\}$ and
$\nu^{**} = \{(0.2,0.3,0.1),(0.2,0.3,0.3),(0.6,0,0.2),(0.1,0,0.8),(0.2,0.4,0.3),(0.2,0.4,0.2)\}$.

(v) $\nu_5^* = \nu \cup \nu^* \cup \nu^{**}$, where
$\nu = \{(0,0,1),(1,1,0),(0,0.1,0.8),(0.1,0.4,0.6),(0.9,0.1,0.1),(0.1,0.3,0.5),(0.3,0.1,0.6)\}$,
$\nu^* = \{(0.9,0.4,0.1),(0.1,0.4,0.5),(0.3,0.4,0.6),(0.9,0.3,0.1),(0.3,0.3,0.5)\}$ and
$\nu^{**} = \{(0.1,0.1,0.6),(0.1,0.3,0.6),(0.1,0.1,0.5)\}$.

Step 3: Find neutrosophic negative score functions:

(i) $N_seuNeScFu(\tau) = 0.4$, $N_seuNeScFu(\tau^*) = 0.3067$ and $N_seuNeScFu(\tau^{**}) = 0.525$.

$$N_seuNeScFu(\tau_1) = 0.4106.$$

(ii) $N_seuNeScFu(\tau) = 0.4$, $N_seuNeScFu(\tau^*) = 0.2167$ and $N_seuNeScFu(\tau^{**}) = 0.4334$.

$$N_seuNeScFu(\tau_2) = 0.3501.$$

(iii) $N_seuNeScFu(\tau) = 0.4619$, $N_seuNeScFu(\tau^*) = 0.3112$ and $N_seuNeScFu(\tau^{**}) = 0.4167$.

$$N_seuNeScFu(\tau_3) = 0.3966.$$

(iv) $N_seuNeScFu(\tau) = 0.4476$, $N_seuNeScFu(\tau^*) = 0.2667$ and $N_seuNeScFu(\tau^{**}) = 0.4667$.

$$N_seuNeScFu(\tau_4) = 0.3937.$$

(v) $N_seuNeScFu(\tau) = 0.4467$, $N_seuNeScFu(\tau^*) = 0.3917$ and $N_seuNeScFu(\tau^{**}) = 0.4834$.

$$N_seuNeScFu(\tau_5) = 0.4473.$$

(i) $N_seuNeScFu(\nu) = 0.4143$, $N_seuNeScFu(\nu^*) = 0.3083$ and $N_seuNeScFu(\nu^{**}) = 0.4143$.

$$N_seuNeScFu(\nu_1) = 0.3668.$$

(ii) $N_seuNeScFu(\nu) = 0.4619$, $N_seuNeScFu(\nu^*) = 0.2889$ and $N_seuNeScFu(\nu^{**}) = 0.4778$.

$$N_seuNeScFu(\nu_2) = 0.4095.$$

(iii) $N_seuNeScFu(\nu) = 0.5$, $N_seuNeScFu(\nu^*) = 0.3445$ and $N_seuNeScFu(\nu^{**}) = 0.525$.

$$N_seuNeScFu(\nu_3) = 0.4565.$$

(iv) $N_seuNeScFu(\nu) = 0.4191$, $N_seuNeScFu(\nu^*) = 0.2334$ and $N_seuNeScFu(\nu^{**}) = 0.4112$.

$$N_seuNeScFu(\nu_4) = 0.3546.$$

(v) $N_seuNeScFu(\nu) = 0.4857$, $N_seuNeScFu(\nu^*) = 0.4067$ and $N_seuNeScFu(\nu^{**}) = 0.5445$.

$$N_seuNeScFu(\nu_5) = 0.479.$$

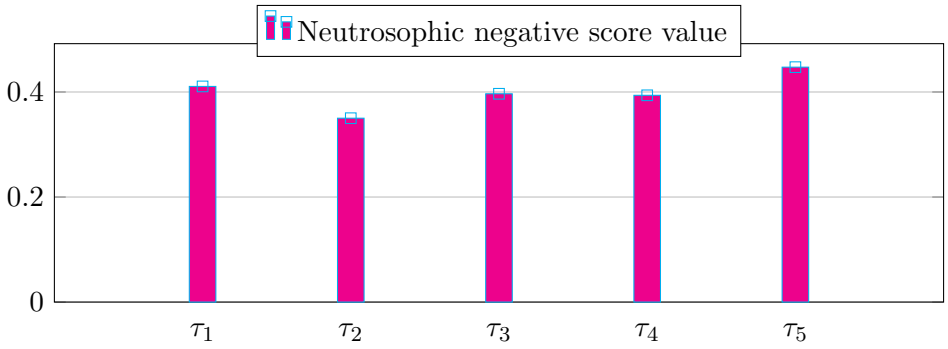

FIGURE 11. Neutrosophic negative score values for Patients

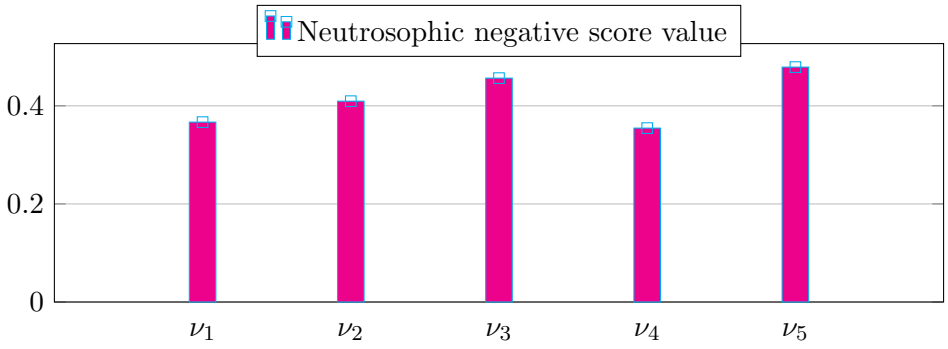

FIGURE 12. Neutrosophic negative score values for Diseases

Step 4: Final Decision:

Arrange neutrosophic negative score values for the alternatives τ_1, τ_2, τ_3, τ_4, τ_5 and the attributes ν_1, ν_2, ν_3, ν_4, ν_5 in descending order. We get the following sequences $\tau_5 \leq \tau_1 \leq \tau_3 \leq \tau_4 \leq \tau_2$ and $\nu_5 \leq \nu_3 \leq \nu_2 \leq \nu_1 \leq \nu_4$. Thus the Pat_5 suffers from Menarche, the Pat_1 suffers from Lymphedema, the Pat_3 suffers from Insomnia, the Pat_4 suffers from Hypothyroidism and the Pat_2 suffers from Arthritis.

5. Conclusions

One of the research areas in general fuzzy topological spaces dealing with the concept of vagueness is neutrosophic topological space. This study established the neutrosophic negative scoring function and the technique based on qualities, as well as alternatives to its real-world application. In addition, the medical diagnosis decision-making problem employing qualities and choices on the neutrosophic score function. This theory can be developed and applied to other general topology study areas such as rough topology, digital topology, image processing, neural networks, and so on. Furthermore, the neutrosophic accuracy function and neutrosophic certainty function are based on applications that can be carried out in future studies.

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