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Exploring Novel Application of Single-Valued Neutrosophic Sets

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Abstract

At their onset, many medical conditions present a combination of overlapping and distinct symptoms, complicating early detection. To assist physicians in navigating these complexities and securing accurate diagnoses, this paper introduces a novel framework that maps the relationships between specific patient pathologies and broader disease categories. Central to this approach is the introduction of the sin-log distance method within Single-Valued Neutrosophic Sets (SVNS). By systematically accounting for data gaps and indeterminacy, this methodology overcomes the limitations and uncertainties of existing diagnostic tools. The practical application of this framework demonstrates its robust capability in accurately identifying illnesses and guiding effective clinical interventions.

Keywords: Neutrosophic set, Single-valued neutrosophic set, Sin-log distance, Medical diagnosis.

1 | Introduction

The foundation of handling uncertainty in real-world applications began in 1965 when Zadeh introduced Fuzzy Set Theory [1]. To address situations where the membership function itself is uncertain and cannot be expressed as a crisp value, the concept of Interval-Valued Fuzzy Sets was developed. Later, in 1986, Atanassov [2] extended this field by introducing Intuitionistic Fuzzy Sets (IFS), which incorporate both truth-membership and falsity-membership degrees. Samuel and Narmadhagnanam [3] developed tangent inverse distance and sine similarity measures for IFS to use in clinical diagnostics. Similarly, Rajkalpana et al. [4] utilized IFS and its operators for medical applications. Kozae et al. [5] applied IFS to COVID-19 diagnosis and determination. Shinoj and John [6] merged fuzzy multi-sets with IFS to create Intuitionistic Fuzzy Multi-Sets (IFMS). Rajarajeswari and Uma [7], [8] proposed various methodologies within IFMS, while Samuel and Narmadhagnanam [9] introduced sine inverse distance measures for IFMS, applying them to medical diagnostics. Eventually, IFS was further extended into Interval-Valued IFS to capture broader ranges of

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uncertainty. While intuitionistic and interval-valued IFS successfully manage incomplete data, they fail to process indeterminate and inconsistent information commonly found in real-world belief systems. To overcome this limitation, Smarandache [10] introduced Neutrosophic Sets (NS) from a philosophical perspective, capable of handling uncertain, imprecise, incomplete, and inconsistent data. Concurrently, Pawlak introduced Rough Set (RS) Theory [11] as a mathematical tool to model incomplete information using equivalence relations to establish lower and upper approximations. Over time, researchers merged these distinct frameworks: Nanda and Majumdar [12] studied Fuzzy RS. Broumi et al. [13] introduced Rough NS, which were later expanded with cosine and cotangent similarity measures by Pramanik and Mondal [14], [15], and correlation coefficients by Pramanik et al. [16]. Samuel and Narmadhagnanam [17–20] developed several rough neutrosophic methods specifically tailored for medical diagnosis. Zheng et al. [21] introduced a multi-granularity variable precision neutrosophic RS model featuring three distinct strategies for group decision-making. NS have been extensively adopted in decision-making and optimization [22–27]. Notably, Wang et al. [28] introduced Single-Valued Neutrosophic Sets (SVNS), prompting a wave of specialized research: Majumdar and Samanta [29] proposed similarity and entropy measures, while Ye [30] introduced a cotangent similarity measure. Ye et al. [31] also established correlation coefficients for both single-valued and interval-valued neutrosophic environments. New distance and similarity metrics were developed by Garg and Nancy [32], as well as Chai et al. [33]. Narmadhagnanam and Samuel [34], [35] introduced sine exponential measures and tan-log distances. Broumi et al. [36] introduced single-valued (2N+1)-sided and (2N)-sided polygonal neutrosophic numbers. Li et al. [37] developed a slope stability assessment approach using arctangent and tangent similarity measures of neutrosophic numbers. Imran et al. [38] designed a multi-attribute decision-making system using a single-valued neutrosophic hesitant fuzzy Aczel-Alsina aggregation operator. Byeon et al. [39] suggested an unsupervised SVNS approach for cloud clustering. To track multiple occurrences of elements, Ye and Ye [40] formulated Single-Valued Neutrosophic Multi-Sets. Samuel and Narmadhagnanam [41] then established a cosine exponential distance for these multi-sets to assist in medical diagnostics. In 2013, Smarandache [42] generalized these concepts into n-Valued Refined Neutrosophic Logic, breaking down the standard components into sub-components. This gave rise to Neutrosophic Refined Sets (NRS), generalizing both fuzzy and IFMS. Broumi and Smarandache [43] extended Ye's [44] improved cosine similarity measure to NRS. Samuel and Narmadhagnanam [45], [46] designed multiple NRS methods for clinical diagnosis. Zhao and Ye [47] implemented a Multi-Criteria Group Decision-Making (MCGDM) model using a weighted hyperbolic sine similarity measure on neutrosophic multivalued sets for assessing teacher quality. Hemabala et al. [48] evaluated medical diagnoses utilizing refined neutrosophic fuzzy logic. Wang et al. [49] introduced Interval Neutrosophic Sets (INS) to allow membership degrees to be represented as intervals rather than crisp values. This framework evolved through several key contributions: Ulucay [50] explored concepts regarding interval-valued refined NS, and later [51] introduced hybrid distance-based similarity measures for n-valued neutrosophic trapezoidal numbers. Pourersmaeil et al. [52] designed a parametric scoring function for multi-criteria decision-making. Liu et al. [53] engineered a similarity measure for INS to optimize resource offloading in edge computing. Hema et al. [54] formulated a novel approach within a plithogenic interval-valued neutrosophic environment. Saqlain et al. [55] utilized a neutrosophic linguistic valued hypersoft set for medical treatment and diagnosis. Broumi et al. [56] generalized n-valued NS inton-valued INS. Samuel and Narmadhagnanam [57–61] subsequently introduced multiple methodologies within this domain, successfully applying them to clinical diagnostics. To deliver a more dependable and accurate medical diagnostic tool, this paper introduces a novel, streamlined and highly precise approach based on SVNS.

The remainder of this article is organized as follows. Section 2 Reviews essential preliminary concepts. Section 3 Defines the proposed concept and analyzes its core properties. Section 4, 5, and 6 Present the clinical assessment framework, operational procedure, and a hypothetical medical diagnosis case study, respectively. Section 7 Outlines the significance statements of the research. Section 8 Concludes the paper with final remarks.

2 | Preliminaries

2.1 | Definition

Let X be a Universe of discourse,with a generic element in X denoted by x, the NS A is an object having the form

$$A = \{\langle x : T_A(x), I_A(x), F_A(x)\rangle, x \in X\},$$

where the functions define $T, I, F : X \to]^{-}0,1^{+}[$ respectively the degree of membership (or Truth), the degree of indeterminacy and the degree of non-membership (or Falsehood) ofthe element $x \in X$ to the set A with the condition

$$^{-}0 \le T_A(x) + I_A(x) + F_A(x) \le 3^{+}.$$

2.2 | Definition

Let X be a space of points (objects) with a generic element in X denoted by x. A SVNS A in X ischaracterized by truth membership function T_A, indeterminacy function I_A and falsity membership function F_A. For each point x in X [28],

$$T_A(x), I_A(x), F_A(x) \in [0,1],$$

when X is continuous, a SVNS A can be written as

$$A = \int_x \langle T(x), I(x), F(x)\rangle / x, x \in X,$$

When X is discrete, a SVNS A can be written as

$$A = \sum_{i=1}^{n} \langle T(x_i), I(x_i), F(x_i)\rangle / x_i, x_i \in X.$$

3 | Proposed Concept

3.1 | Sin-Log Distance

Let $R = \sum_{i=1}^{n} \frac{z_i}{\langle T_R(z_i), I_R(z_i), F_R(z_i)\rangle}$ and $S = \sum_{i=1}^{n} \frac{z_i}{\langle T_S(z_i), I_S(z_i), F_S(z_i)\rangle}$ be two SVNS in $Z = \{z_1, z_2, ..., z_n\}$ then the tan – log distance is defined as

$$\text{SINLOGD}_{\text{SVNS}}(R,S) = \sum_{i=1}^{n} \Big[\sin\Big[\log[1 + |T_R(z_i) - T_S(z_i)| + |I_R(z_i) - I_S(z_i)| + |F_R(z_i) - F_S(z_i)|]\Big]\Big].$$

Example 1. Let R = [0.2,0.3,0.5] & S = [0.3,0.7,0.1] then

$$\text{SINLOGD}_{\text{SVNS}}(R,S) = 0.0271.$$

Proposition 1.

I. $\text{SINLOGD}_{\text{SVNS}}(R,S) > 0$

II. $\text{SINLOGD}_{\text{SVNS}}(R,S) = \text{SINLOGD}_{\text{SVNS}}(S,R)$

III. If $R \subseteq S \subseteq U$ then $\text{SINLOGD}_{\text{SVNS}}(R,U) \ge \text{SINLOGD}_{\text{SVNS}}(R,S)$ and $\text{SINLOGD}_{\text{SVNS}}(R,U) \ge \text{SINLOGD}_{\text{SVNS}}(S,U)$

Proof: 1) For SVNS, it is evident that the truth-membership function, indeterminacy-membership function and falsity-membership function are within [0,1]. Hence, $SINLOGD_{SVNS}(R,S) > 0$. 2) We are aware of that

- $|T_R(z_i) - T_S(z_i)| = |T_S(z_i) - T_R(z_i)|$
- $|I_R(z_i) - I_S(z_i)| = |I_S(z_i) - I_R(z_i)|$
- $|F_R(z_i) - F_H S(z_i)| = |F_S(z_i) - F_R(z_i)|$

Hence, $SINLOGD_{SVNS}(R,S) = SINLOGD_{SVNS}(S,R)$. 3) We are aware of that

- $T_R(z_i) \le T_S(z_i) \le T_U(z_i)$
- $I_R(z_i) \ge I_S(z_i) \ge I_U(z_i)$
- $F_R(z_i) \ge F_S(z_i) \ge F_U(z_i)$
- $[\because R \subseteq S \subseteq U]$

Hence,

- $|T_R(z_i) - T_S(z_i)| \le |T_R(z_i) - T_U(z_i)|$
- $|I_R(z_i) - I_S(z_i)| \le |I_R(z_i) - I_U(z_i)|$
- $|F_R(z_i) - F_S(z_i)| \le |F_R(z_i) - F_U(z_i)|$
- $|T_S(z_i) - T_U(z_i)| \le |T_R(z_i) - T_U(z_i)|$
- $|I_S(z_i) - I_U(z_i)| \le |I_R(z_i) - I_U(z_i)|$
- $|F_S(z_i) - F_U(z_i)| \le |F_R(z_i) - F_U(z_i)|$

Here, the sine log distance is an increasing function

$SINLOGD_{SVNS}(R,U) \ge SINLOGD_{SVNS}(R,S)$ and $SINLOGD_{SVNS}(R,U) \ge SINLOGD_{SVNS}(S,U)$.

4 | Clinical Assessment Framework

This section presents a clinical assessment utilizing the following defined sets:

I. C represents the classifications of illnesses: {Diabetes Mellitus, Dengue fever, Pulmonary Tuberculosis}.

II. B represents the cohort of individuals presenting with specific pathologies: {Amit, Jeyanthinathar, Janardanan}.

III. D represents the set of clinical indicators: {Body Temperature, Fatigue, Weight loss, Loss of appetite, Malaise}.

let E_1 denote the single-valued neutrosophic relation mapping those indicators to the specific patient cohort and Let E_2 denote the single-valued neutrosophic relation mapping the disease classifications to the clinical indicators, and

The primary objectives of this computational methodology are:

I. Indicator determination: Identifying and evaluating the relevant clinical symptoms.

II. Knowledge modeling: Constructing a scientific framework utilizing SVNS.

III. Diagnostic assessment: Evaluating the data through the newly developed processing technique.

5 | Procedure

Step 1. *Table 1* details a cohort of patients exhibiting a particular pathology, mapped against a specific set of clinical indications, denoted as E_1.

Step 2. *Table 2* outlines the correlation between the specified set of clinical indications and the disease classifications, denoted as E_2.

Step 3. By evaluating the data from *Tables 1* and *2*, the calculation E_3 is derived and recorded in *Table 3*. To determine the likelihood that a specific patient cohort is affected by a particular disease classification, the lowest value within each row was selected.

6 | Hypothetical example

Applying *Step 1*:

Table 1. A cohort of patients exhibiting a particular pathology, mapped against a specific set of clinical indications.

E_1	Body Temperature	Fatigue	Weight Loss	Loss of Appetite	Malaise
Amit	(0.5,0.3,0.2)	(0.4,0.3,0.3)	(0.8,0.1,0.1)	(0.9,0.1,0.0)	(0.4,0.2,0.4)
Jeyanthinathar	(0.6,0.2,0.2)	(0.3,0.2,0.5)	(0.1,0.4,0.5)	(0.2,0.6,0.2)	(0.0,0.7,0.3)
Janardanan	(0.7,0.2,0.1)	(0.1,0.2,0.7)	(0.2,0.5,0.3)	(0.1,0.8,0.1)	(0.8,0.2,0.0)

Applying *Step 2*:

Table 2. The correlation between the specified set of clinical indications and the disease classifications.

E2	Diabetes Mellitus	Dengue Fever	Pulmonary Tuberculosis
Body Temperature	(0.7,0.1,0.2)	(0.0,0.2,0.8)	(0.6,0.1,0.3)
Fatigue	(0.3,0.1,0.6)	(0.4,0.2,0.4)	(0.3,0.1,0.6)
Weight loss	(0.2,0.0,0.8)	(0.9,0.0,0.1)	(0.2,0.8,0.0)
Loss of appetite	(0.1,0.3,0.6)	(0.3,0.2,0.5)	(0.3,0.0,0.7)
Malaise	(0.2,0.7,0.1)	(0.2,0.2,0.6)	(0.3,0.3,0.4)

Applying *Step 3*. (select the minimum value)

Table 3. Sin-log distance.

E3	Diabetes Mellitus	Dengue Fever	Pulmonary Tuberculosis
Amit	1.3914	0.9750	1.2041
Jeyanthinathar	0.8086	1.3668	1.0427
Janardanan	1.1533	1.6163	1.1935

Table 3 indicates that Amit is suffering from Dengue fever, Jeyanthinathar and Janardanan are experiencing Diabetes Mellitus.

7 | Significance Statements

The findings of this study enable the precise identification of the specific illnesses affecting the participating individuals. Because the employed methodology is free from the constraints common to alternative approaches, it expands beyond clinical diagnostics to offer foundational insights for novel theories in fields such as pattern recognition and image processing.

8 | Conclusion

This study investigated how a specific group of individuals with a particular pathology relates to the signs and classification of their illness. To determine which specific disease likely affected them, we utilized the "sin – log distance" technique. Because this method is reliable and accurate, it provides an efficient way to manage complex medical diagnostic challenges. Ultimately, this approach improves diagnostic precision, allowing it to overcome the limitations and drawbacks found in previous research.

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Conflict of interest

The writers say they have no competing interests.

References

[1] Zadeh, L. A. (1965). Fuzzy sets. *Information and control*, *8*(3), 338–353. https://doi.org/10.1016/S0019-9958(65)90241-X

[2] Atanassov, K. T. (1986). Intuitionistic fuzzy sets. *Fuzzy sets and systems*, *20*(1), 87–96. https://doi.org/10.1016/S0165-0114(86)80034-3

[3] Samuel, A. E., & S.Rajakumar. (2018). Intuitionistic fuzzy sets in medical diagnosis. *International journal of pure and applied mathematics*, *120*(1), 129–135. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://acadpubl.eu/hub/2018-120-8/1/14.pdf

[4] Rajkalpana, M., KavyaSri, R., Abarna, S., & Nishantini, M. (2020). An analysis of medical diagnosis using intuitionistic fuzzy set and its operators. *International journal of advanced science and technology*, *29*(2), 2496–2500.

[5] Kozae, A. M., Shokry, M., & Omran, M. (2020). Intuitionistic fuzzy set and its application in Corona Covid-19. *Applied and computational mathematics*, *9*(5), 146–154. https://doi.org/10.11648/j.acm.20200905.11

[6] Shinoj, T. K., & John, S. J. (2012). Intuitionistic fuzzy multisets and its application in medical diagnosis. *World academy of science, engineering and technology*, *6*(1), 1418–1421. https://www.researchgate.net/publication/265089040

[7] Rajarajeswari, P., & Uma, N. (2013). Hausdroff similarity measures for intuitionistic fuzzy multi sets and its application in medical diagnosis. *International journal of mathematical archive-4 (9)*, *4*(9), 106–111.

[8] Rajarajeswari, P., & Uma, N. (2014). Normalized hamming similarity measure for intuitionistic fuzzy multi sets and its application in medical diagnosis. *International journal of mathematics trends and technology-IJMTT*, *5*(3), 219–225.

[9] Samuel, A. E., & Narmadhagnanam, R. (2018). Intuitionistic fuzzy multisets in medical diagnosis. *International journal of fuzzy mathematical archive*, *16*(01), 13–19. http://dx.doi.org/10.22457/ijfma.v16n1a3

[10] Smarandache, F. (2005). *A unifying field in logics: Neutrosophic logic. neutrosophy, neutrosophic set, neutrosophic probability (fifth edition)*. American Research Press. http://doi.org/10.5281/zenodo.49174

[11] Pawlak, Z. (1982). Rough sets. *International journal of computer & information sciences*, *11*(5), 341–356. https://doi.org/10.1007/BF01001956

[12] Nanda, S., & Majumdar, S. (1992). Fuzzy rough sets. *Fuzzy sets and systems*, *45*(2), 157–160. https://doi.org/10.1016/0165-0114(92)90114-J

[13] Said, B., Smarandache, F., & Dhar, M. (2014). Rough neutrosophic sets. *Italian journal of pure and applied mathematics*, *32*, 493–502. https://doi.org/10.5281/zenodo.30310

[14] Pramanik, S., & Mondal, K. (2015). Cosine similarity measure of rough neutrosophic sets and its application in medical diagnosis. *Global journal of advanced research*, *2*, 212–220. https://doi.org/10.5281/zenodo.23041

[15] Pramanik, S., & Mondal, K. (2015). Cotangent similarity measure of rough neutrosophic sets and its application to medical diagnosis. *Journal of new theory*, *4*, 90-102. https://dergipark.org.tr/en/pub/jnt/article/381119

[16] Pramanik, S., Roy, R., Roy, T., & Smarandache, F. (2017). Multi criteria decision making using correlation coefficient under rough neutrosophic environment. *Neutrosophic sets and systems*, *17*, 29–36. https://doi.org/10.5281/zenodo.1012237

[17] Samuel, A. E., & .Narmadhagnanam, R. (2018). Utilization of rough neutrosophic sets in medical diagnosis. *International journal of engineering science invention (IJESI)*, *7*(3), 1–5. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://fs.unm.edu/neut/UtilizationOfRoughNeutrosophicMedical.pdf

[18] Samuel, A. E., & Narmadhagnanam, R. (2018). Neoteric techniques for rough neutrosophic set and their utilization in Medical Diagnosis. *International journal for research in engineering application & management*, *4*(7), 253–258. https://doi.org/10.18231/2454-9150.2018.0951

[19] Samuel, A. E., & Narmadhagnanam, R. (2018). Rough neutrosophic sets in medical diagnosis. *International journal of pure and applied mathematics*, *120*(8), 79–87. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://acadpubl.eu/hub/2018-120-8/1/9.pdf

[20] Samuel, A. E., & Narmadhagnanam, R. (2019). Pi-distance of rough neutrosophic sets for medical diagnosis. *Neutrosophic sets and systems, 28*, 51–57. https://doi.org/10.5281/zenodo.3382511

[21] Zheng, H., Bo, C., Li, L., Wang, L., & Jiang, W. (2025). A novel multi-granularity variable precision neutrosophic rough set and group decision-making application with three strategies. *AIMS mathematics*, *10*(10), 23187–23219. https://doi.org/10.3934/math.20251029

[22] Abdel-Basset, M., Mohamed, R., Zaied, A. E. N. H., & Smarandache, F. (2019). A hybrid plithogenic decision-making approach with quality function deployment for selecting supply chain sustainability metrics. *Symmetry*, *11*(7), 1–21. https://doi.org/10.3390/sym11070903

[23] Abdel-Basset, M., Nabeeh, N. A., El-Ghareeb, H. A., & Aboelfetouh, A. (2020). Utilising neutrosophic theory to solve transition difficulties of IoT-based enterprises. *Enterprise information systems*, *14*(9–10), 1304–1324. https://doi.org/10.1080/17517575.2019.1633690

[24] Nabeeh, N. A., Abdel-Basset, M., El-Ghareeb, H. A., & Aboelfetouh, A. (2019). Neutrosophic multi-criteria decision making approach for IoT-based enterprises. *IEEE access*, *7*, 59559–59574. https://doi.org/10.1109/ACCESS.2019.2908919

[25] Abdel-Baset, M., Chang, V., & Gamal, A. (2019). Evaluation of the green supply chain management practices: A novel neutrosophic approach. *Computers in industry*, *108*, 210–220. https://doi.org/10.1016/j.compind.2019.02.013

[26] Abdel-Basset, M., Saleh, M., Gamal, A., & Smarandache, F. (2019). An approach of TOPSIS technique for developing supplier selection with group decision making under type-2 neutrosophic number. *Applied soft computing*, *77*, 438–452. https://doi.org/10.1016/j.asoc.2019.01.035

[27] Abdel-Baset, M., Chang, V., Gamal, A., & Smarandache, F. (2019). An integrated neutrosophic ANP and VIKOR method for achieving sustainable supplier selection: A case study in importing field. *Computers in industry*, *106*, 94–110. https://doi.org/10.1016/j.compind.2018.12.017

[28] Wang, H., Smarandache, F., Zhang, Y., & Sunderraman, R. (2010). *Single valued neutrosophic sets*. https://www.researchgate.net/publication/262047656

[29] Majumdar, P., & Samanta, S. K. (2014). On similarity and entropy of neutrosophic sets. *Journal of intelligent & fuzzy systems*, *26*(3), 1245–1252. https://doi.org/10.3233/IFS-130810

[30] Ye, J. (2017). Single-valued neutrosophic similarity measures based on cotangent function and their application in the fault diagnosis of steam turbine. *Soft computing*, *21*(3), 817–825. https://doi.org/10.1007/s00500-015-1818-y

[31] Ye, J., Du, S., & Yong, R. (2021). Correlation coefficients of credibility interval-valued neutrosophic sets and their group decision-making method in single- and interval-valued hybrid neutrosophic multi-valued environment. *Complex & intelligent systems*, *7*(6), 3225–3239. https://doi.org/10.1007/s40747-021-00500-z

[32] Garg, H., & Nancy. (2020). Algorithms for single-valued neutrosophic decision making based on TOPSIS and clustering methods with new distance measure. *AIMS mathematics*, *5*(3), 2671–2693. https://doi.org/10.3934/math.2020173

[33] Chai, J. S., Selvachandran, G., Smarandache, F., Gerogiannis, V. C., Son, L. H., Bui, Q. T., & Vo, B. (2021). New similarity measures for single-valued neutrosophic sets with applications in pattern recognition and medical diagnosis problems. *Complex & intelligent systems*, *7*(2), 703–723. https://doi.org/10.1007/s40747-020-00220-w

[34] Narmadhagnanam, R., & Edward Samue, A. (2022). Sine exponential measure of single valued neutrosophic sets in medical diagnosis. *Neutrosophic sets and systems*, *51*, 303–310. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://fs.unm.edu/NSS/SineExponentialNeutrosophic19.pdf

[35] Narmadhagnanam, R., & Samuel, A. E. (2024). Enhancing medical diagnosis with single valued neutrosophic sets and tan-log distance. *Soft computing fusion with applications*, *1*(1), 50–58. https://doi.org/10.22105/scfa.v1i1.29

[36] Broumi, S., Murugappan, M., Talea, M., Bakali, A., Smarandache, F., Singh, P. K., & Dey, A. (2018). Single valued (2N+1) sided polygonal neutrosophic numbers and single valued (2N) sided polygonal neutrosophic numbers. *Neutrosophic sets and systems*, *25*, 54–65. https://www.researchgate.net/publication/333559807

[37] Li, C., Ye, J., Cui, W., & Du, S. (2019). Slope stability assessment method using the arctangent and tan-gent similarity measure of neutrosophic numbers. *Neutrosophic sets and systems*, *27*, 98–103. https://doi.org/10.5281/zenodo.3275419

[38] Imran, R., Ullah, K., Ali, Z., & Akram, M. (2024). An approach to multi-attribute decision-making based on single-valued neutrosophic hesitant fuzzy aczel-alsina aggregation operator. *Neutrosophic syst. appl*, *22*, 43–57. https://doi.org/10.61356/j.nswa.2024.22387

[39] Byeon, H., Kumar, P., Khan, I. R., Alghayadh, F. Y., Rusho, M. A., & Soni, M. (2025). Unsupervised single valued neutrosophic sets approach for cloud clustering. *Procedia computer science*, *258*, 3580–3589. https://doi.org/10.1016/j.procs.2025.04.613

[40] Ye, S., & Ye, J. (2014). Dice similarity measure between single valued neutrosophic multisets and its application in medical diagnosis. *Neutrosophic sets and systems*, *6*(1), 49–54. https://digitalrepository.unm.edu/cgi/viewcontent.cgi?article=1073&context=nss_journal

[41] Samuel, A. E., & Narmadhagnanam, R. (2018). Cosine exponential distance of single valued neutrosophic multi sets in medical diagnosis. *International journal of engineering research and application*, *8*(6), 26–29. https://doi.org/10.9790/9622-0806012629

[42] Smarandache, F. (2014). n-valued refined neutrosophic logic and its applications to physics. *Progress in physics*, *4*, 143–146. https://doi.org/10.5281/zenodo.30245

[43] Broumi, B., & Smarandache, F. (2014). Neutrosophic refined similarity measure based on cosine function. *Neutrosophic sets and systems*, *6*, 486–496. https://doi.org/10.5281/zenodo.30230

[44] Ye, J. (2014). Vector similarity measures of simplified neutrosophic sets and their application in multicriteria decision making. *International journal of fuzzy systems*, *16*(2), 204–211. https://www.researchgate.net/publication/281546974

[45] Samuel, A. E., & R.Narmadhagnanam. (2017). Neutrosophic refined sets in medical diagnosis. *International journal of fuzzy mathematical archive*, *14*, 117–123. https://doi.org/10.22457/ijfma.v14n1a14

[46] Samuel, E. (2018). Sine logarithmic distance of neutrosophic refined sets in medical diagnosis. *Journal of global research in mathematical archives(JGRMA)*, *5*(6), 14–19. https://www.jgrma.com/index.php/jgrma/article/view/482

[47] Zhao, M., & Ye, J. (2022). MCGDM approach using the weighted hyperbolic sine similarity measure of neutrosophic (indeterminate fuzzy) multivalued sets for the teaching quality assessment of teachers.

Neutrosophic sets and systems, *48*(1), 1–8. https://digitalrepository.unm.edu/cgi/viewcontent.cgi?article=2005&context=nss_journal

[48] Hemabala, K., Kumar, B. S., & Smarandache, F. (2023). Medical diagnosis via refined neutrosophic fuzzy logic: Detection of illness using neutrosophic sets. *Journal of advanced zoology*, *44*, 15–24. https://doi.org/10.17762/jaz.v44iS-1.197

[49] Wang, H., Smarandache, F., Zhang, Y. Q., & Sunderraman, R. (2005). *Interval neutrosophic sets and logic: Theory and applications in computing*. https://doi.org/10.5281/zenodo.8818

[50] Uluçay, V. (2021). Some concepts on interval-valued refined neutrosophic sets and their applications. *Journal of ambient intelligence and humanized computing*, *12*(7), 7857–7872. https://doi.org/10.1007/s12652-020-02512-y

[51] ULUÇAY, V. (2026). A novel hybrid distance-based similarity measures for n-valued neutrosophic trapezoidal numbers and its applications. *Neutrosophic sets & systems*, *95*, 62–74. https://digitalrepository.unm.edu/nss_journal/vol95/iss1/5/

[52] Pouresmaeil, H., Khorram, E., & Shivanian, E. (2022). A parametric scoring function and the associated method for interval neutrosophic multi-criteria decision-making. *Evolving systems*, *13*(2), 347–359. https://doi.org/10.1007/s12530-021-09394-1

[53] Liu, Q., Wang, X., Kong, M., & Qin, K. (2023). Similarity measure for interval neutrosophic sets and its decision application in resource offloading of edge computing. *Electronics*, *12*(8), 1–20. https://doi.org/10.3390/electronics12081931

[54] Hema, R., Sudharani, R., & Kavitha, M. (2023). A novel approach on plithogenic interval valued neutrosophic hypersoft sets and its application in decision making. *Indian journal of science and technology*, *16*(32), 2494–2502. https://doi.org/10.17485/IJST/v16i32.1302

[55] Saqlain, M., Kumam, P., & Kumam, W. (2024). Neutrosophic linguistic valued hypersoft set with application: Medical diagnosis and treatment. *Neutrosophic sets and systems*, *63*, 130–152. https://doi.org/10.5281/zenodo.10531779

[56] Broumi, S., Deli, I., & Smarandache, F. (2015). N-Valued interval neutrosophic sets and their application in medical diagnosis. *Critical review*, *10*, 45–69. https://doi.org/10.5281/zenodo.49148

[57] Samuel, A. E., & Narmadhagnanam, R. (2017). Innovative approaches for n-valued interval neutrosophic sets and their execution in medical diagnosis. *Journal of applied sciences*, *17*(9), 429–440. https://doi.org/10.3923/jas.2017.429.440

[58] Samuel, A. E., & Narmadhagnanam, R. (2018). N-valued interval neutrosophic set in medical diagnosis. *International journal of pure and applied mathematics*, *120*(8), 59–67. https://acadpubl.eu/hub/2018-120-8/2/7.pdf

[59] Samuel, A. E., & Narmadhagnanam, R. (2018). Execution of n-valued interval neutrosophic sets in medical diagnosis. *International journal of mathematics trends and technology (IJMTT)*, *58*(1), 66–70. https://doi.org/10.14445/22315373/IJMTT-V58P509

[60] Narmadhagnanam, R., & Samuel, A. E. (2024). Application of secant span in medical diagnosis. *Neutrosophic systems with applications*, *18*, 40–45. https://doi.org/10.61356/j.nswa.2024.18254

[61] Narmadhagnanam, R., & Samuel, A. E. (2024). Cotangent similarity measure of n-valued interval neutrosophic sets for medical diagnosis. *Uncertainty discourse and applications*, *1*(2), 210–218. https://doi.org/10.48313/uda.v1i2.42