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EXPLORING HEPTAPARTITIONED NEUTROSOPHIC PYTHAGOREAN TOPOLOGICAL SPACES

Abstract: The aim of this paper is to introduce a novel concept known as the Heptapartitioned Neutrosophic Pythagorean Topological spaces and discussed the fundamental aspects and key properties. This new concept integrates with existing mathematical structure and its significance in the broader field of Topology.

Keywords: Heptapartitioned Neutrosophic Set, Heptapartitioned Neutrosophic Topological Space, Heptapartitioned Neutrosophic Pythagorean Topological Space.

Mathematics Subject Classification: 54C50, 54G99.

1. Introduction

The fuzzy [15] set concept was introduced by Zadeh in 1965. Later, F. Smarandache introduced the neutrosophic set, which is a mathematical tool designed to address problems involving imprecise, indeterminate and inconsistent data. Smarandache's neutrosophic set allows the indeterminacy membership function to operate independently from the truth and falsity membership functions. This theory has been extensively explored by researchers and has been applied to various real-life situations that involve uncertainty. Rajesh Chatterjee pioneered the concept of quadripartitioned single-valued neutrosophic sets. Recently, Das [1] and his team introduced Quadripartitioned Neutrosophic Topological Spaces by applying topology to these quadripartitioned neutrosophic sets. Rama Malik [5] and Surapati Pramanik introduced the concept of the pentapartitioned neutrosophic set and its properties. In

this set, indeterminacy is divided into three components contradiction, ignorance and unknown membership functions.

In 2021, R. Radha and A. Stanis Arul Mary [7,8] expanded on the concepts of pentapartitioned and quadripartitioned neutrosophic sets to develop the heptapartitioned neutrosophic set [6]. This advancement brought a new dimension to handle complex indeterminate data by introducing a seven-part partitioning system. Building on this foundation, V. Jeyanthi and T. Mythili [4] made further strides in 2023 by introducing heptapartitioned neutrosophic topological spaces. Their work applied topological principles to the heptapartitioned neutrosophic sets, enhancing their utility in various scientific and mathematical applications. These developments mark significant progress in the field, offering more sophisticated tools for dealing with uncertainty and indeterminacy. As a result, researchers now have better methods to address real-world problems involving complex data. In 1995, F. Smarandache [14] introduced Seven Symbol-Valued Neutrosophic Logic. When the elements T_A, T_R, F_A, F_R, U, C, and G are considered as subsets of [0, 1], this logic evolves into a numerical system with seven distinct values. This system provides the foundation for defining the Heptapartitioned Neutrosophic Set and examining its characteristics. Each of these symbols corresponds to a specific type of membership: absolute truth, relative truth, contradiction, unknown, ignorance, relative falsity, and absolute falsity, respectively.

Building on Heptapartitioned Neutrosophic Topological Spaces, the authors have extended their research to the Heptapartitioned Neutrosophic Pythagorean Set, incorporating it into the framework of topological spaces. This extension allows us to explore the properties and implications of this set within the broader context of topology. Our work now integrates these concepts, offering new insights into their interaction and application in topological settings.

2. Preliminaries

2.1 Basic Concepts

Definition 2.1.1: Let X be a universe. A Neutrosophic set A on X can be defined as follows:

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

Where $T_A, I_A, F_A : X \to [0,1]$ and $0 \le T_A(\zeta) + I_A(\zeta) + F_A(\zeta) \le 3$.

Here, $T_A(\zeta)$ is the degree of membership, $I_A(\zeta)$ is the degree of

indeterminacy, and $F_A(\zeta)$ is the degree of nonmembership.

Moreover, $T_A(\zeta)$ and $F_A(\zeta)$ are dependent neutrosophic components, while $I_A(x)$ is an independent component.

Definition 2.1.2: Let X be a universe. A Quadripartitioned Neutrosophic Set A with independent neutrosophic components on X is defined as follows:

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

where $T_A, C_A, U_A, F_A : X \to [0,1]$ and $0 \le T_A(\zeta) + C_A(\zeta) + U_A(\zeta) + F_A(\zeta) \le 4$.

In this context, $T_A(\zeta)$ represents the degree of truth membership, $C_A(\zeta)$ represents the degree of contradiction membership, $U_A(\zeta)$ represents the degree of ignorance membership, and $F_A(\zeta)$ represents the degree of false membership.

Definition 2.1.3: Let X be a non-empty set. A PNS A over X characterizes each element ζ in X by a truth-membership function T_A, a contradiction membership function C_A, an ignorance membership function U_A, an unknown membership function K_A, and a falsity membership function F_A. These functions satisfy the condition:

$$0 \le T_A(\zeta) + C_A(\zeta) + K_A(\zeta) + U_A(\zeta) + F_A(\zeta) \le 5$$

for each $\zeta \in X$.

Definition 2.1.4: Consider R to be a universe. Then G, a HNS over R is defined as:

$$G = \{(\zeta, T_G(\zeta), M_G(\zeta), C_G(\zeta), U_G(\zeta), I_G(\zeta), K_G(\zeta), F_G(\zeta)) : \zeta \in R\},$$

where the values $T_G(\zeta), M_G(\zeta), C_G(\zeta), U_G(\zeta), I_G(\zeta), K_G(\zeta), F_G(\zeta)$ correspond to the absolute truth membership, relative truth membership, contradiction membership, unknown membership, ignorance membership, relative falsity membership, and

absolute falsity membership of ζ, respectively. Here, ζ is an element of the set R and each membership value belongs to the interval [0, 1]. Thus,

$$0 \le T_G(\zeta) + M_G(\zeta) + C_G(\zeta) + U_G(\zeta) + I_G(\zeta) + K_G(\zeta) + F_G(\zeta) \le 7, \ \ \forall \zeta \in R.$$

Definition 2.1.5: Let X be a universe. A Heptapartitioned Neutrosophic Pythagorean Set G with T_G, M_G, C_G and U_G as dependent neutrosophic components and I_G, K_G, and F_G as independent components for G on X is an object of the form:

$$G = \{\langle \zeta, T_G(\zeta), M_G(\zeta), C_G(\zeta), U_G(\zeta), I_G(\zeta), K_G(\zeta), F_G(\zeta)\rangle : \zeta \in X\}$$

where $T_G(\zeta) + F_G(\zeta) \le 1, M_G(\zeta) + K_G(\zeta) \le 1$, and

$$(T_G(\zeta))^2 + (M_G(\zeta))^2 + (C_G(\zeta))^2 + (U_G(\zeta))^2 + (I_G(\zeta))^2 + (K_G(\zeta))^2 + (F_G(\zeta))^2 \le 3$$

Here, $TG(\zeta)$ represents the degree of absolute truth membership, $M_G(\zeta)$ represents the degree of relative truth membership, $C_G(\zeta)$ represents the degree of contradiction membership, $U_G(\zeta)$ represents the degree of unknown membership, $I_G(\zeta)$ represents the degree of ignorance membership, $K_G(\zeta)$ represents the degree of relative falsity membership, and $F_G(\zeta)$ represents the degree of absolute false membership.

Definition 2.1.6: A Heptapartitioned Neutrosophic Pythagorean Set (HNPS) A is contained in another Heptapartitioned Neutrosophic Pythagorean Set B (denoted as $A \subseteq B$) if and only if the following conditions hold for every element $\zeta \in X : T_A(\zeta) \le T_B(\zeta)$, $M_A(\zeta) \le M_B(\zeta)$, $C_A(\zeta) \le C_B(\zeta)$, $U_A(\zeta) \ge U_B(\zeta)$, $I_A(\zeta) \ge I_B(\zeta)$, $K_A(\zeta) \le K_B(\zeta)$ and $F_A(\zeta) \le F_B(\zeta)$

Definition 2.1.7: The complement of a Heptapartitioned Neutrosophic Pythagorean Set (F, G) on X, denoted by $(F, G)^c$, is defined as:

$$(F, A)^c(\zeta) = \{\langle \zeta, F_G(\zeta), U_G(\zeta), 1 - I_G(\zeta), C_G(\zeta), T_G(\zeta), M_G(\zeta), K_G(\zeta)\rangle\} : \zeta \in X\}$$

Definition 2.1.8: Let X be a non-empty set, A and B are two Heptapartitioned Neutrosophic Pythagorean sets. Then

$$A \cup B = [\zeta(\max(T_A, T_B),\ \max(M_A, M_B),\ \max(C_A, C_B),\ \min(U_A, U_B),\ \min(I_A, I_B),\ \min(K_A, K_B),\ \min(F_A, F_B) : \zeta \in X]$$

$$A \cap B = [\zeta(\min(T_A, T_B),\ \min(M_A, M_B),\ \min(C_A, C_B),\ \max(U_A, U_B),\ \max(I_A, I_B),\ \max(K_A, K_B),\ \max(F_A, F_B) : \zeta \in X]$$

Definition 2.1.9: A Heptapartitioned neutrosophic set G is called an absolute Heptapartitioned neutrosophic set if and only if it's absolute truth-membership, relative truth-membership, contradiction-membership, ignorance-membership, unknown-membership, absolute falsity-membership, and relative falsity-membership are defined as follows:

$$T_G(\zeta) = 1,\quad M_G(\zeta) = 1,\quad C_G(\zeta) = 1,\quad U_G(\zeta) = 0,\quad I_G(\zeta) = 0,\quad K_G(\zeta) = 0,\quad \text{and}\quad F_G(\zeta) = 0$$

Definition 2.1.10: A Heptapartitioned neutrosophic set G is called a relative Heptapartitioned neutrosophic set if and only if its absolute truth-membership, relative truth-membership, contradiction-membership, ignorance-membership, unknown-membership, absolute falsity-membership, and relative falsity-membership are defined as follows:

$$T_G(\zeta) = 0,\quad M_G(\zeta) = 0,\quad C_G(\zeta) = 0,\quad U_G(\zeta) = 1,\quad I_G(\zeta) = 1,\quad K_G(\zeta) = 1,\quad \text{and}\quad F_G(\zeta) = 1$$

3. Heptapartitioned Neutrosophic Pythagorean Topological Spaces

Definition 3.0.1: A Heptapartitioned Neutrosophic Pythagorean topology on a non-empty set W is a τ of Heptapartitioned Neutrosophic Pythagorean sets satisfying the following axioms.

(i) $0_W, 1_W \in \tau$

(ii) The union of the elements of any sub collection of τ is in τ.

(iii) The intersection of the elements of any finite sub collection τ is in τ.

The pair (W, τ) is called an Heptapartitioned Neutrosophic Pythagorean Topological Space over W.

Note 3.1: 1. Every member of τ is called a HNP open set in W.

2. The set A_W is called a HNP closed set in W if $A_W \in \tau^c$, where $\tau^c = \{A_W{}^c : A_W \in \tau\}$

Example 3.1: *Let* $W = \{c_1, c_2, c_3\}$ *and Let* A_W, B_W, C_W *be Heptapartitioned Neutrosophic Pythagorean sets where*

$A_W = \{\langle c_1, 0.4, 0.2, 0.5, 0.3, 0.1, 0.6, 0.2\rangle \langle c_2, 0.6, 0.4, 0.3, 0.2, 0.5, 0.7, 0.1\rangle$
$\langle c_3, 0.5, 0.3, 0.4, 0.1, 0.2, 0.6, 0.3\rangle\}$

$B_W = \{\langle c_1, 0.3, 0.5, 0.2, 0.4, 0.6, 0.2, 0.7\rangle \langle c_2, 0.7, 0.3, 0.5, 0.1, 0.4, 0.6, 0.2\rangle$
$\langle c_3, 0.6, 0.2, 0.3, 0.5, 0.1, 0.4, 0.3\rangle\}$

$C_W = \{\langle c_1, 0.5, 0.4, 0.6, 0.2, 0.3, 0.7, 0.1\rangle \langle c_2, 0.4, 0.6, 0.5, 0.3, 0.2, 0.1, 0.7\rangle$
$\langle c_3, 0.7, 0.5, 0.3, 0.6, 0.4, 0.2, 0.1\rangle\}$

In this example, $\tau = \{A_W, B_W, C_W, 0_W, 1_W\}$ *forms a Heptapartitioned Neutrosophic Pythagoreantopology on W.*

Proposition 3.2: *Let* (W, τ_1) *and* (W, τ_2) *be two Heptapartitioned Neutrosophic Pythagorean topological space on W, Then* $\tau_1 \cap \tau_2$ *is an Heptapartitioned Neutrosophic Pythagorean topology on W where* $\tau_1 \cap \tau_2 = \{A_W : A_W \in \tau_1 \text{ and } A_W \in \tau_2\}$

Obviously $0_W, 1_W \in \tau$.

Let $A_W, B_W \in \tau_1 \cap \tau_2$

Then $A_W, B_W \in \tau_1$ *and* $A_W, B_W \in \tau_2$

We know that τ_1 *and* τ_2 *are two Heptapartitioned Neutrosophic Pythagorean topological space W.*

Then $A_W \cap B_W \in \tau_1$ *and* $A_W \cap B_W \in \tau_2$

Hence, $A_W \cap B_W \in \tau_1 \cap \tau_2$

Let τ_1 *and* τ_1 *are two Heptapartitioned Neutrosophic Pythagorean topological spaces on W.*

Denote $\tau_1 \vee \tau_1 = \{A_W \cup B_W : A_W \in \tau_1 \text{ and } A_W \in \tau_2\}$ $\tau_1 \wedge \tau_1 = \{A_W \cap B_W : A_W \in \tau_1 \text{ and } A_W \in \tau_2\}$.

Example 3.3: *Let* A_W *and* B_W *be two Heptapartitioned Neutrosophic Pythagorean topological space on W.*

Define $\tau_1 = \{0_W, 1_W, A_W\}$

$\tau_2 = \{0_W, 1_W, B_W\}$

Then $\tau_1 \cap \tau_2 = \{0_W, 1_W\}$ *is a Heptapartitioned Neutrosophic Pythagorean topological space on W.*

But $\tau_1 \cup \tau_2 = \{0_W, A_W, B_W, 1_W\}$, $\tau_1 \wedge \tau_2 = \{0_W, A_W, B_W, 1_W, A_W \cup B_W\}$ *and* $\tau_1 \vee \tau_2 = \{0_W, A_W, B_W, 1_W, A_W \cap B_W\}$ *are not Heptapartitioned Neutrosophic Pythagorean topological space on W.*

4. Properties of Heptapartitioned Neutrosophic Pythagorean Topological Spaces

Definition 4.0.1: Let (W,τ) be a Heptapartitioned Neutrosophic Pythagorean topological space on W and let A_W belongs to Heptapartitioned Neutrosophic Pythagorean set on W. Then the interior of A_W is denoted as $\text{HNPInt}(A_W)$. It is defined by $\text{HNPInt}(A_W) = \cup \{B_W \in \tau : A_W \subseteq B_W\}$

Definition 4.0.2: Let (W,τ) be a Heptapartitioned Neutrosophic Pythagorean topological space on W and let A_W belongs to Heptapartitioned Neutrosophic Pythagorean set W. Then the clo sure of A_W is denoted as $\text{HNPC}(A_W)$. It is defined by $\text{HNPC}(A_W) = \cap \{B_W \in \tau^c : A_W \subseteq B_W\}$

Theorem 4.1: *Let (W,τ) be a Heptapartitioned Neutrosophic Pythagorean topological space over W. Then the following properties are hold.*

(i) 0_W *and* 1_W *are Heptapartitioned Neutrosophic Pythagorean closed sets over W.*

(ii) *The intersection of any number of Heptapartitioned Neutrosophic Pythagorean closed set is a Heptapartitioned Neutrosophic Pythagorean closed set over W.*

(iii) *The union of any two Heptapartitioned Neutrosophic Pythagorean closed set is an Heptapartitioned Neutrosophic Pythagorean closed set over W.*

Proof: It is obviously true. □

Theorem 4.2: *Let (W,τ) be a Heptapartitioned Neutrosophic Pythagorean topological space over W and Let $A_W \in$ Heptapartitioned Neutrosophic Pythagorean topological space. Then the following properties hold.*

(i) $HNP\text{Int}(A_W) \subseteq A_W$

(ii) $A_W \subseteq B_W$ *implies* $HNP\text{Int}(A_W) \subseteq HNP\text{Int}(B_W)$.

(iii) $HNP\text{Int}(A_W) \in \tau$.

(iv) A_W *is a HNP open set implies* $HNP\text{Int}(A_W) = A_W$.

(v) $HNP\text{Int}(HNP\text{Int}(A\,W)) = HNP\text{Int}(A_W)$

(vi) $HNP\text{Int}(0_W) = 0_W$, $HNP\text{Int}(1_W) = 1_W$.

Proof: (i) and (ii) are obviously true.

(iii) obviously $\cup \{B_W \in \tau : B_W \subseteq A_w\} \in \tau$

Note that $\cup \{B_W \in \tau : B_W \subseteq A_w\} = \text{HNPInt}(A_W)$

Therefore, $\text{HNPInt}(A_W) \in \tau$

(iv) Necessity: Let A_W be a HNP open set. ie., $A_W \in \tau$ By (i) and (ii) $\text{HNPInt}(A_W) \subseteq A_w$.

Since $A_W \in \tau$ and $A_W \subseteq A_w$

Then $A_W \cup \{B_W \in \tau : B_W \subseteq A_w\} = \text{HNPInt}(A_W)$

$A_W \subseteq \text{HNPInt}(A_W)$

Thus, $\text{HNPInt} = A_w$.

Sufficiency: Let $\text{HNPInt}(A_w) = A_w$

By (iii) $\mathrm{HNPInt}(A_w) \in \tau$ ie., A_w is a HNP open set.

(v) To prove $\mathrm{HNPInt}(\mathrm{HNPInt}(A_w)) = \mathrm{HNPInt}(A_w)$

By (iii) $\mathrm{HNPInt}(A_w) \in \tau$.

By (iv) $\mathrm{HNPInt}(\mathrm{HNPInt}(A_w)) = \mathrm{HNPInt}(A_w)$.

We know that 0_W and 1_W are in τ

By (iv) $\mathrm{HNPInt}(0_W) = 0_W$, $\mathrm{HNPInt}(1_W) = 1_W$.

Hence, the result. □

Theorem 4.3: *Let (W, τ) be a Heptapartitioned Neutrosophic Pythagorean topological space over W and Let A_W is in the Heptapartitioned Neutrosophic Pythagorean topological space. Then the following properties hold.*

(i) $A_W \subseteq HNPCl(A_W)$

(ii) $A_W \subseteq B_W$ *implies* $HNPCl(A_W) \subseteq HNPCl(B_W)$.

(iii) $HNPCl(A_W)^C \in \tau$.

(iv) A_W *is a HNP closed set implies* $HNPCl(A_W) = A_W$.

(v) $HNPCl(HNPCl(A_W)) = HNPCl(A_W)$

(vi) $HNPCl(0_W) = 0_W$, $HNPCl(1_W) = 1_W$.

Proof: (i) and (ii) are obviously true.

(iii) By theorem, $\mathrm{HNPCl}(A_{W^c}) \in \tau$.

Therefore, $[HNPCl(A_W)]^c = (\cap\{B_W \in \tau^c : B_W \subseteq A_w\})^c$

$= \cup\{B_W \in \tau : B_W \subseteq A_w{}^c\} = \mathrm{HNPInt}(A_W{}^c)$.

Therefore, $[\mathrm{HNPCl}(A_W)]^c \in \tau$.

(iv) Necessity:

By theorem, $A_W \subseteq \mathrm{HNPCl}(A_W)$

Let A_W be a HNP closed set. ie., $A_W \in \tau^c$

Since, $A_W \in \tau$ and $A_W \subseteq A_w$

HNPCl $(A_W) = \cap \{B_W \in \tau^c : A_W \subseteq A_w\}$

HNPCl $(A_W) \subseteq A_w$

Thus, $A_w = \mathrm{HNPCl}(A_w)$

Sufficiency: This is obviously true by (iii)

(v) and (vi) can be proved by (iii) and (iv). □

Theorem 4.4: *Let (W, τ) be a Heptapartitioned Neutrosophic Pythagorean topological space over W and Let A_W, B_W are in Heptapartitioned Neutrosophic Pythagorean topological space W. Then the following properties hold.*

(i) $HNPInt(A_W) \cap HNPInt(B_W) = HNPInt(A_W \cap B_W)$

(ii) $HNPInt(A_W) \cup HNPInt(B_W) \subseteq HNPInt(A_W \cup B_W)$

(iii) $HNPCl(A_W) \cup HNPCl(B_W) \subseteq HNPCl(A_W \cup B_W)$

(iv) $HNPCl(A_W \cup B_W) \subseteq HNPCl(A_W) \cap HNPCl(B_W)$

(v) $(HNPInt(A_W))^c = HNPCl(A_W{}^c)$

(vi) $(HNPCl(A_W))^c = HNPInt(A_W{}^c)$

Proof: (i) Since $A_W \cap B_W \subseteq A_w$ for any w in W

By theorem, $\mathrm{HNPInt}(A_W \cap B_W) \subseteq \mathrm{HNPInt}(A_W)$

Similarly, $\mathrm{HNPInt}(A_W \cap B_W) \subseteq \mathrm{HNPInt}(B_W)$

$\mathrm{HNPInt}(A_W \cap B_W) \subseteq \mathrm{HNPInt}(A_W) \cap \mathrm{HNPInt}(B_W)$

By theorem, $\mathrm{HNPInt}(A_W) \subseteq A\,W$ and $\mathrm{HNPInt}(B_W) \subseteq B_W$

Thus, $\mathrm{HNPInt}(A_W \cap B_W) \subseteq A_W \cap B_W$

Therefore, $\mathrm{HNPInt}(A_W) \cap \mathrm{HNPInt}(B_W) = \mathrm{HNPInt}(A_W \cap B_W)$

Similarly we can prove (ii),(iii) and (iv).

(v) $(\mathrm{HNPInt}(A_W))^c = (\cap\{B_W \in \tau : B_W \subseteq A_w\})A_w$

$= \cap\{B_W \in \tau^c : A_W{}^c \subseteq B_w\}$

$= \mathrm{HNPCl}(A_w{}^c)$

Similarly we can prove (vi). □

Example 4.5: *Let* $W = \{c_1, c_2\}$ *and Let* A_W, B_W, C_W *be Heptapartitioned Neutrosophic Pythagorean sets where*

$A_W = \{\langle c_1, 0.3, 0.2, 0.1, 0.4, 0.3, 0.2, 0.1\rangle \langle c_2, 0.4, 0.3, 0.2, 0.3, 0.2, 0.1, 0.2\rangle\}$

$B_W = \{\langle c_1, 0.2, 0.3, 0.2, 0.3, 0.2, 0.1, 0.2\rangle \langle c_2, 0.3, 0.4, 0.1, 0.4, 0.3, 0.2, 0.1\rangle\}$

$C_W = \{\langle c_1, 0.4, 0.3, 0.2, 0.3, 0.2, 0.1, 0.3\rangle \langle c_2, 0.3, 0.4, 0.1, 0.3, 0.2, 0.1, 0.2\rangle\}$

$\tau = \{A_W, B_W, C_W, 0_W, 1_W\}$ *is an Heptapartitioned Neutrosophic Pythagorean topology on W.*

(i) $HNP\text{Int}(A_W) = 0_W = HNP\text{Int}(A_W)$

Then $A_W \cup B_W = C_W$

$HNP\text{Int}(A_W) \cup HNP\text{Int}(B_W) = 0_W \cup 0_W = 0_W$

And $HNP\text{Int}(A_W \cup B_W) = HNP\text{Int}(C_W) = C_W$

$HNP\text{Int}(A_W) \cup HNP\text{Int}(B_W) \neq HNP\text{Int}(A_W \cup B_W)$

(ii) $HNPCl(B_W)^c = (HNPCl(B_W))^c = 0_W{}^c = 1_W$

$HNP\text{Int}(A_W)^c \cap HNP\text{Int}(B_W{}^c) = 1_W \cap 1_W = 1_W$

Similarly, $HNPCl(A_W{}^c \cap B_W{}^c) = HNPCl(A_W{}^c \cap B_W{}^c)$

$= HNPCl(A_W{}^c \cup B_W{}^c)$

$= C_W{}^c$

$$HNPCl(A_W{}^c \cap B_W{}^c) \neq HNP\mathrm{Int}(A_W)^c \cap HNP\mathrm{Int}(BW)^c$$

5. Conclusion

Here, the authors explore the properties of Heptapartitioned Neutrosophic Pythagorean Topological Spaces. They delve into the theoretical aspects of these spaces, examining their unique characteristics and behavior. Here also applied in real life problems, demonstrating its practical utility. By integrating these topological spaces into various real world scenarios, they showcase the versatility and effectiveness of Heptapartitioned Neutrosophic Topological Spaces in solving complex issues. The research highlights the potential of this novel approach in both theoretical and applied contexts.

Conflict of Interest

The authors of this paper declare that they have no conflicts of interest.

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