HyperSoft Set Methods in Engineering

Journal Homepage: sciencesforce.com/hsse

HyperSoft Set Meth. Eng. Vol. 1 (2024) 59–70

Paper Type: Original Article

Development of Pythagorean Neutrosophic Hypersoft Set with Application in Work Life Balance Problem

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Received: 30 Sep 2023 **Revised:** 30 Dec 2023 **Accepted:** 27 Jan 2024 **Published:** 31 Jan 2024

Abstract

By introducing Pythagorean Neutrosophic Hypersoft Sets and giving definitions, operations, and an overview of some of their attributes, this study seeks to expand the hypersoft set idea to Pythagorean Neutrosophic Hypersoft Sets (PNHS). In this set structure two existing set structures are combined Pythagorean and Neutrosophic Hypersoft Sets theories with two dependent variables, Truthiness and Falsity, and one independent variable, Indeterminacy, with $0\leq \alpha^* + \beta^* \leq 2$. Furthermore, an application is presented to show how a new judgment technique based on Pythagorean Neutrosophic Hypersoft Sets works. This study emphasizes the importance of PNHS in managing complicated and ambiguous information, enhancing our comprehension of and ability to use it in decision-making processes. Score functions are essential for evaluating the efficacy and dependability of the suggested approach, which helps make well-informed decisions and improves problem-solving skills across a range of fields.

Keywords: Soft Sets (SS), Hyper Soft Sets (HSSs), Pythagorean Fuzzy Hyper Soft Sets (PFHSs), Pythagorean Neutrosophic Soft Set (PNSs).

1 | Introduction

Multiple Criteria Decision Making is known as MCDM. It is an area of research that addresses dilemmas with several criteria or objectives that must be considered concurrently. Most of the time, judgements in the real world are made using a mix of several criteria with varying weights, priorities, and levels of relevance. The development of systematic methodologies and procedures to assist decision-makers in assessing and choosing the best option from a range of workable possibilities is the aim of MCDM. To offer insights and suggestions for making decisions, these strategies take into consideration the preferences, priorities, and trade-offs between the criteria. In actual circumstances, decision-makers are unable to offer exact statistics for their alternative judgements. Zadeh developed fuzzy sets (FS) [1], Fuzzy logic is a potent and adaptable framework that may be used to close the mentioned gap and solve uncertainty and imprecision in different investigations. The mathematical technique of fuzzy logic allows for the depiction of degrees of membership or truth values between 0 and 1, which helps to cope with uncertainty and imprecision. Researchers created several tweaks

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https://doi.org/10.61356/j.hsse.2024.18550

and additions to further expand fuzzy logic's capabilities after its invention and successful use in a number of sectors. The advent of type-2 fuzzy sets is a noteworthy development in fuzzy systems' [2], Intuitionistic fuzzy set (IFS) [3], Hesitant fuzzy set (HFS) [4], Pythagorean fuzzy set (PFS) [5], etc.

Smarandache [6] presented the neutrosophic set (NS) theory in 1998 as an extension of the concepts. He explored the truthiness, ambiguity, and inaccuracy of this hypothesis. Following that, Wang et al. [7] designed and used a single-valued neutrosophic set (SVNS) to address real-world issues. Molodtsov established the concept of soft sets (SS) as a ground-breaking new mathematical method for dealing with ambiguous issues. Molodtsov [8] explains an SS as a parameterized family of the subsets of the universal set, where each member is taken into consideration as a set of approximative SS elements. SS aggregation operators are further covered in this discussion. altered by Maji et al. [9, 10], and the proposal of a decision-making algorithm used several object values. Later, Roy and Maji [11] released the fuzzy soft sets (FSS) theoretical approach and produced an algorithm for resolving issues that have practical application.

The SS theory and NS theory were expanded in a variety of ways. The interval-valued neutrosophic set (IVNS) and the SVNS were suggested by [12, 13]. Peng et al. [14] offered a Simplified neutrosophic set as a solution to issues with a collection of a particular number of characteristics. A NSS was proposed by Maji et al. [15], and Depending on the linguistic number, a TOPSIS approach extension for MADM was proposed by Ye [16]. Tian et al. [17] MCDM challenges were used to test a normalized weighted mean operator for a simplified NS. Wang and Li [18] the rough neutrosophic set and the multi-valued neutrosophic set were provided by the TODIM technique that was proposed. Broumi et. al [19], Jun et al. [20] engaged in studies on neutrosophic cubic sets. Following that, many scholars focused on aggregation operators that depend on various formulations. Dombi [21] developed cubic M-polar fuzzy with T-norm and T-conorm for Dombi's and worked on fuzzy operators and their de morgan class and fuzziness. Riaz et al. [22]. yager et al. [23,24], operator was suggested as the power average and prioritized aggregation operators. By using soft mappings of the M-polar neutrosphere, Riaz and Hashmi [25] and employed in a variety of mental illnesses-related personality disorders. A generalized M-polar neutrosophic and neutrosophic M-polar Einstein operators were employed to diagnose COVID-19 by Hashmi et al [26].

Numerous models of SVNS, including correlation coefficients, inclusion measures, similarity measurements, entropy measures, and distance measures, have been proposed over the years. Broumi and Smarandache [27] NSs similarity measures have been extensively researched on. Using a correlation coefficient, Ye et al. devised the MCDM. [28], and aggregation operator [29] as well as their vector similarity metrics for SVNS and simplified neutrosophic sets (SNS) [30]. In [31] Ye et al. developed clustering techniques for SVNS and cosine similarity metrics for SNS [32], Similarity metrics are used in the SVNS clustering technique [33], and uses of cotangent functions in SVNS [34]. Furthermore, Cui, and Ye [35], Sahin et al. [36], Majumdar and Samanta [37], Ye and Fu [38], Chai et al. [39], Mondal and Pramanik [40], Jafar et al. [41], Liu [42], Akram et al. [43], Garg and Nancy [44], Yang and Lin [45], Hung and Yang [46], Yang and Hussain [47], Ejegwa et al. [48], a number of important research publications on SVNS distance and similarity measurements were presented.

Smarandache [49] The soft set was extended to the hypersoft set (HSS) to cope with difficulties involving multiple objectives and many characteristics. This was done by developing a strategy for handling more uncertain situations. This structure was further expanded to include the fuzzy hypersoft set (FHSS) by Jafar et al. [50]. and multi-fuzzy hypersoft set by Saeed et al. [51]. Jafar et al. [52] developed on and applied the IFHSS matrix theory. The set of Pythagoreans [53] To address complicated imprecision and uncertainty, an extension of intuitionistic fuzzy sets called was developed, provided that the sum of the squares of the membership and non-membership degrees is between 0 and 1. Pythagorean Neutrosophic set [53] is a combination of Pythagorean and Neutrosophic set with the condition $0 \leq \left(\mathcal{U}'_{Ķő}(ŧ)\right)^2 + \left(\sigma'_{Ķő}(ŧ)\right)^2 + \left(Ħ'_{Ķő}(ŧ)\right)^2 \leq 2$. The dependent components of the set are membership, nonmember ship, and the independent component indeterminacy. This set's notion was expanded upon in graphs [53] and decision-making. In order to connect Pythagorean neutrosophic soft sets and the concept of soft sets, we want to leverage the basics of this to propose the Pythagorean Neutrosophic Hyper soft set. was also shown, fusing soft sets of intuitionistic and neutrosophic type.

1.1 | Motivation

An intellectually fascinating and extremely inspiring task is working on the Pythagorean Neutrosophic Hypersoft Set (PNHS). The strength of Pythagorean fuzzy sets, neutrosophic sets, and hypersoft sets are combined in this new area of research to address difficult decision-making issues in an unknowable and unpredictable environment.

Researchers and practitioners have the chance to advance knowledge by studying PNHS and contribute to the creation of cutting-edge methods for dealing with ambiguity, vagueness, and conflicting information. These many mathematical frameworks' integration offers up new avenues for examining complex decision-making processes and simulating real-world scenarios.

Exploring the nuances of membership, non-membership, hesitant levels, indeterminacy, neutrality, and graded preferences is part of engaging with PNHS. It calls for sharp analytical reasoning, original problem-solving, and the capacity to create effective approaches and algorithms.

1.2 | Paper Outline

This paper includes outlined the Pythagorean neutrosophic hypersoft set and with the use of examples, addressed several of its features, including union, intersection, and distributive property. And by applying the newly proposed soft set to an issue involving decision-making, a real-world example is utilized to illustrate it. The structure of the paper is as follows: In Section 2, basic terms and definitions are covered, and in Section 3, the combined Pythagorean Neutrosophic soft set is presented. In Section 4, a demonstration using Pythagorean neutrosophic Hypersoft sets is given, and Section 5 ends.

2 | Preliminaries

Fuel cell vehicles, operating on hydrogen, are introduced into the smart waste management system. Their use aims to improve environmental performance by reducing emissions associated with traditional fossil fuel vehicles. MCDM Methods Multi-Criteria Decision-Making (MCDM) methods are employed to evaluate alternatives and criteria in the decision-making process.

2.1 Definition: Let the universal set $\dot{W}'$ is $ß'(\dot{W}')$, $ꞓ \subseteq Ơ$, $Ơ$ describes the selection of parameters. Soft is a span (Œ, ꞓ) for Œ: $ꞓ \rightarrow ß'(\dot{W}')$.

2.2 Definition: The cluster of fuzzy sets of world $\dot{W}'$ be $ß'(\dot{W}')$, $ꞓ \subseteq Ơ$,$Ơ$ be the cluster of parameters. Fuzzy soft is a span (Œ, ꞓ), for $ꞓ \rightarrow ß'(\dot{W}')$.

2.3 Definition: Let $ß'(\dot{W}')$ be Neutrosophic sets in $\dot{W}'$, $ꞓ \subseteq Ơ$ where $Ơ$ cluster of parameters. (Œ, ꞓ) is NS, Œ: $ꞓ \rightarrow ß'(\dot{W}')$. Where $0 \leq (ɰ'_{ꞓő}(ŧ)) + (\sigma'_{ꞓő}(ŧ)) + (Ħ'_{ꞓő}(Ʊ)) \leq 3$

2.4 Definition: Let $ß'(\dot{W}')$ be Pythagorean fuzzy set of $\dot{W}'$, $ꞓ \subseteq Ơ$, $Ơ$ describes the selection of parameters. *Pythagorean fuzzy soft is a span* (Œ, ꞓ) for Œ: $ꞓ \rightarrow ß'(\dot{W}')$ for

$$0\leq \left(Ꝇ'_{Ķő}(ŧ)\right)^2 + \left(\sigma'_{Ķő}(ŧ)\right)^2 \leq 1$$

2.5 Definition: Intuitionistic neutrosophic sets of $\dot{W}'$ be Ꞁ$(\dot{W}')$ and ƺ ⊆ Ơ,the set of parameters. The set of (Œ, ƺ) is INSS over $\dot{W}'$,Where Œ: ƺ → Ꞁ$(\dot{W}')$.

2.6 Definition: Let $\dot{W}'$ be an initial universal set and Ǯ ⊂ Ơ set of attributes.PN $(\dot{W}')$ is the cluster of all PN sets of $\dot{W}'$.The pair (Œ, Ǯ) is considered as PNSS on $\dot{W}'$ for Œ: Ǯ → $PN(\dot{W}')$. where Truthiness and Falseness are dependent and Indeterminacy are independent

$$0\leq \left(Ꝇ'_{Ķő}(ŧ)\right)^2 + \left(\sigma'_{Ķő}(ŧ)\right)^2 + \left(Ƕ'_{Ķő}(ŧ)\right)^2 \leq 2.$$

3 | Pythagorean Neutrosophic Hyper soft set

Let $\dot{W}'$ be a universal set and $Ӝ_1, Ӝ_2, Ӝ_3, \ldots \ldots \ldots \ldots \ldots Ӝ_n$ are the set of parameters and their corresponding parameters are $ӝ_1, ӝ_2, ӝ_3, \ldots \ldots \ldots, ӝ_n$, in which $ӝ_i \cap ӝ_j = \emptyset$.

Let $ӝ_1 \times ӝ_2 \times ӝ_3, \ldots \ldots \ldots, ӝ_n = \boldsymbol{ӝ}$, where F:$(ӝ_1 \times ӝ_2 \times ӝ_3, \ldots \ldots \ldots, ӝ_n) \to P(\dot{W}')$

Is called Hyper soft set and is defined F:$(ӝ_1 \times ӝ_2 \times ӝ_3, \ldots \ldots \ldots, ӝ_n) = \{< ӝ_i, (ѫ_i, Ꝇ', \sigma', Ƕ'), ӝ_i \in Ӝ, ѫ_i \in \dot{W}'\}$ where Truthiness and Falseness are dependent $0\leq Ꝇ'^2 + \sigma'^2 \leq 1$ and Indeterminacy is independent $0\leq \left(Ꝇ'_{Ķő}(ŧ)\right)^2 + \left(\sigma'_{Ķő}(ŧ)\right)^2 + \left(Ƕ'_{Ķő}(ŧ)\right)^2 \leq 2.$

3.1 | Example

Let us consider the universal set $\ddot{Ш} = \{\ddot{ш}^1, \ddot{ш}^2, \ddot{ш}^3, \ddot{ш}^4\}$ where $\ddot{ш}^i$ denote the laptops which have recently entered the market and possess Ꞁ$' = \{o^1, o^2, o^3\}$, Ꞁ$'' = \{ő^1, ő^2, ő^3\}$, Ꞁ$''' = \{\breve{ő}^1, \breve{ő}^2, \breve{ő}^3\}$, where Ꞁ$' = Hp$, Ꞁ$''$ = Dell, Ꞁ$'''$=Lenovo and Hp= {Performance, Portability, Display}, Dell= {Reviews, Operating system, connectivity}

Lenovo= {Battery Life, Price, Ratings}

$$Hp=\begin{bmatrix} \ddot{ш}^1 & \ddot{ш}^2 & \ddot{ш}^3 \\ (p,(0.6,0.3,0.4)) & (p,(0.5,0.3,0.5) & (p,(0.5,0.4,0.5) \\ (pd,(0.7,0.2,0.3)) & (pd,(0.5,0.1,0.5) & (pd,(0.6,0.4,0.4)) \\ (di,(0.8,0.1,0.2)) & (di,(0.4,0.3,0.6) & (di,(0.3,0.5,0.7)) \end{bmatrix}$$

$$Dell=\begin{bmatrix} \ddot{ш}^1 & \ddot{ш}^2 & \ddot{ш}^3 \\ (R,(0.7,0.3,0.3)) & (R,(0.4,0.5,0.6)) & (R,(0.4,0.3,0.2)) \\ (os,(0.1,0.3,0.9)) & (os,(0.2,0.3,0.8)) & (os,(0.5,0.4,0.5)) \\ (c,(0.4,0.2,0.6)) & (c,(0.8,0.2,0.2)) & (c,(0.4,0.3,0.6)) \end{bmatrix}$$

$$\text{Le} = \begin{bmatrix} \text{ѿ}^1 & \text{ѿ}^2 & \text{ѿ}^3 \\ (\text{B}, (0.5{,}0.3{,}0.5)) & (\text{B}, (0.6{,}0.4{,}0.4)) & (\text{B}, (0.4{,}0.5{,}0.6)) \\ (\text{P}, (0.2{,}0.3{,}0.8)) & (\text{P}, (0.9{,}0.4{,}0.1)) & (\text{P}, (0.5{,}0.5{,}0.5)) \\ (\text{di}, (0.7{,}0.4{,}0.3)) & (\text{di}, (0.7{,}0.3{,}0.3)) & (\text{di}, (0.8{,}0.4{,}0.2)) \end{bmatrix}$$

is defined $F{:}(\text{ӂ}_1 \text{ x } \text{ӂ}_2 \text{ x } \text{ӂ}_3, \ldots\ldots\ldots., \text{ӂ}_n) = \{< \text{ӂ}_i, (\text{ѫ}_i, \text{ӌ}', \text{ơ}', \text{Ң}'), \text{ӂ}_i \in \text{Ӂ}, \text{ѫ}_i \in \dot{\text{W}}'\}$

$$\text{ѿ}^i = \begin{bmatrix} \text{ѿ}^1 & \text{ѿ}^2 & \text{ѿ}^3 \\ (p, (0.6{,}0.3{,}0.4)) & (p, (0.5{,}0.3{,}0.5)) & (p, (0.5{,}0.4{,}0.5)) \\ (os, (0.7{,}0.2{,}0.3)) & (os, (0.2{,}0.3{,}0.8)) & (os, (0.5{,}0.4{,}0.4)) \\ (B, (0.5{,}0.3{,}0.5)) & (B, (0.6{,}0.4{,}0.4)) & (B, (0.4{,}0.5{,}0.6)) \end{bmatrix}$$

3.2 | Pythagorean Neutrosophic Hyper Soft Set Operations

3.2.1 | Complement

Let A be a Pythagorean Neutrosphic Hyper Soft set and their operators be defined as: $\tilde{}_{P}A(\text{ơ}'_A, \text{ӌ}'_A, \text{Ң}'_A)$

$$\text{A}=\begin{bmatrix} (0.6{,}0.3{,}0.4) & (0.5{,}0.3{,}0.5) & (0.5{,}0.4{,}0.5) \\ (0.7{,}0.2{,}0.3) & (0.2{,}0.3{,}0.8) & (0.5{,}0.4{,}0.4) \\ (0.5{,}0.3{,}0.5) & (0.6{,}0.4{,}0.4) & (0.4{,}0.5{,}0.6) \end{bmatrix}$$

$$\tilde{}_{P}A=\begin{bmatrix} (0.4{,}0.3{,}0.6) & (0.5{,}0.3{,}0.5) & (0.5{,}0.4{,}0.5) \\ (0.3{,}0.2{,}0.7) & (0.2{,}0.3{,}0.8) & (0.4{,}0.4{,}0.5) \\ (0.5{,}0.3{,}0.5) & (0.4{,}0.4{,}0.6) & (0.6{,}0.5{,}0.4) \end{bmatrix}$$

3.2.2 | Intersection

Let A and B are two Pythagorean Neutrosphic Hyper Soft set and their operators be defined as: $A\overset{\wedge}{_P}\text{B}=\langle \text{ӌ}'_A \wedge \text{ӌ}'_B, \ \text{ơ}'_A \vee \text{ơ}'_B, \text{Ң}'_A \vee \text{Ң}'_B \ \rangle$

$$\text{A}=\begin{bmatrix} (0.6{,}0.3{,}0.4) & (0.5{,}0.3{,}0.5) & (0.5{,}0.4{,}0.5) \\ (0.7{,}0.2{,}0.3) & (0.2{,}0.3{,}0.8) & (0.5{,}0.4{,}0.4) \\ (0.5{,}0.3{,}0.5) & (0.6{,}0.4{,}0.4) & (0.4{,}0.5{,}0.6) \end{bmatrix}$$

$$\text{B}=\begin{bmatrix} (0.5{,}0.3{,}0.5) & (0.6{,}0.3{,}0.4) & (0.4{,}0.4{,}0.5) \\ (0.7{,}0.2{,}0.3) & (0.8{,}0.3{,}0.1) & (0.4{,}0.5{,}0.3) \\ (0.6{,}0.7{,}0.4) & (0.3{,}0.4{,}0.7) & (0.9{,}0.5{,}0.1) \end{bmatrix}$$

$$A\overset{\wedge}{_P}\text{B}=\begin{bmatrix} (0.5{,}0.3{,}0.5) & (0.5{,}0.3{,}0.5) & (0.5{,}0.4{,}0.5) \\ (0.7{,}0.2{,}0.3) & (0.8{,}0.3{,}0.1)) & (0.4{,}0.5{,}0.4)) \\ (0.5{,}0.7{,}0.5)) & (0.6{,}0.4{,}0.7)) & (0.4{,}0.5{,}0.6) \end{bmatrix}$$

3.2.3 | Union

Let A and B are two Pythagorean Neutrosphic Hyper Soft set and their operators be defined as: $A\overset{\vee}{_P}\text{B}=\langle \text{ӌ}'_A \vee \text{ӌ}'_B, \ \text{ơ}'_A \wedge \text{ơ}'_B, \text{Ң}'_A \wedge \text{Ң}'_B \ \rangle$

$$A=\begin{bmatrix}(0.6,0.3,0.4) & (0.5,0.3,0.5) & (0.5,0.4,0.5)\\(0.7,0.2,0.3) & (0.2,0.3,0.8) & (0.5,0.4,0.4)\\(0.5,0.3,0.5) & (0.6,0.4,0.4) & (0.4,0.5,0.6)\end{bmatrix}$$

$$B=\begin{bmatrix}(0.5,0.3,0.5) & (0.6,0.3,0.4) & (0.4,0.4,0.5)\\(0.7,0.2,0.3) & (0.8,0.3,0.1) & (0.4,0.5,0.3)\\(0.6,0.7,0.4) & (0.3,0.4,0.7) & (0.9,0.5,0.1)\end{bmatrix}$$

$$A_P^{\vee}B=\begin{bmatrix}(0.6,0.3,0.4) & (0.6,0.3,0.4) & (0.5,0.4,0.5)\\(0.7,0.2,0.3) & (0.8,0.3,0.1) & (0.5,0.4,0.3)\\(0.6,0.3,0.4) & (0.6,0.4,0.4) & (0.9,0.5,0.1)\end{bmatrix}$$

3.3 | Score Function

In the context of matrix theory, the Score Function is essential for improving decision-making since it offers a methodical and impartial way to assess options. The Score Function is a quantitative metric used in matrix-based decision models to evaluate each option's performance or appropriateness in relation to predetermined criteria. The Score Function converts qualitative data into a standardized and comparable format by giving scores to various features or criteria, enabling a more thorough study.

3.3.1 | Score Function

Suppose that $\dot{W}' = \{ӂ_i, (ѫ_i, ӌ', \sigma', Ħ')\}$ is a PNHSs, then the term Score function can be defined as $(\dot{W}') = ӌ' + \sigma' - Ħ'$.

3.3.2 | Properties of Score Function

Suppose $\dot{W}'^{1}=\{ӂ_1, (ѫ_1, ӌ', \sigma', Ħ')$ and $\dot{W}'^{2}=\{ӂ_2, (ѫ_2, ӌ', \sigma', Ħ')$ be two PNHSs , Score $(\dot{W}'^{1})$ and Score$(\dot{W}'^{2})$ is a score-function of $\dot{W}'^{1}$ and $\dot{W}'^{2}$.

- Suppose that if we have Score $(\dot{W}'^{1})$ >Score $(\dot{W}'^{2})$,which implies that $\dot{W}'^{1} > \dot{W}'^{2}$.
- Suppose that if we have Score $(\dot{W}'^{1})$ =Score $(\dot{W}'^{2})$,which implies that $\dot{W}'^{1} = \dot{W}'^{2}$.

4 | Application

In the "decision-making process" application phase, soft sets are important. Fuzzy soft sets have been used to suggest a variety of approaches and models for dealing with the application of decision-making in practical settings. We suggest a new algorithm for generating decisions with the newly established PNHSS.

The concept of **"work-life balance"** examines the best distribution of time and resources between obligations in one's personal life and activities linked to their jobs. A development of Neutrosophic set theory known as the Pythagorean Neutrosophic Hyper soft Set (PNHSS) uses the idea of truth-membership-indeterminacy values to express uncertainty and insufficient knowledge. We may talk about work-life balance from the standpoint of Pythagorean Neutrosophic Hypersoft Set by combining these two ideas. Work-life balance is sometimes difficult and includes adjustments. By taking into account the indeterminacy values connected to various possibilities, PNHSS can assist in the analysis of these adjustments. It enables people to evaluate the degree of ambiguity or compromise necessary to achieve the desired balance and then make defensible judgements in that regard.

4.1 | MCDM Algorithm

In the context of matrix theory, the Score Function is essential for improving decision-making since it offers a methodical and impartial way to assess options. The Score Function is a quantitative metric used in matrix-based decision models to evaluate each option's performance or appropriateness in relation to predetermined criteria. The Score Function converts qualitative data into a standardized and comparable format by giving scores to various features or criteria, enabling a more thorough study.

Step 1. Enter the PNHSS.

Step 2. Format the PNHSS in table.

Step 3. Use the score function $ɥ' + \sigma' - H'$ for each W^i(i=1,2,3).

Step 4. Use the formula $s_i^{\circ} = \sum P_j$ (j=1,2,3) to get chosen value for each W^i.

Step 5. Select the maximum s_i° as the best option. If many W^i are equal, the best. Option can be picked from any of them.

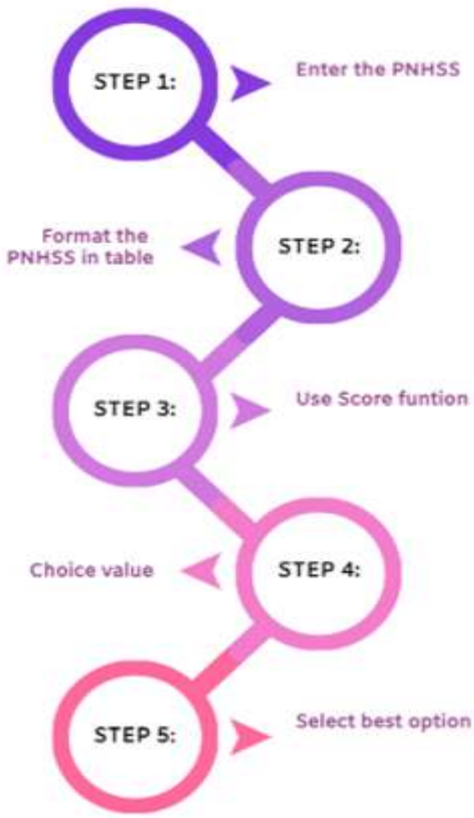

Figure 1. Flow chart of proposed algorithm.

4.2 | Illustration

Let us take three major factors that's important in work-life balance situation. Three major factors are work personal life interference, personal life work, and life enhancement. The decision-making expert can take the opinions on these parameters. The main goal of our is to compare all three parameters and get the best result.

Let us consider three workplaces W= $\{W^1, W^2, W^3\}$ and discuss attributes which affect our personal life.

WPLI=Work Personal Life Interference

PLW= Personal Life Work Interference

LE= Life Enhancement

WPLI= {work load, flexibility, technology and connectivity}

PLW ={health problems, financial stress, care giving responsibilities}

LE ={physical health, personal development, financial well-being}

Step 1: Workload is the quantity of work that a person or a team is required to finish in a specific length of time is referred to as their workload. The quantity of tasks or projects allocated, the number of hours worked, or the total amount of effort necessary to complete duties can all be used to determine the. The capacity to manage one's work schedule, location, and hours is referred to as flexibility in the workplace. Within the constraints imposed by their employer, it gives workers a certain amount of choice over how and where they work. Flextime, compressed workweeks (working greater hours in fewer days), remote work (working from a place outside the office), and part-time schedules are some examples of flexible work arrangements. Technology and connectivity help people to balance their personal and professional obligations, consider personal preferences, and even cut down on travel time or operate in surroundings that are most comfortable for them. Physical or mental issues that impair a person's wellbeing and ability to operate are referred to as health concerns. When someone is anxious or concerned about their financial status, they are said to be under financial stress. Giving physical or emotional support to family members or loved ones who are unable to care for themselves due to age, disease, or disability falls under the category of caregiving obligations.

Step 2:

$$\text{WPLI}=\begin{bmatrix} W^1 & W^2 & W^3 \\ (wl,(0.6,0.3,0.4)) & (wl,(0.5,0.3,0.5) & (wl,(0.5,0.4,0.5) \\ (fl,(0.7,0.2,0.3)) & (fl,(0.5,0.1,0.5) & (fl,(0.6,0.4,0.4)) \\ (tc,(0.8,0.1,0.2)) & (tc,(0.4,0.3,0.6) & (tc,(0.3,0.5,0.7)) \end{bmatrix}$$

$$\text{PLW}=\begin{bmatrix} W^1 & W^2 & W^3 \\ (hp,(0.7,0.3,0.3)) & (hp,(0.4,0.5,0.6)) & (hp,(0.4,0.3,0.2)) \\ (fs,(0.1,0.3,0.9)) & (fs,(0.2,0.3,0.8)) & (fs,(0.5,0.4,0.5)) \\ (cgr,(0.4,0.2,0.6)) & (cgr,(0.8,0.2,0.2)) & (cgr,(0.4,0.3,0.6)) \end{bmatrix}$$

$$LE=\begin{bmatrix} W^1 & W^2 & W^{3s} \\ (ph,(0.5,0.3,0.5)) & (ph,(0.6,0.4,0.4)) & (ph,(0.4,0.5,0.6)) \\ (pd,(0.2,0.3,0.8)) & (pd,(0.9,0.4,0.1)) & (pd,(0.5,0.5,0.5)) \\ (fw,(0.7,0.4,0.3)) & (fw,(0.7,0.3,0.3)) & (fw,(0.8,0.4,0.2)) \end{bmatrix}$$

Step 3: The decision maker will assign PNHSS to the attributes of alternatives

$$\begin{bmatrix} W^1 & W^2 & W^{3s} \\ (wl,(0.6,0.3,0.4)) & (wl,(0.5,0.5,0.5)) & (wl(0.8,0.4,0.2)) \\ (cgr(0.4,0.2,0.6)) & (cgr(0.8,0.7,0.2)) & (cgr(0.4,0.3,0.6)) \\ (pd,(0.2,0.3,0.8)) & (pd,(0.9,0.6,0.1)) & (pd,(0.5,0.5,0.5)) \end{bmatrix}$$

Step 4: Score Table of the PNHSS

$$\text{Scr}\ (\dot{W}') = \begin{bmatrix} W^1 & W^2 & W^3 \\ (wl,(0.7)) & (wl,(0.5)) & (wl,(0.6)) \\ (cgr(0.8)) & (cgr(0.3)) & (cgr(0.7)) \\ (pd,(0.6)) & (pd,(0.4)) & (pd,(0.5)) \end{bmatrix}$$

Step 5:

$$s_i^{\circ} = \begin{bmatrix} W^1 & W^2 & W^3 \\ 2.1 & 1.2 & 1.8 \end{bmatrix}$$

The maximum value is 2.1 for W^1. The proposed algorithm gives the ranking $W^1 \geq W^3 \geq W^2$. Therefore, offers the finest options for employment, promoting work-life balance.

4.3 | Result Discussion and Comparison

In this case study, the application of scoring functions to the complex issues of managing workload, workplace flexibility, health issues, financial stress, and caregiving responsibilities has produced illuminating outcomes. A thorough understanding of the interactions between these aspects has been attained using scoring functions, such as quantitative assessments of task distribution, evaluation of workplace flexibility policies, and measurement of financial and health stress indicators. Based on the investigation, it was shown that when supportive workplace flexibility initiatives are combined with efficient task management measures, employees' health problems and financial stress are lessened. The results also highlight how crucial it is to incorporate flexible work arrangements like flextime and remote work options to support work-life balance and improve general wellbeing. The report also emphasizes how important it is for organizations to help employees who are also taking on caregiving obligations to create a welcoming and inclusive work environment. Overall, the findings highlight how important score functions are for guiding evidence-based choices and developing strategies for maximizing worker happiness, productivity, and health in contemporary workplaces.

5 | Conclusion

PNHS is a versatile and effective tool for making decisions and solving problems in challenging and uncertain situations. In a promising and developing field of study, the Pythagorean Neutrosophic Hyper Soft Set unifies and integrates the advantages of Pythagorean fuzzy sets, hyper soft sets, and neutrosophic logic to address uncertainty and imprecision. The discipline is anticipated to greatly enhance problem-solving and decision-making methods across a variety of domains as it continues to develop. Furter, the proposed algorithms for decision making by using score function and choice value scheme have been successfully implemented with the help of real-world problem. Further this study shows that the result of the proposed methodology is used for ranking. In future work this proposed techniques will use, In areas including medical diagnostics, image processing, data mining, and intelligent systems, PNHSS has to be applied to a variety of real-world issues. PNHSS's performance and efficacy may be assessed by using it in real-world situations, and its benefits over current methods can be shown.

Acknowledgments

The author is grateful to the editorial and reviewers, as well as the correspondent author, who offered assistance in the form of advice, assessment, and checking during the study period.

Author Contributaion

All authors contributed equally to this work.

Funding

This research has no funding source.

Data Availability

The datasets generated during and/or analyzed during the current study are not publicly available due to the privacy-preserving nature of the data but are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there is no conflict of interest in the research.

Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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