Neutrosophic Sets and Systems

Volume 51 Article 5

10-5-2022

LGU-Combined-Consciousness State Model

Shazia Rana

Muhammad Saeed

Florentin Smarandache

Neutrosophic Sets and Systems, Vol. 51,2022

University of New Mexico

LGU-Combined-Consciousness State Model

Shazia Rana [1], Muhammad Saeed [2], Florentin Smarandache [3*]

[1] University University of Management and Technology, Johar Town Campus, Lahore, 54000, Pakistan shaziaranams@gmail.com

[2] University University of Management and Technology, Johar Town Campus, Lahore, 54000, Pakistan muhammad.saeed@umt.edu.pk

[3] University of New Mexico, Mathematics, Physics, and Natural Science Division, 705 Gurley Ave., Gallup, NM 87301, USA; smarand@unm.edu

Abstract
This article aims to introduce some modern algebraic structures as hyper super matrices. The classical algebra and matrices cannot process higher-dimensional information with several levels of ambiguity and uncertainty. Hence, it is necessary to establish such superalgebraic structures that can organize and classify the uncertain and incomplete information floating in parallel higher dimensions as facts, events, or realities. To achieve the desired goal, a particular construction of Hypersoft Matrix (HS-Matrix) and Subjectively Whole Hyper-SuperSoft Matrix (SWHSS-Matrix) is offered in a plithogenic Fuzzy environment initially, and some aggregation operators are formulated. A Local-Global-Universal Combined Consciousness State Ranking Model is formulated as an application. As the classification of non-physical phenomena like state of physical health or Consciousness has not yet been addressed in the area of decision making therefor the proposed model will open a new dimension of classification of the non-physical part of the universe in which one can select the most suitable possible reality from several parallel realities which would be useful in the field of artificial intelligence. This model classifies the accumulated states of matter bodies (subjects). And gives a possible description of the Combined-Consciousness State of a Universe. In addition, it offers a local ranking by observing the information through several angles of vision, just like a human mind does, and a universal ranking by classifying the accumulated states. Furthermore, the final Global Ranking is achieved by constructing a percentage frequency-matrix and an authenticity measure of the order is offered. A numerical example is constructed to describe SWHSS-Matrix and LGU-Ranking Model. Some pie graphs are used to describe the individual states, accumulated states, and the ultimate accumulated universal state of all given subjects (a Combined Conscious State of Universe).

Keywords: Subjectively-Whole-Hyper-Super-Soft-Matrix, Parallel-Dimensions, Attributive-Ranking, Local-Global-Universal-Ranking, Combined-Consciousness, Percentage-Frequency-Matrix, Pie-Graphs.

1. Introduction

As we know, the human brain has some factors of vagueness and precariousness in its judgments and inferences due to multiple opinions, and the complexity of the data, as attributes events, and information derived from its own environments. Scientists after taking into account this basic trait of the human mind start arguing the dire need for some different mathematics that could possibly handle this vagueness factor. Some of the following theories developed gradually. Fuzzy set theory by Zadeh (1965) [1] Intuitionistic fuzzy set (IFS) theory by k.Atanassov [2] [3]. The cloud of vagueness is further extended by F. Smarandache, [4][5][6]. Some more recent extensions and modernizations of the neutrosophic set are presented in [7] [8] [9] [10] [11] [12]. In 1999 Molodtsove [13] introduced Soft Set, a soft set is a parameterized representation of subsets in which one can express multiple attributes and subjects in a unique parameterized formulation. Some further extensions of the soft set were provided in [14] [15] [16]. Later, in 2018, F.Smarandache [17] [18] introduced another expanded version of Softest known as the Hypersoft-Set and the Plithogenic Hypersoft-Set. In these sets, he extended the function of the combination of attributes to multi attributes and sub-attributes. He presented the basic definitions and addressed many open problems of the development of new literature, such as aggregation operators and MADM techniques. We are going to answer some of the open issues raised by Smarandache, S.Rana and co-authors "[19] extended the Plithogenic Hyper-Soft Set to Plithogenic Whole-Hyper-Soft Set by accumulating the memberships and providing both exterior and interior states of the part of Universe/Event/Reality/Information (a combination of Attributes, Sub Attributes, Subjects represented). We represented the Plithogenic Fuzzy Hyper-Soft set and the Plithogenic Fuzzy Whole Hyper-Soft set in a novel form of matrices in the fuzzy environment named as Plithogenic Fuzzy Hyper-Soft Matrix (PFHS-Matrix) and Plithogenic Fuzzy Whole Hyper-Soft Matrix and some local operators were established. Furthermore. In the next phase, S.Rana and co-authors "[20] further dilated the Plithogenic Whole Hyper-Soft Set to Plithogenic Crisp/Fuzzy/Intuitionistic/Neutrosophic Subjective Hyper-Soft Set and represented them in the more dilated version of Soft-Matrix initially in the fuzzy environment termed as Plithogenic Subjective Hyper Super Soft-Matrix. Then developed a Local-Global Universal Subjective Ranking Model by using the new amplified expression of matrices. Some further literature on HyperSoft Set and Plithogency was established in [21-28]. In this article, in the first stage, we have further broadened those earlier introduced Plithogenic Fuzzy Whole Hyper Soft Set and Plithogenic Subjective Hyper-Soft Set to Plithogenic Attributive Subjectively Whole Hyper Soft Set (PASWHSS-Set) in the Fuzzy environment. we have formulated a new type of Matrix initially in a fuzzy environment named Plithogenic Subjectively Whole Hyper Super Soft Matrix (PSWHSS-Matrix). These advanced types of matrices are generated by the hybridization of hyper matrices and super matrices [29-32] These hypersoft matrices are sets/clusters of parallel layers of matrices representing clusters of parallel universes/ realities/ events/ information. These are such hyper-matrices (parallel layers of matrices) whose elements are also matrices. Thus, these matrices are tensors of rank three and four, respectively, having three and four indices of variations. Then later, we have formulated an LGU Combined-Consciousness State Ranking Model. The forte of this model is its classification of nonphysical phenomena. Thus, it will allow opening a new non-physical dimension of classification i.e. selecting one possibility out of multiple possibilities. Moreover, it offers a transparent ranking of attributes (states of subjects) and universes from micro-universe to macro-universe levels by observing them through numerous angles of vision in dissimilar environments of different ambiguity and hesitation levels. Furthermore, it will also furnish and formulate extreme and neutral values of these universes (sets of information, realities, events). This new model actually compacts the expanded Universe to a single lowest point. Finally, we have also anticipated producing a percentage authenticity measure of ranking, which is provided by using a frequency matrix. In the end, we have given an application of the Model using a numerical example. In this example, fuzzy linguistic scales are used to quantify the states of our subjects (bodies of matter known as individuals). The quantified states of subjects are attributes/sub-attributes known as individual fuzzy states or individual fuzzy memberships. Later, the aggregation operators are used to accumulate these states (subject-wise). The accumulated states are represented by fuzzy whole memberships. Initially, these states are accumulated at the local level using a single aggregation operator representing a viewpoint, and a local ordering of states would be achieved. The global ordering of states would be achieved through the use of multiple aggregation operators. By the further accumulation of the already accumulated states, the universal states of accumulation and the universal order would be reached.

Now the further query arises why we are specifically using hyper-Soft and Hyper-Super-Soft matrices for the expression of the Plithogenic Hyper-Soft Set and Plithogenic Attributive Hyper-Soft Set? The answer might be convincing that this Plithogenic Universe is so vast and expanded in its interior (having Fuzzy, Intuitionistic Fuzzy, Neutrosophic, environments with memberships non-memberships, and indeterminacies) and in its exterior (managing many attributes, sub-attributes, and sub-sub-attributes concerning to its subjects). Therefore to organize and classify such highly scattered information we need to formulate some super algebraic structures like these Matrices.

This article is organized into seven basic sections. After the (**section-1**) introduction, **Section 2** summarises some related preliminaries. In **Section 3** we introduce some fundamental new concepts and definitions of the Hypersoft set expression, the HS matrix, and the SWHSS matrix with examples in a plithogenic fuzzy environment. We use these new types of matrices to develop the LGU Combined-Consciousness State Ranking Model. While in **Section 4** some local aggregation operators such as disjunction operators, conjunction operators, averaging operators and compliment operators for PFHS matrices are formulated. **Section 5** describes the algorithm of the LGU Combined-Consciousness State Ranking Model in the plithogenic fuzzy environment In this Model, we would provide the classification of attributes (a non-physical phenomenon or states) at the local, Global and Universal levels. We offer the Universal ranking by classifying these already accumulated universal states. The Local Ranking is offered by observing the higher dimensional information through several angles of vision or states just like a human mind which possesses multiple layers of thought. These thoughts undergo and change their angles in order to achieve a precise or accurate status but before certain complex procedures of mind are applied upon them. Finally, mental thoughts hold their possibly best and desired status/angels depending upon certain complex procedures and environments. In order to learn the transparent Global Ranking, we have applied a Percentage-Frequency-Matrix by accumulating the states of the human mind (several angles of vision). Finally, to preserve transparency and accuracy, our model also provides the authenticity measure of the ordering. In **Section 6** Application of the LGU-Combined-Consciousness State Ranking Model is presented and final combined universal states are offered. In **Section 7** the flow of the model from individual states of subjects to their combined-universal states is described by pi graphs and some conclusions and open problems are discussed.

2 Preliminaries

This section, narrates some fundamental useful definitions of the hyper-soft set, Hyper matrices, and Super matrices.

Definition 2.1 [17] (Hyper-soft set)
Let U be the initial universe of discourse $P(U)$ the power set of U.
let $a_1, a_2, \dots, a_n$ for $n \geq 1$ be n distinct attributes, whose corresponding attribute-values are respectively the sets $A_1, A_2, \dots, A_n$ with $A_i \cap A_j = \varphi$ for $i \neq j$ and $i, j \in \{1,2,\dots,n\}$.
Then the pair $(F, A_1 \times A \times \dots \times A_n)$ where,

$$F: A_1 \times A \times \dots \times A_n \to P(U),$$

is called a hyper-soft set over U;
Definition 2.2 [29] [30] (super-matrices)

A rectangular or square arrangements of numbers in rows and columns are known as matrices,or simply ordinary matrices, wheras a super-matrix is such matrix whose elements are matrices. These elements can be either scalars or matrices.

$a = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$, *where*

$a_{11} = \begin{bmatrix} 2 & -4 \\ 0 & 1 \end{bmatrix},\ a_{12} = \begin{bmatrix} 0 & 40 \\ 21 & -12 \end{bmatrix},$

$a_{21} = \begin{bmatrix} 3 & -1 \\ 5 & 7 \\ -2 & 9 \end{bmatrix},\ a_{22} = \begin{bmatrix} 4 & 12 \\ -17 & 6 \\ 3 & 7 \end{bmatrix}$ *a is a super-matrix.*

Note: The elements of super-matrices are considered as sub-matrices i.e. $a_{11}, a_{12}, a_{21}, a_{22}$ are submatrices of the super-matrix a.

Definition 2.3 [31] [32] (Hyper-matrices)

For $n_1, \ldots, n_d \in N$, a function $f: (n_1) \times \ldots \times (n_d) \rightarrow F$ is a hyper-matrix, or d-hyper-matrix. Often $a_{k_1 \ldots k_d}$ are used to denote the value $f(k_1 \ldots k_d)$ of f at $(k_1 \ldots k_d)$ and think of f (renamed as A) as specified by a d-dimensional table of values, writing $A = [a_{k_1 \ldots k_d}]_{k_1 \ldots k_d}^{n_1, \ldots, n_d}$

A 3-hypermatrix can be written on a (2-dimensional) piece of paper as a list of ordinary matrices, called slices. For example

$$A = \begin{bmatrix} a_{111} & a_{121} & a_{131} & \cdot & a_{112} & a_{122} & a_{132} \\ a_{211} & a_{221} & a_{231} & \cdot & a_{212} & a_{222} & a_{232} \\ a_{311} & a_{321} & a_{331} & \cdot & a_{312} & a_{322} & a_{332} \end{bmatrix}$$

3. Plithogenic Fuzzy HS-Matrix and Plithogenic Fuzzy SWHSS-Matrix

This section, develops some literature about the plithogenic hypersoft set in the following manner.

1. We introduce some basic new beliefs and definitions of expression of hypersoft set and HS-Matrix with examples.
2. We introduce novel HS-matrix as SWHSS-Matrix in plithogenic Fuzzy environment.
3. We portray the compact and expanded expressions of HS-Mtricx and SWHSS-Matrix.

To develop an understanding of the literature, we give some new definitions.

Definition 3.1 (Plithogenic Fuzzy HyperSoft-Set (PFHS-Set)): Let U_F be the initial universe of discourse $P(U_F)$ the power set of U_F. A_j^k is a combination of attributes/Sub-Attributes for some $j = 1,2,3, \ldots, N$ Attributes, $k = 1,2,3, \ldots, L$ Sub-Attributes and x_i $i = 1,2,3, \ldots,$ M are subjects under consideration then $(F_F, A_1^k, A_2^k \ldots, A_3^k)$ is PFHS-Set represented by plithogenic fuzzy memberships $\mu_{A_j^k}(x_i)$.

where, $F_F: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow, P(U_F)$ is a mapping from a complex cross product of the attributes to the power set $P(U_F)$. This PFHS-Set is represented as

$$\mathrm{F} = \left\{ \begin{matrix} x_1\left(\mu_{A_j^k}(x_1)\right), \\ x_2\left(\mu_{A_j^k}(x_2)\right), \\ \cdot \\ \cdot \\ \cdot \\ x_{\mathrm{M}}\left(\mu_{A_j^k}(x_M)\right) \end{matrix} \right\}$$

Definition 3.2 (Plithogenic Fuzzy HyperSoft-Matrix (PFHS-Matrix)):

Let U_F be the Fuzzy universe of discourse, $P(U_F)$ be the power set of U_F, A_j^k is a combination of attributes/sub-attributes for some $j = 1,2,3, \ldots, N$ attributes, $k = 1,2,3, \ldots, L$ sub-attributes and x_i $i =$

$1,2,3,\ldots, M$ are subjects under consideration then PFHS-Matrix, $F_{ij}^{k} = \left[\mu_{A_j^k}(x_i)\right]$ is a mapping $F_F: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow P(U_F)$, from a complex cross product of the attributes to the power set $P(U_F)$., Where $\mu_{A_j^k}(x_i) \in [0,1]$ are fuzzy memberships s.t $\mu_{A_j^k}(x_i) + \upsilon_{A_j^k}(x_i) = 1$. These Fuzzy memberships $\mu_{A_j^k}(x_i)$ are the elements of PFHS-Matrix and are assigned for the Part of Universe/Reality/Event/Information, by decision-makers or concerned bodies through the linguistic scales. For further details, see ref. [28-31]. we may call these memberships the individual fuzzy memberships.

We may write F_{ij}^{k} simply as F.The compact form of PFHS-Matrix, is

$$F = \left[\mu_{A_j^k}(x_i)\right] \tag{3.1}$$

And an expanded form of PFHS-Matrix, is

$$F = \begin{array}{c} \\ x_1 \\ x_2 \\ . \\ . \\ . \\ x_M \end{array} \begin{array}{c} \begin{array}{cccc} A_1^k & A_2^k & \cdots & A_N^k \end{array} \\ \begin{bmatrix} \mu_{A_1^k}(x_1) & \mu_{A_2^k}(x_1) & . \; . \; . & \mu_{A_N^k}(x_1) \\ \mu_{A_1^k}(x_2) & \mu_{A_2^k}(x_2) & . \; . \; . & \mu_{A_N}(x_2) \\ . & . & . \; . \; . \; . & . \\ . & . & . \; . \; . \; . & . \\ . & . & . \; . \; . \; . & . \\ \mu_{A_1^k}(x_M) & \mu_{A_2^k}(x_M) & . \; . \; . & \mu_{A_N^k}(x_M) \end{bmatrix} \end{array} \tag{3.2}$$

Example 1:

Consider the mapping F defined as,

$F_F: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow, P(U_F\ )$

(taking some specific numeric values of A_j^k)

Consider $T = \{x_1, x_2, x_3\}$, is a subset of powerset $P(U_F\ )$ and x_i subjects for $i = 1,2,3$, are x_1, x_2, x_3. The associated states of these subjects are A_j^k Attributes/Sub-Attributes for $j = 1,2,3,4$ and $k = 1,2,3$. To represent these states some fuzzy memberships would be assigned by the Concerned body, through the five-point linguistic scale (see ref. [28-31]) T

The set representation of information is described as PFHS-Set as,

$$F_\alpha(A_1^3, A_2^1, A_3^1, A_4^2) = \begin{Bmatrix} x_1(0.3,0.6,0.5,0.5), \\ x_2(0.4,0.4,0.3,0.1), \\ x_3(0.6,0.3,0.4,0.7) \end{Bmatrix} \tag{3.3}$$

And further organized and expressed in one layer of PFHS-Matrix F_{ij}^{α},

$$\mathrm{F} = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{cccc} A_1^3 & A_2^1 & A_3^1 & A_4^2 \end{array} \\ \begin{bmatrix} 0.3 & 0.6 & 0.5 & 0.5 \\ 0.4 & 0.4 & 0.3 & 0.1 \\ 0.6 & 0.3 & 0.4 & 0.7 \end{bmatrix} \end{array} \tag{3.4}$$

Where $A_1^3\ A_2^1\ A_3^1\ A_4^2$ is a specific α combination of Attributes/Sub-Attributes representing states of subjects $x_1, x_{2,} x_3$. F_{ij}^{α} is representing a single layer out of multiple possible layers of PFHS-Matrix. For a more detailed description and applications, see [19]

Example 2. Consider layered representation $F = \left[\mu_{A_j^k}(x_i)\right]$ for $k = 1,\ j = 1,2,3,4$ and $i = 1,2,3$, i.e (first level-layer) and for $k = 2$, $j = 1,2,3,4$ and $i = 1,2,3$, i.e (second level-layer). let $T = \{x_1, x_2, x_3\}$ be Subjects in PFHS-Set associated to given attribute the PFHS-Set is represented through fuzzy memberships as described bellow,

$$F(A_1^1, A_2^1, A_3^1, A_4^1) = \begin{Bmatrix} x_1(0.3,0.6,0.3,0.5), \\ x_2(0.4,0.5,0.2,0.1), \\ x_3(0.6,0.2,0.3,0.7) \end{Bmatrix} \tag{3.5}$$

$$F(A_1^2, A_2^2, A_3^2, A_4^2) = \begin{Bmatrix} x_1(0.5,0.4,0.2,0.6) \\ ,x_2(0.5,0.7,0.8,0.4), \\ x_3(0.7,0.6,0.5,0.9) \end{Bmatrix} \tag{3.6}$$

The matrix representation of this PFHS-Set F is described as PFHS-Matrix,

$$\boldsymbol{F} = \begin{bmatrix} \begin{bmatrix} 0.3 & 0.6 & 0.3 & 0.5 \\ 0.4 & 0.5 & 0.2 & 0.1 \\ 0.6 & 0.2 & 0.3 & 0.7 \end{bmatrix} \\ \begin{bmatrix} 0.5 & 0.4 & 0.2 & 0.6 \\ 0.5 & 0.7 & 0.8 & 0.4 \\ 0.7 & 0.6 & 0.5 & 0.9 \end{bmatrix} \end{bmatrix} \tag{3.8}$$

For further details, see ref.[20]

Definition 3.3 (Plithogenic Fuzzy Subjectively-Whole Hyper-Super-Soft-Matrix (PFSWHSS-Matrix)):

Let U_F be the primary universe of discourse, in the Fuzzy situation and $P(U_F)$ be the power set of U_F. Let $A_1^k, A_2^k, \dots, A_N^k$ are A_j^k N distinct attributes/subattributes for $= 1,2,\dots N$, $k = 1,2,\dots L$ is representing attribute values then **PFSWHSS-Matrix** is, $F \begin{bmatrix} \left[\mu_{A_j^k}(x_i)\right] \\ \left[\Omega^t_{\mathbf{A}_j^k}(X)\right] \end{bmatrix}$ is mapping

$$F_F: A_1^k \times A_2^k \times \ldots \times A_N^k \to P(U_F)$$

we may use a compact notation of PFSWHSS-Matrix, F_{ij}^{kt}, This matrix is expressed by both individual fuzzy memberships $\mu_{A_j^k}(x_i)$ (individual fuzzy states of subjects regarding each attribute) and the aggregated fuzzy memberships $\Omega_{A_j^k}(\boldsymbol{X})$ (subject-wise aggregated states). In F_{ij}^{kt} $t = 1,2,\dots O$ is representing aggregation operators. In PFSWHSS-Matrix the fuzzy states (fuzzy memberships) of all given subjects are aggregated and then represented as for each attribute/sub-attribute. This PFSWHSS-Matrix handles not only a single combination of attributes/subattributes but rather multiple combinations of attributes/sub-attributes out of their complex cross products or in other words. This matrix F_{ij}^{kt}, has four indices of variation is a soft tensor of rank 4. We may write F_{ij}^{kt} as F for the simplification of notation. Four types of variation are presented in this PFSWHSS matrix. The first Variations on the index $i = 1,2,\dots M$ generate M rows of Matrix, the second variations on the index $j = 1,2,\dots N$ generate N columns, and the third variations on $k = 1,2,\dots L$ produces L combinations of rows and columns as parallel-layers of $M \times N$ matrices as hyperSoft Matrix. The fourth variation on $t = 1,2,\dots P$ describes $the\ P\ sets$ of Clusters.

The representation of PFSWHS-Matrix in a compact form is,

$$\mathrm{F} = \begin{bmatrix} \left[\mu_{A_j^k}(x_i)\right] \\ \left[\Omega^t_{\mathbf{A}_j^k}(X)\right] \end{bmatrix}, \tag{3.9}$$

$\mathrm{F} = \begin{bmatrix} \left[\mu_{A_j^1}(x_i)\right] \\ \left[\Omega^t_{\mathbf{A}_j^1}(X)\right] \end{bmatrix}$ represents a single Layer of SWHSS-Matrix for $k = 1$ i.e an α universe.

$\mathrm{F} = \begin{bmatrix} \left[\mu_{A_j^1}(x_i)\right] \\ \left[\Omega^t_{\mathbf{A}_j^1}(X)\right] \end{bmatrix}$ represents a single Layer of SWHSS-Matrix for $k = 2$ i.e an β universe.

The representation of PFSWHS-Matrix in an expanded form is,

$$\mathbf{F}=\begin{bmatrix}
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^1}(x_1) & \mu_{A_2^1}(x_1) & \cdots & \mu_{A_N^1}(x_1)\\ \mu_{A_1^1}(x_2) & \mu_{A_2^1}(x_2) & \cdots & \mu_{A_N^1}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^1}(x_M) & \mu_{A_2^1}(x_M) & \cdots & \mu_{A_N^1}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_1^1}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_2^1}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_N^1}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}\\
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^2}(x_1) & \mu_{A_2^2}(x_1) & \cdots & \mu_{A_N^2}(x_1)\\ \mu_{A_1^2}(x_2) & \mu_{A_2^2}(x_2) & \cdots & \mu_{A_N^2}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^2}(x_M) & \mu_{A_2^2}(x_M) & \cdots & \mu_{A_N^2}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_1^2}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_2^2}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_N^2}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}\\
\vdots\\
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^L}(x_1) & \mu_{A_2^L}(x_1) & \cdots & \mu_{A_N^k}(x_1)\\ \mu_{A_1^L}(x_2) & \mu_{A_2^L}(x_2) & \cdots & \mu_{A_N^L}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^L}(x_M) & \mu_{A^L}(x_M) & \cdots & \mu_{A_N^L}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_1^L}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}^L}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{1}}_{\mathbf{A}_N^L}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}\\
\vdots\\
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^1}(x_1) & \mu_{A_2^1}(x_1) & \cdots & \mu_{A_N^1}(x_1)\\ \mu_{A_1^1}(x_2) & \mu_{A_2^1}(x_2) & \cdots & \mu_{A_N^1}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^1}(x_M) & \mu_{A_2^1}(x_M) & \cdots & \mu_{A_N^1}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_1^1}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_2^1}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_N^1}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}\\
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^2}(x_1) & \mu_{A_2^2}(x_1) & \cdots & \mu_{A_N^2}(x_1)\\ \mu_{A_1^2}(x_2) & \mu_{A_2^2}(x_2) & \cdots & \mu_{A_N^2}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^2}(x_M) & \mu_{A_2^2}(x_M) & \cdots & \mu_{A_N^2}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_1^2}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_2^2}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_N^2}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}\\
\vdots\\
\begin{bmatrix}\begin{bmatrix}\mu_{A_1^L}(x_1) & \mu_{A_2^L}(x_1) & \cdots & \mu_{A_N^k}(x_1)\\ \mu_{A_1^L}(x_2) & \mu_{A_2^L}(x_2) & \cdots & \mu_{A_N^L}(x_2)\\ \vdots & \vdots & & \vdots\\ \mu_{A_1^L}(x_M) & \mu_{A^L}(x_M) & \cdots & \mu_{A_N^L}(x_M)\end{bmatrix}\\ \begin{bmatrix}\mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_1^L}(\boldsymbol{X}) & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}^L}(\boldsymbol{X}) & \cdots & \mathbf{\Omega}^{\mathbf{2}}_{\mathbf{A}_N^L}(\boldsymbol{X})\end{bmatrix}\end{bmatrix}
\end{bmatrix} \tag{3.10}$$

This PFSWHS-Matrix exhibits both internal and subjective external states of the universe. The internal state of the universe, event, or reality is reflected by individual fuzzy memberships $\mu_{A_j^k}(x_i)$ whilst the Subjectively exterior state of the universe, event, or reality is reflected through Subjectively aggregated memberships $\Omega_{A_j^k}(X)$ that is accumulated specifically for all given subjects at each attributive/sub-attributive level. Therefore the PFSWHSS-Matrix would provide an attributive classification (non-physical classification) through a subject-wise accumulation of states. The subjective aggregation is applied to fuzzy memberships $\mu_{A_j^k}(x_i)$ at the index i, i.e at each specific sub-attributive level by applying several suitable aggregation operators. In the next section-4 for the construction of this PFSWHSS-Matrix, we have formulated some aggregation operators. The application of these operators and SWHSS-Matrix as LGU Combined-Consciousness State Ranking Model is presented in Section-5, whereas the application of this Whole Model is described in Sec-6, where the faculty ranking Model is represented.

4 Local aggregation operators for the Construction of SWHSS-Matrix

This section describes Local aggregation operators like disjunction operators, conjunction operators, Averaging operators, and Compliment-operator for PFHS-Matrix. By applying these local operators on the **PFHS-Matrix** the **SWHSS-Matrix** would be constructed. By utilizing Local disjunction, Local conjunction, and Local averaging operators, we would develop a combined (whole) memberships $\Omega^t_{\mathrm{A}_j^k}(X)$ for **PFSWSS-Matrix** that would be presented in the last row-matrix of the. SWHSS-Matrix

The general mathematical expression for SWHSS-Matrix $\boldsymbol{F}$ in the plithogenic fuzzy environment is given below.

$\boldsymbol{F} = \begin{bmatrix} \left[\boldsymbol{\mu}_{A_j^k}(\boldsymbol{x}_i)\right] \\ \left[\boldsymbol{\Omega}^t_{\mathrm{A}_j^k}(\boldsymbol{X})\right] \end{bmatrix}$ In this Matrix the last row of cumulative memberships $\boldsymbol{\Omega}^t_{\mathrm{A}_j^k}(\boldsymbol{X})$ is framed by using three local operators, $t = 1$ is used for the Max-operator $t = 2$ for Min-operator, and $t = 3$ for the $averaging$-operator. Furthermore, $t = 4$ is representing Compliment-operator**.**

In SHWHS-Matrix

$\boldsymbol{F}_{\mathbf{S}_t} = \left[\left[\boldsymbol{\mu}_{A_j^k}(\boldsymbol{x}_i)\right] \quad \left[\boldsymbol{\Omega}^t_{\mathbf{A}^k}(\boldsymbol{x}_\mathbf{i})\right]\right]$ the last column of cumulative memberships $\Omega_{A^k}(x_i)$ are obtained by using three local operators, $t = 1$ used for the Max-operator $t = 2$ is used to portray the Min-operator, and $t = 3$ is used for the $averaging$-operator. Furthermore, $t\ =\ 4\ represents\ the\ compliment.$

These four operators are described as follows:

4.1 Local-Disjunction-Operator for the construction of SWHSS-Matrix:

$$\cup_{\boldsymbol{i}}\left(\boldsymbol{\mu}_{A_j^k}(\boldsymbol{x}_i)\right) = \underset{i}{Max}\left(\mu_{A_j^k}(x_i)\right) = \Omega^1_{\mathrm{A}_j^k}(X)\ ,\ \text{for some } k = l \tag{4.1}$$

This Max-operator reflects the optimal state of mind of the decision-maker.

4.2 Local-Conjunction Operator for construction of SWHSS-Matrix:

$$\cap_i\left(\mu_{A_j^k}(x_i)\right) = \underset{i}{Min}\left(\mu_{A_j^k}(x_i)\right) = \Omega^2_{\mathrm{A}_j^k}(X)\ ,\text{for some } k = l \tag{4.2}$$

This Min-operator reflects the pessimistic state of mind of the decision-maker.

4.3 Local-Averaging-Operator for construction of SWHSS-Matrix:

$$\Gamma_i\left(\mu_{A_j^k}(x_i)\right) = \frac{\sum_i\left(\mu_{A_j^k}(x_i)\right)}{M} = \Omega^3_{\mathrm{A}_j^k}(X)\ ,\ \text{for some } k = l \tag{4.3}$$

This averaging operator reflects the neutral state of mind of the decision-maker.

4.4 Local Compliment for the construction of SWHSS-Matrix:

$$C_{loc}(F) = \begin{Bmatrix} Max_i\left(1-\mu_{A_j^k}(x_i)\right) \\ Min_i\left(1-\mu_{A_j^k}(x_i)\right) \\ \sum_{i=1}^{M}\frac{\left(1-\mu_{A_j^k}(x_i)\right)}{M} \end{Bmatrix}, \quad \text{for some } k = l \tag{4.4}$$

5. Algorithm of LGU Combined-Consciousness State Ranking Model

This section, utilizes the local operators built in the previous section for the formulation of the LGU Combined-Consciousness State Ranking Model in the Fuzzy environment.

In this model, we would provide the classification of attributes (a nonphysical phenomenon) at the local, Global, and Universal levels. We have called this Model the LGU Combined-Consciousness State Ranking Model. Some specialties of this LGU Combined-Consciousness State Ranking Model are mentioned to describe why this model would be preferred over previously developed MADM models

1. The first and most important feature of this model is that it provides a ranking of the non-physical states of the universe. As we know, the classification of non-physical phenomena has not yet been addressed in the area of decision-making. This model will open a new dimension of classification of the non-physical part of the universe / event / reality / information, in which one can choose a possible reality from several parallel realities that would be useful in the field of artificial intelligence.
2. The second peculiarity of this model is that it offers the classification of attributes by looking at them from multiple angles of visions. For example, the choice of the $max\ operator$ is an expression of an optimistic perspective. In contrast to this, the choice of the Min-operator is an expression of the pessimistic point of view and the choice of the $average$-operator is an expression of a neutral point of view. The combination of all operators in one model offers a transparent decision that is made from multiple perspectives
3. This model has the potential to offer a classification of attributes in numerous environments such as Fuzzy, Intuitionistic, Neutrosophic, or any other suitable environment required. Each environment has its own ambiguity or hesitation level. By choosing a particular environment, this model would be expanded to work on any level of uncertainty, hesitation, or ambiguity.
4. This attributive/state ranking model offers the ranking from micro-universe to macro-universe stages i.e. from inner smaller cell to outer larger universe.
5. Primarily, this Model delivers the internal ranking of attributes (states of subjects) named "Local Attributive ranking" (ranking of states) (classification of attributes/states of micro-universe)
6. On the next stage, this Model offers an exterior classification of states named "Global Attributive Ranking."
7. On a further extended level this Model offers the 3rd type of attributive ranking named "Universal Combined-Consciousness State Ranking (Classification of attributes of the macro-universe)
8. This model also offers extreme values, as extreme behaviors, and neutral values, as neutral behavior of universes that would be helpful to find the optimal and neutral states of all kinds of universes/realities/events/information from their micro- to macro levels.
9. At the final level, it provides a precise measure of the authenticity of classification by using the frequency matrix.

Initially, we consider the case of the PFSWHSS-Matrix to rank the given attributes or states of subjects. These subjects with their all attributes/sub attributes are considered to be one universe.

Later, we can generalize this Model into Plithogenic Intuitionistic, Plithogenic Neutrosophic, and other multiple useful required environments agreeing the state of mind of the decision-makers.
The Algorithm of the LGU Combined-Consciousness State Ranking Model is described below,
Step 1. Construction of Universe: Consider the fuzzy universe of discourse $U_F = \{x_i\}$ $i = 1,2,3, \ldots, M$. Consider some attributes/sub-attributes and subjects need to be classified where attributes/sub-attributes are A_j^k $j = 1,2,3, \ldots, N$ and $k = 1,2, \ldots, L$ represents numeric values of attributes A_j (parallel level layers), and concerned subjects are $T = \{x_i\} \subset U_F$ where i can take some values from 1 to M such that Define mappings F and G such that,

$$F: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow P(U) \text{ For some fixed } k \text{ (leve-1)} \tag{5.1}$$

$$G: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow P(U), \text{ For some different fixed } k \text{ (level-2)} \tag{5.2}$$

Step 2. Construction of PFHS-Matrix: Write the data or information (fuzzy-memberships) of PFHS-Set in the form of PFHS-Matrix $B = \left[\mu_{A_j^k}(x_i)\right]$. If there are some non-favorable attributes in the given Information, we may replace their memberships $(\mu_{A_j^k}(x_i))$ by non-membership $(1 - \mu_{A_j^k}(x_i))$ while the neutral and favorable attributes would be displayed by their fuzzy memberships.
Step 3. Construction of PFSWHSS-Matrix: By using local aggregation operators constructed in Sec. -4 formulate PFSWHSS-Matrix given as,

$$B_{\mathbf{A}_t} = \begin{bmatrix} \left[\mu_{A_j^k}(x_i)\right] \\ \left[\Omega^t_{\mathbf{A}_j^k}(X)\right] \end{bmatrix}. \tag{5.3}$$

Step 4. Local Attributive Ranking: The Local Attributive Ranking **is** the ranking of the accumulated states of matter bodies (subjects) that would be acquired by considering cumulative memberships $\Omega^t_{\mathbf{A}_j^k}(X)$ of the last row of each layer of $B_{\mathbf{A}_t}$.
The higher the membership value, the better the attribute / sub-attribute that corresponds to this membership. At this stage, the attributive classification of all layers or a selected layer would be provided according to the required situation. In addition, the process would eventually stop when the transparent local attributive ranking is obtained. If there are some ties or ambiguities in the local attributive ranking that would be eliminated in the next step of the global ranking, a more transparent ranking would be observed.
Step 5. Global Attributive Ranking: Final global attribute ordering would be provided by using the Frequency Matrix, "F_{ij}" and the percentage frequencies Matrix f_{ij}^* by combining the states of mind of the decision-makers.

$$F_{ij} = \begin{array}{c} A_1 \\ A_2 \\ . \\ . \\ . \\ A_N \end{array} \begin{bmatrix} f_{11} & f_{12} & . & . & . & f_{1N} \\ f_{21} & f_{22} & . & . & . & f_{2N} \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ f_{M1} & f_{M2} & . & . & . & f_{NN} \end{bmatrix} \tag{5.4)a}$$

$$F_{ij}^* = \begin{array}{c} A_1 \\ A_2 \\ . \\ . \\ . \\ A_N \end{array} \begin{bmatrix} f_{11}^* & f_{12}^* & . & . & . & f_{1N}^* \\ f_{21}^* & f_{22}^* & . & . & . & f_{2N}^* \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ f_{N1}^* & f_{N2}^* & . & . & . & f_{NN}^* \end{bmatrix} \tag{5.4)b}$$

Where, f_{ij}^{*} is the percentage frequency measure

$$f_{ij}^{*} = \frac{(f_{ij})}{\sum_{i}(f_{ij})} \times 100 \tag{5.4)c}$$

In F_{ij} the values of the first column signify the frequency with which the 1st position is achieved, which is reached by some specific attributes. The elements of the column 2 represent the frequency of acquiring the second position and so on. Similarly the elements of F_{ij}^{*} represent the percentage frequencies. To find out which attribute would be assigned the first position we consider the entries in the first column of F_{ij}^{*} the attribute corresponds to the highest value of the first column attains the first position and then we delete this column of the first position and the row associated with this attribute. This reduces the dimension of the matrix. Then, for the second position, add the remaining percentage frequencies of the first position into the next percentage frequencies of the second column and then look for the highest percentage frequency in the second column for the decision of the second position.

Once the second position is determined, we delete the corresponding column and row of that position and continue the practice until the final position is allocated.

This Percentage Frequency Matrix has a great potential to handle ties.

Step 6. **Authenticity measurement of the Global ranking:** In the last step, we can check the authenticity by means of ratios.

Percentage authenticity measure of j $_{th}$ selected positions for i_{th} Attribute,

$$\frac{\text{Highest frequency of } j_{th} \text{ position}}{\text{Total frequency of } j_{th} \text{position}} \times 100$$

$$f_{ij}^{\circ} = \frac{\max_{i}(f_{ij}^{*})}{\sum_{i}(f_{ij})} \times 100 \tag{5.5}$$

Step 7. **Final Universal States (Combined Consciousness States) and Ranking:**

The final universal states (Combined Consciousness states) of Universes as final accumulated fuzzy memberships $\mathbf{\Omega}_{kt}$ are provided by using the disjunction operator, (t = 1) the conjunction operator, (t = 2), and the average operator ($t = 3$) on already cumulative memberships of the last row of SWHSS-Matrix $B_{\mathbf{A}_{t}}$, These accumulated fuzzy memberships $\mathbf{\Omega}_{kt}$ represent the final Universal State or the Combined Consciousness State of the universe.

For a fixed k and t the universe with the greatest cumulative membership would be considered the better universe, and further order of the universes would be observed by arranging the $\mathbf{\Omega}_{kt}$ in descending order. To get the final ranking of the universal states and to obtain extreme and neutral accumulated states of the Universe/Reality/Event/Information, we would proceed as

Taking $t = 1,2,3$ respectively on $\mathbf{\Omega}_{kt}$ we would obtain the following extreme and neutral values.

$$\mathbf{\Omega}_{k1} = \max_{j} \Omega^{1}_{\mathbf{A}_{j}^{k}}(X) \tag{5.6}$$

$$\mathbf{\Omega}_{k2} = \min_{j} \left[\Omega^{2}_{\mathbf{A}_{j}^{k}}(X)\right] \tag{5.7}$$

$$\mathbf{\Omega}_{k3} = \frac{\sum_{j}\left[\Omega^{3}_{\mathbf{A}_{j}^{k}}(X)\right]}{N} \tag{5.8}$$

At this level $\mathbf{\Omega}_{k1}$ and $\mathbf{\Omega}_{k2}$ would give the extreme (lowest and highest) states and $\mathbf{\Omega}_{k3}$ would give the neutral states of Universe/Reality/Event/Information as accumulated fuzzy memberships.

The local order of the universes is obtained by arranging these cumulative memberships in descending order, and the global order is offered by using the same scenario of the frequency matrix (step-5).

5. Application of LGU Combined-Consciousness State Ranking Model

Numerical Example:

To achieve the purpose of non-physical classification, initially, we first develop two PFHS-Sets with α-Combination and β-Combination of attributes, i.e., for α and β universes. Then we represent it as PFHS-Matrix B, which consists of two layers that represent the mappings F and G that are used to parameterize a combination of attributes/subattributes. By assuming different or specific numerical values of k, consider α-Combination of attributes are parameterized by mapping F and β-Combination of attributes by mapping G. The overall LGU Combined-Consciousness State Ranking is described by following the steps in the algorithm described in Section -5.

Step 1. Construction of the Universe: Consider U be the set in five candidates of the mathematics department and out of these five only three have participated in consciousness quantification and classification experiment. let T be a set of these three candidates (subjects), T = {Peter, Aina, kitty}, ($T \subset U$). The elements of T are our subjects. The states of these subjects are A_j^k attributes quantified through the fuzzy linguistic scales. The classification of these attributes is required.

These A_j^kattributes are organized in the following manner:

A_1^k = Intelligence level with numeric values, $k = 1{,}2$ s.t
A_1^1 = very intelligent, A_1^2 = moderate intelligent
A_2^k = Fous, with numeric values, $k = 1{,}2$ s.t
A_2^1 = Strong focus A_2^2 = Weak focus
A_3^k = Observation with numeric values, $k = 1{,}2$ s.t
A_3^1 = Strong observation , A_3^2 = weak observation
A_4^k = Expression with numeric values $k\ =\ 1{,}2\ st$
$A_4^1 =$ Strong expression, A_4^2 = Weak expression

F and G be the plithogenic fuzzy parameterizations of the combination of their states (attributes) such that
$F: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow P(U)$ (choosing some of the numeric values of A_j^k, $k = 1,2, \ldots, L$
$G: A_1^k \times A_2^k \times A_3^k \times \ldots \times A_N^k \rightarrow P(U)$ (choosing some other numeric values of A_j^k, $k = 1,2, \ldots, L$

Let these candidates of set T are our $x_i$subjects, $i = 1{,}2{,}3$, and their states are attributed/sub-attribute represented A_j^k $j = 1{,}2{,}3{,}4$ and $k = 1{,}2$. We are looking for the best-reflected attribute among the given Combination of attributes (case of the local universe). The local universe of subjects and attributes for first level $k = 1$ is described as

$T = \{\text{Peter, Aina, kitty}\} = \{x_1, x_2, x_3\}$ where x_1, x_2, x_3 represent x_i subjects under consideration, initially, we represent the combination of states of the first level for $k = 1$(combination of attributes that are parametrized by mapping F)

1. Intelligence: $j = 1$, $k = 1$ (very intelligent)
2. Focus: $j = 2$, $k = 1$ (strong focus)
3. Observation: $j = 3$, $k = 1$ (strong observation)
4. Expression: $j = 4$, $k = 1$ (strong expression)

Now fuzzy memberships (fuzzy parameterization) are assigned by using fuzzy linguistic scales for details see ref. [33-36].

Let the Function F represents the fuzzy parameterization of the given combination of states/attributes s.t.,

$$F(A_1^1, A_2^1, A_3^1, A_4^1) = \{x_1(0.3,0.7,0.4,0.5), x_2(0.4,0.5,0.4,0.1), x_3(0.6,0.2,0.5,0.7)\} \quad (6.1)$$

let us name the combination of attributes $A_1^1, A_2^1, A_3^1, A_4^1$ as α Combination representing the first level for $k = 1$

Consider some other combination of states described for $k = 2$ These states are parametrized by mapping G s.t $G: A_1^k \times A_2^k \times A_3^k \times A_4^k \rightarrow P(U)$

The local universe of subjects and attributes for second-level $k = 2$ is described below

1. Intelligence $j = 1, k = 2$ (moderate intelligent)
2. Focus: $j = 2, k = 2$ (weak focus)
3. Observation: $j = 3, k = 2$ (weak observation)
4. Expression: $j = 3, k = 2$ (weak expression)

Let the function be G represent the fuzzy parametrization of the given combination of states/attributes s.t,

$$G(A_1^2, A_2^2, A_3^2, A_4^2) = \{x_1(0.5,0.0,0.2,0.6), x_2(0.6,0.7,0.8,0.5), x_3(0.4,0.7,0.5,0.9)\} \tag{6.2}$$

let us name the combination of attributes $A_1^1, A_2^1, A_3^1, A_4^1$ as β Combination representing the second level for $k = 2$

Step 2. Construction of PFHS-Matrix:

The first layer of PFHS-Matrix $B = \left[\mu_{A_j^k}(x_i)\right]$ is constructed by using the parametrized states given in Eq. 6.1 for α combination (first level layer of PFHS-Matrix, k =1) and The second layer of PFHS-Matrix is constructed by using the parametrized states given in Eq. 6.2 for β combination (second level layer of PFHS-Matrix, k =2) and this information would be displayed in PFHS-Matrix as shown below.

$$B = \begin{bmatrix} \begin{bmatrix} 0.3 & 0.7 & 0.4 & 0.5 \\ 0.4 & 0.5 & 0.4 & 0.1 \\ 0.6 & 0.2 & 0.5 & 0.7 \end{bmatrix} \\ \begin{bmatrix} 0.5 & 0.0 & 0.2 & 0.6 \\ 0.6 & 0.7 & 0.8 & 0.5 \\ 0.4 & 0.7 & 0.5 & 0.9 \end{bmatrix} \end{bmatrix} \tag{6.3}$$

Step 3. Construction of PFSWHSS-Matrix:

The PFSWHSS-Matrix $B_{\mathbf{A}_t}$ is constructed by using Eqs. (3.10), (4.1), (4.2), and (4.3) for information of (6.3)

$$B_{\mathbf{A}_t} = \begin{bmatrix} \begin{bmatrix} \begin{bmatrix} 0.3 & 0.7 & 0.4 & 0.5 \\ 0.4 & 0.5 & 0.4 & 0.1 \\ 0.6 & 0.2 & 0.5 & 0.7 \\ [\mathbf{0.6} & \mathbf{0.7} & \mathbf{0.5} & \mathbf{0.7}] \end{bmatrix} \\ \begin{bmatrix} 0.5 & 0.0 & 0.2 & 0.6 \\ 0.6 & 0.7 & 0.8 & 0.5 \\ 0.4 & 0.7 & 0.5 & 0.9 \\ [\mathbf{0.6} & \mathbf{0.7} & \mathbf{0.8} & \mathbf{0.9}] \end{bmatrix} \end{bmatrix} \\ \begin{bmatrix} \begin{bmatrix} 0.3 & 0.7 & 0.4 & 0.5 \\ 0.4 & 0.5 & 0.4 & 0.1 \\ 0.6 & 0.2 & 0.5 & 0.7 \\ [\mathbf{0.3} & \mathbf{0.2} & \mathbf{0.4} & \mathbf{0.1}] \end{bmatrix} \\ \begin{bmatrix} 0.5 & 0.0 & 0.2 & 0.6 \\ 0.6 & 0.7 & 0.8 & 0.5 \\ 0.4 & 0.7 & 0.5 & 0.9 \\ [\mathbf{0.4} & \mathbf{0.0} & \mathbf{0.2} & \mathbf{0.5}] \end{bmatrix} \end{bmatrix} \\ \begin{bmatrix} \begin{bmatrix} 0.3 & 0.7 & 0.4 & 0.5 \\ 0.4 & 0.5 & 0.4 & 0.1 \\ 0.6 & 0.2 & 0.5 & 0.7 \\ [\mathbf{0.43} & \mathbf{0.46} & \mathbf{0.43} & \mathbf{0.43}] \end{bmatrix} \\ \begin{bmatrix} 0.5 & 0.0 & 0.2 & 0.6 \\ 0.6 & 0.7 & 0.8 & 0.5 \\ 0.4 & 0.7 & 0.5 & 0.9 \\ [\mathbf{0.5} & \mathbf{0.46} & \mathbf{0.5} & \mathbf{0.66}] \end{bmatrix} \end{bmatrix} \end{bmatrix} \tag{6.4}$$

Step 4. Local Attributive/States Ranking: $B_{\mathbf{A}_{1\alpha}}$ provides The local order of states/attributes for α Combination of attributes or α-universe i.e the first level-layer is obtained by observing the whole memberships of (6.4) for first-level $k = 1$ and first aggregation operator ($t = 1$). See Eq.4.1 We observe here a tie between A_2^1 ($\Omega^1_{\mathbf{A}_2^1}(X) = 0.7$) and A_4^1 ($\Omega^1_{\mathbf{A}_4^1}(X) = 0.7$) which would be removed in the next step of the Global States ranking using the Frequency-Matrix F_{ij}.

$$A_2^1 = A_4^1 \succ A_1^1 \succ A_3^1 \tag{6.5}$$

$B_{\mathbf{A}_{1\beta}}$ provides The local ordering of attributes for β Combination of attributes or β-Universe (second level-layer obtained for $k = 2$) See Eq. 6.4 by using the first operator $t = 1$ (eq. 4.1)

$$A_4^2 \succ A_3^2 \succ A_2^2 \succ A_1^2 \tag{6.6}$$

$B_{\mathbf{A}_{2\alpha}}$ provides the local ordering of attributes for α-Combination of attributes (α-Universe) by using the second operator $t = 2$ Eqs 6.4 and (4.2)

$$A_3^1 \succ A_1^1 \succ A_2^1 \succ A_4^1 \tag{6.7}$$

Similarly

$B_{\mathbf{A}_{2\beta}}$ provides the local ordering of attributes for β Combination of attributes (β-Universe) by using the second operator $t = 2$ Eqs 6.4 and (4.2)

$$A_4^2 \succ A_1^2 \succ A_3^2 \succ A_2^2 \tag{6.8}$$

$B_{\mathbf{A}_{3\alpha}}$ provides the local ordering of attributes for α Combination of attributes (α-Universe) by using the third operator $t = 3$ Eqs 6.4 and (4.3)

$$A_2^1 \succ A_1^1 = A_3^1 = A_4^1 \tag{6.9}$$

$B_{\mathbf{A}_{3\beta}}$ provides the local ordering of attributes for β Combination of attributes (β-Universe) by using the third operator ($t = 3$) Eqs 6.4 and (4.3)

$$A_4^2 \succ A_1^2 = A_3^2 \succ A_2^2 \tag{6.10}$$

Step 5. Global States/Attributive Ranking:

The frequency matrix F_{ij} provides a final global ordering of attributes. In the frequency matrix F_{ij}^{α}, which is a square matrix of frequencies of positions for first level-layer α-Universe, the columns of F_{ij}^{α} represents frequencies of positions, i.e., the entries of the first column represent the frequencies of attaining the first position by some attributes while a row of F_{ij} represents the attributes. The F_{ij}^{α} is constructed from Eq. (6.5), (6.7), (6.9), and (5.4)a, (5.4)b, (5.4)c

$$F_{ij}^{\alpha} = \begin{array}{c} \alpha \\ A_1^1 \\ A_2^1 \\ A_3^1 \\ A_4^1 \end{array} \begin{bmatrix} p_1 & p_2 & p_3 & p_4 \\ 0 & 3 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix} \tag{6.11}$$

$$F_{ij}^{*\alpha} = \begin{array}{c} \alpha \\ A_1^1 \\ A_2^1 \\ A_3^1 \\ A_4^1 \end{array} \begin{bmatrix} p_1 & p_2 & p_3 & p_4 \\ 0 & 100 & 0 & 0 \\ 66.7 & 0 & 33.3 & 0 \\ 33.3 & 33.3 & 33.3 & 0 \\ 33.3 & 33.3 & 0 & 33.3 \end{bmatrix} \tag{6.11a}$$

The Global States ranking of attributes obtained from $F_{ij}^{*\alpha}$ is given below.

$$A_2^1 \succ A_1^1 \succ A_3^1 \succ A_4^1 \tag{6.12}$$

The F_{ij}^{β} is constructed from Eq. (6.6), (6.8), (6.10), and (5.4)a, (5.4)b, (5.4)c

$$F_{ij}^{\beta} = \begin{array}{c} \beta \\ A_1^2 \\ A_2^2 \\ A_3^2 \\ A_4^2 \end{array} \begin{bmatrix} p_1 & p_2 & p_3 & p_3 \\ 0 & 2 & 0 & 1 \\ 0 & 0 & 1 & 2 \\ 0 & 1 & 2 & 0 \\ 3 & 0 & 0 & 0 \end{bmatrix} \tag{6.13}$$

$$F_{ij}^{*\beta} = \begin{array}{c} \beta \\ A_1^2 \\ A_2^2 \\ A_3^2 \\ A_4^2 \end{array} \begin{bmatrix} p_1 & p_2 & p_3 & p_3 \\ 0 & 66.7 & 0.0 & 33.3 \\ 0 & 0.0 & 33.3 & 66.7 \\ 0 & 33.3 & 66.7 & 0 \\ 100 & 0 & 0 & 0 \end{bmatrix} \tag{6.13}$$

The Global States ranking of attributes obtained from $F_{ij}^{*\beta}$ is given below.

$$A_4^2 \succ A_1^2 \succ A_3^2 \succ A_2^2 \tag{6.14}$$

It is observed that the ties of local ranking are removed in the final global ranking

Step 6. Authenticity measurement of the Global States Ranking:

Percentage authenticity measure for first level α-universe is obtained by using Eq. (5.5) and (6.11)a

Percentage authenticity of the first position for $A_2^1 = 66.7\%$

Percentage authenticity of the second position for $A_1^1 = 60\%$

Percentage authenticity of the third position for $A_3^1 = 50\%$

Percentage authenticity of the fourth position for $A_4^1 = 100\%$

Percentage authenticity measure for first level β-universe is obtained by using (5.5) and (6.13)a

Percentage authenticity of the first position for $A_4^2 = 100\%$

Percentage authenticity of the second position for $A_1^2 = 66.7\%$

Percentage authenticity of the third position for $A_3^2 = 66.67\%$

Percentage authenticity of the fourth position for $A_2^2 = 66.7\%$

Step 7. Final Universal States (Combined Consciousness States) and Ranking:

we provide the final ordering of the universe by using all three aggregation operators.

Maximum Combined Consciousness States (Universal Memberships) of α and β universes:

taking $k = 1,2$ for α and β universes and fixing $t = 1$ (Max-operator) using Eqs. (6.4) and (5.6)

$$\boldsymbol{\Omega}_{11} = 0.7,\ \boldsymbol{\Omega}_{21} = 0.9 \tag{6.15}$$

We can see by using operator $t = 1$, β universe is better than α universe.

Minimum Combined consciousness States (Universal Memberships) of α and β universes:

Taking $k = 1,2$ for α and β universes and fixing $t = 2$ minimum universal memberships of all given Attributes with respect to subjects, are obtained using Eqs. (6.4) and (5.7) respectively.

$$\boldsymbol{\Omega}_{12} = 0.1,\ \boldsymbol{\Omega}_{22} = 0.0 \tag{6.16}$$

We observe by using the operator $t = 2$, β universe is better than α universe.

Neutral Combined Consciousness States (Universal Memberships) of α and β universes:

similarly, taking $k = 1,2$ for α and β universes and fixing $t = 3$, we can provide average universal memberships of all given subjects with respect to attributes, using Eqs. (6.4) and (5.7)

$$\boldsymbol{\Omega}_{13} = 0.437,\ \boldsymbol{\Omega}_{23} = 0.53 \tag{6.17}$$

The Universal States ordering: By applying the frequency matrix analysis (Eqs. 6.15, 6.16, 6.17, and (5.4)a, (5.4)b, (5.4)c The ranking of the states of the universes is

$$\beta(\text{universe}) \succ \alpha(\text{universe}) \tag{6.18}$$

7. Pie graphs of the LGU Combined-Consciousness State Ranking Model

7.1 Pie graphs of the LGU Combined-Consciousness State Ranking Model for the α-Universe

The pie graphs (Fig1-Fig 4) present the individual states (fuzzy memberships) of 3 subjects considering one attribute at a time for the α-Universe (for aggregation purposes, we use the averaging operator (t = 3)

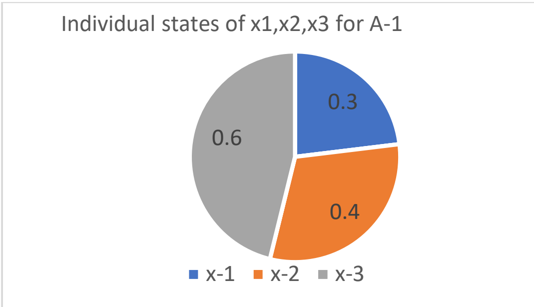

Figure 1a (Individual states of A-1)

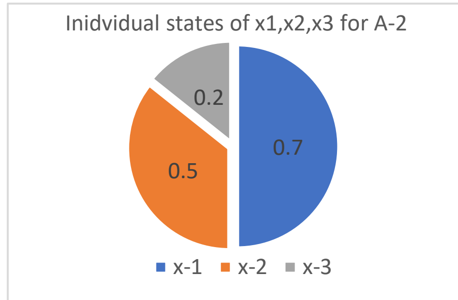

Figure 2a (Individual states of A-2)

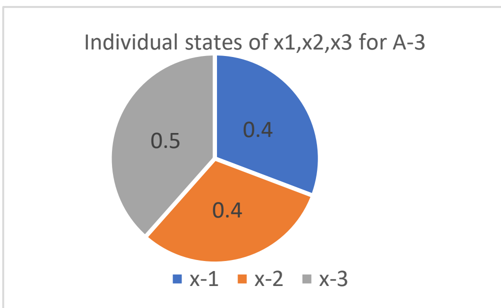

Figure 3a (Individual states of A-3)

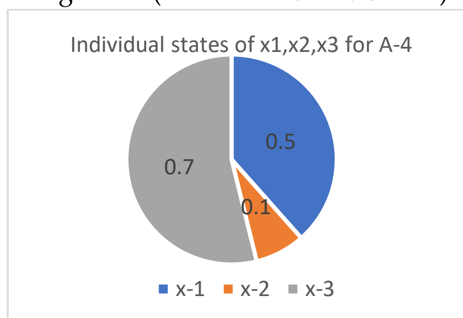

Figure 4a (Individual states of A-4)

Fig. 5 represents the aggregated states of the three subjects (α-Universe first level of aggregation) represented for each attribute.

Fig 6 is representing the aggregated state of the whole universe that is obtained by aggregating the previous aggregated states of fig 5 by using the averaging operator (α-Universe second level of aggregation)

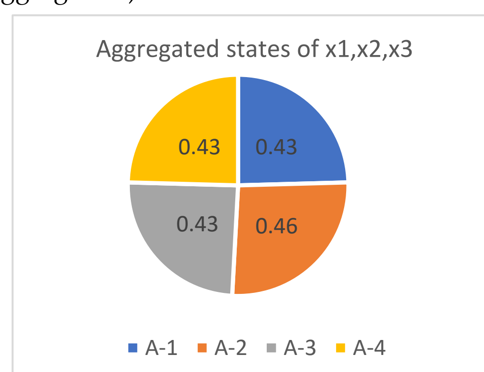

Figure 5a (Aggregated states)

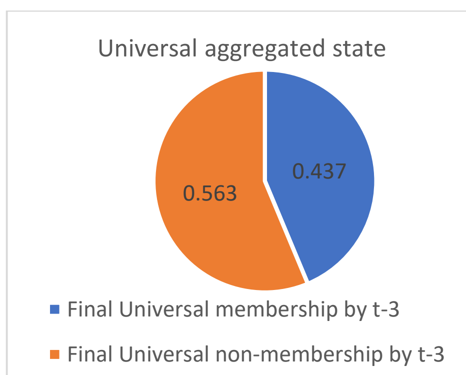

Figure 6a (Universal states)

7.2 Pie graphs of the LGU Combined-Consciousness State Ranking Model for the β-Universe

(Fig1b-Fig 4b) pie graphs are presenting the individual states (fuzzy memberships) of 3 subjects by considering one attribute at a time for the β-Universe (The aggregation operator used is the averaging operator (t = 3)

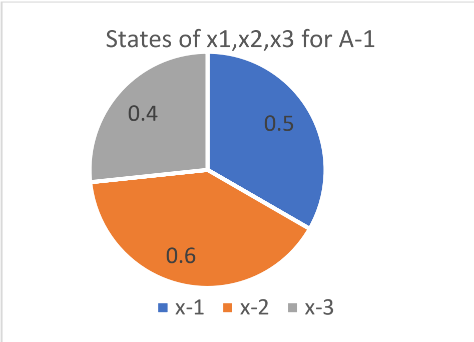

Figure 1b (Aggregated States for A-1)

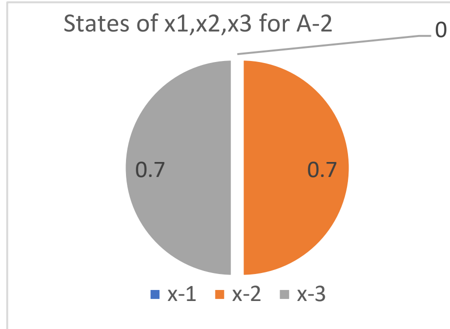

Fig 2b (Aggregated States for A-2)

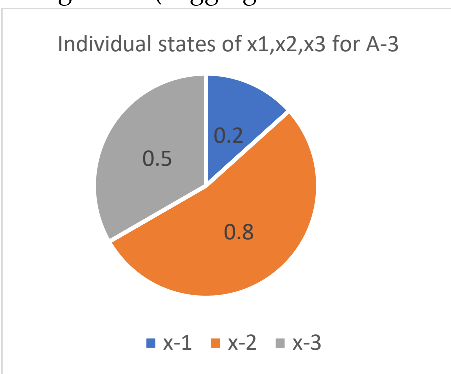

Figure 3b (Aggregated States for A3)

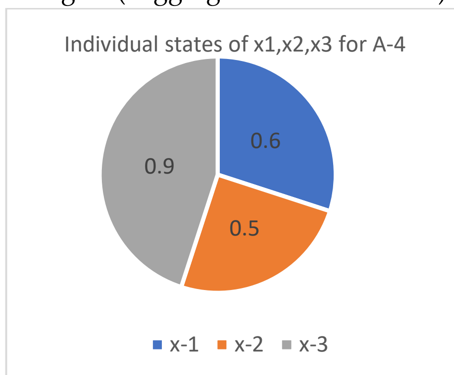

Figure 4b(Aggregated States for A-4)

Fig 5b is representing aggregated states of the three subjects (β-Universe first level of aggregation) represented for each attribute.

Fig. 6b represents the aggregated state of the entire -Universe that is obtained by aggregating the previous aggregated states of Fig. 5b by using the averaging operator (β-Universe, the second level of aggregation)

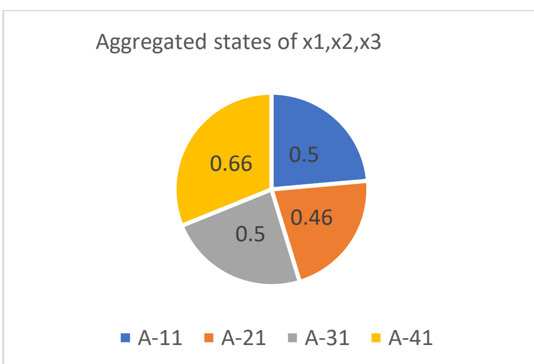

Figure 5b (Aggregated states)

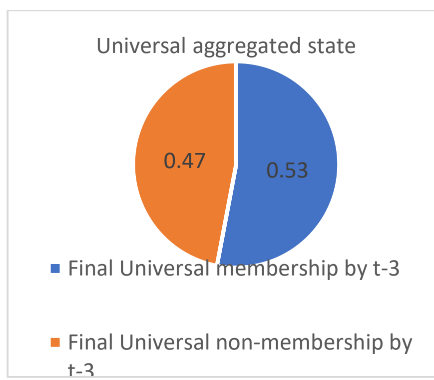

Figure 6b (Aggregated states)

8. Conclusion :

1. We have observed the final global ordering obtained in Eq. (6.12) is the most frequently observed local ordering in all these ranking orders, which is also observed the same in the local ordering of β universe in Eq. (6.14) which shows the final global State ranking is most transparent and authentic Ranking.
2. Expressions (6.15), (6.16), (6.17) provide the highest, lowest, and average states of universes, through final accumulative memberships.
3. The Ordering of universes shows that on the Global Universal level, β universe is better than α universe.

4. these results of local and global ordering are also verified by the pie graphs

1. Local ordering: we can observe local orders using these novel plithogenic hyper-supersoft matrices and local operators. Each operator reflects the state of mind of the decision-maker; for example, the Max operator reflects the optimal state of mind, the Min operator reflects the Passimistic state of mind, and the Average operator reflects the neutral state of mind.

2. Global ordering: We can provide a global order by combining the results of all three rankings using the frequency matrix. These three rank orders are obtained from three aggregation operators that represent three states of the human mind. The ranking at the levels of global states will be transparent and impartial, taking into account three different states of the human mind

3. Universal ordering: We can compare the universes by applying $the\ max\ operator\ (t = 1)$, $the\ min\ operator\ (t = 2)$ and $the\ average\ operator\ (t = 3)$ on cumulative memberships of the last row for each universe. The universe with the largest cumulative membership would be better, and further, a local ordering of the universes is obtained by arranging these cumulative memberships in descending order and the global ordering is offered by using the same scenario of the frequency matrix

4. Extreme Universal Memberships: We can also find out the extreme values of these universes and can observe these attributes in the large universe made up of several smaller parallel universes. We can choose from among all universes the best-reflected attribute that is best in most universes.

5. local and global ordering inside the universe: In this article, our focus is on the non-physical states of the subjects or universe. Local and global ordering We have offered a local and global ordering of states of subjects (Attributes, Sub-attributes) within a universe.

6. local and global ordering of the Universe: Furthermore, a local and global ordering of states of the Universe is offered. The state of the universe is obtained by accumulating the states of all subjects of the given universe.

7. Combined Consciousness of the Universe: The state of the universe is presented by the accumulated states of all its subjects. In this ranking model, the accumulated states of all subjects as a Combined Consciousness of the universe is offered in the form of universal memberships.

9. Open problems:

Now, let us list some of the open problems that could be addressed in future research.

• In this article, we developed the LGU Combined Consciousness State Ranking Model in the plithogenic fuzzy environment.

This model can be extended to other environments, such as intuitionistic environment, neutrosophic environment, or any other mixed environment according to the required conditions or states of mind of the decision-makers.

• In addition, some other local operators can be used in the construction of the model according to the requirements of the relevant authorities.

• Attributive and subjective ranking models can be constructed using the literature developed in this article.

References

1. Zadeh, L. A. (1965). Fuzzy sets, Inform and Control, 8, 338-353.
2. Atanassov, K. T. Intuitionistic fuzzy sets. Fuzzy Sets and Systems, 20(1) (1986) 87-96.
3. Atanassov, K. T. Applications of intuitionistic fuzzy sets. In Intuitionistic Fuzzy Set, Series Studies in Fuzziness and Soft Computing, 35(1), (1999) 237-238.
4. Smarandache, F. Neutrosophic logic and set, (1995) mss.

5. Smarandache, F. Neutrosophic Set is a Generalization of Intuitionistic Fuzzy Set, Inconsistent Intuitionistic Fuzzy Set (Picture Fuzzy Set, Ternary Fuzzy Set), Pythagorean Fuzzy Set, Spherical Fuzzy Set, and q-Rung Orthopair Fuzzy Set, while Neutrosophication is a Generalization of Regret Theory, Grey System Theory, and Three-Ways Decision (revisited). Journal of New Theory, (29) (2019) 1-31.
6. Nabeeh, N. A., Smarandache, F. Abdel-Basset, M., El-Ghareeb, H. A., & Aboelfetouh, AAn Integrated Neutrosophic-TOPSIS Approach and Its Application to Personnel Selection: A New Trend in Brain Processing and Analysis. IEEE Access, 7 (2019) 29734-29744.
7. Saeed, M., Saqlain, M., & Riaz, MApplication of Generalized Fuzzy TOPSIS in Decision Making for Neutrosophic Soft set to Predict the Champion of FIFA 2018: A Mathematical Analysis. Punjab University Journal of Mathematics, 51(6) (2019).
8. Saqlain, M., & Smarandache, FOctagonal Neutrosophic Number: Its Different Representations, Properties, Graphs and De-neutrosophication with the application of Personnel Selection. International Journal of Neutrosophic Science ,8(2) (2020) 19-33.
9. Das, R.Smarandache, F & Tripathy, B. CNeutrosophic Fuzzy Matrices and Some Algebraic Operations. Neutrosophic Sets and Systems, 32(1) (2020). 26.
10. Rezaei, A., & Smarandache, F. (2020). The Neutrosophic Triplet of BI-algebras. Neutrosophic Sets and Systems, 33(1), 20.
11. Rajareega, S.Preethi, D.Vimala, J.Selvachandran, G., & Smarandache, F. Some Results on Single Valued Neutrosophic Hypergroup. Neutrosophic Sets and Systems, 31(1), 6
12. Abdel-Basset, M., Mohamed, M., & Smarandache, F. (2020). Comment on" A Novel Method for Solving the Fully Neutrosophic Linear Programming Problems: Suggested Modifications". Neutrosophic Sets and Systems, 31(1) (2020) 22.
13. Molodtsov, DSoft set theory-First results, Computers and mathematics with applications. 37 (1999) 19-31.
14. N.Cagman,S. Enginoglu and F. Crtak (2011). Fuzzy Soft Set Theory and its Applications, Iranian Journal of Fuzzy Systems, 8/3, 137-147.
15. Onyeozili, I.A.,Gwary T.MA Study of The Fundamentals of Soft Set Theory. International Journal of Scientific & Technology Research, (3) (2014) 2277-8616.
16. Pie, D and Miao, D. From soft sets to informations systems, In:Proceedings of Granular computing IEEE, (2005) 2 617-621
17. Smarandache, F. Extension of soft set to hypersoft set, and then to plithogenic hypersoft set. Neutrosophic Sets and Systems (2018)
18. Smarandache, F. Plithogeny, Plithogenic Set, Logic, Probability, and Statistics. (2018).
19. Rana, S., Qayyum, M., Saeed, M., & Smarandache, FPlithogenic Fuzzy Whole Hypersoft Set: Construction of Operators and their Application in Frequency Matrix Multi Attribute Decision Making Technique. Neutrosophic Sets and Systems, 28(1) (2019).
20. Rana, S., Saeed, M., Qayyum, M., & Smarandache, FPlithogenic Subjective Hyper-Super-Soft Matrices with New Definitions & Local, Global, Universal Subjective Ranking Model. International Journal of Neutrosophic Science, 6(2) (2020) 56-79.
21. Saqlain, M., Moin, S., Jafar, M. N., Saeed, M., & Smarandache, F. (2020). Aggregate Operators of Neutrosophic Hypersoft Set. Neutrosophic Sets and Systems, 32(1) (2020) 18.
22. Saqlain, M., & Smarandache, Octagonal Neutrosophic Number: Its Different Representations, Properties, Graphs and De-neutrosophication with the application of Personnel Selection. International Journal of Neutrosophic Science , 8(2) (2020) 19-33.
23. Rahman, A. U., Saeed, M., Arshad, M., & El-Morsy, S. (2021). Multi-Attribute Decision-Support System Based on Aggregations of Interval-Valued Complex Neutrosophic Hypersoft Set. *Applied Computational Intelligence and Soft Computing*, *2021*.
24. Saeed, Muhammad, and Atiqe Ur Rahman. "Optimal Supplier Selection Via Decision-Making Algorithmic Technique Based on Single-Valued Neutrosophic Fuzzy Hypersoft Set." *Neutrosophic Sets and Systems* 47 (2021): 472-490.

25. Ihsan, Muhammad, Atiqe Ur Rahman, and Muhammad Saeed. "Single Valued Neutrosophic Hypersoft Expert Set with Application in Decision Making." *Neutrosophic Sets and Systems* 47 (2021): 451-471.
26. Saeed, Muhammad, et al. "The Prognosis of Allergy Based Diseases using Pythagorean Fuzzy Hypersoft Mapping Structures and Recommending Medication." *IEEE Access* (2022).
27. Rahman, Atiqe Ur, et al. "Decision making algorithmic techniques based on aggregation operations and similarity measures of possibility intuitionistic fuzzy hypersoft sets." *AIMS Mathematics* 7.3 (2022): 3866-3895.
28. Quek, S. G., Selvachandran, G., Smarandache, F., Vimala, J., Le, S. H., Bui, Q. T., & Gerogiannis, V. C. Entropy Measures for Plithogenic Sets and Applications in Multi-Attribute Decision Making. Mathematics, 8(6) (2020) 965.
29. Kandasamy, W. V., & Smarandache, F Superbimatrices and their generalizations. (2009).
30. Kandasamy, W. V., & Smarandache, F DSm super vector space of refined labels. Zip Publishing (2011).
31. Horst, P. Matrix algebra for social scientists. Holt, Rinehart and Winston (1963).
32. Nye, J. F. Physical properties of crystals: their representation by tensors and matrices. Oxford university press (1985).
33. de Sáa, S. D. L. R., Gil, M. Á., González-Rodríguez, G., López, M. T., & Lubiano, M. A. Fuzzy rating scale-based questionnaires and their statistical analysis. IEEE Transactions on Fuzzy Systems, 23(1) (2014) 111-126.
34. Wang, W. P. (2010). A fuzzy linguistic computing approach to supplier evaluation. Applied Mathematical Modelling, 34 (10) 3130-3141.
35. Herrera, F., & Martnez, L A 2-tuple fuzzy linguistic representation model for computing with words. IEEE Transactions on fuzzy systems, 8(6) (2000) 746-752.
36. Asan, U., Bozdağ, C. E., & Polat, S A fuzzy approach to qualitative cross-impact analysis. Omega, 32(6) (2004) 443-458.

Received: June 20, 2022. Accepted: September 20, 2022