Chapter 9
Dombi Operators Based on Pentapartitioned Neutrosophic Pythagorean Sets for Online Education During the COVID-19 Pandemic

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ABSTRACT

In this chapter the authors have introduced the concept of score and accuracy function of the pentapartitioned neutrosophic pythagorean numbers (PNPN) and also defined ranking methods between two PNPNs which is based on its score function. Dombi operators are used in solving many multicriteria attribute group decision making (MAGDM) problems because of its very good flexibility with a general parameter. Here, Dombi T-norm and T-conorm operations of two PNPNs are defined. Based on this Dombi operations, the authors introduced two Dombi weighted aggregation operators PNPDWAA and PNPDWGA under pentapartitioned neutrosophic pythagorean environment and also studied its properties. Finally, the authors discussed about multicriteria attribute decision making method (MADM) using PNPDWAA or PNPDWGA operator and also an illustrative example is given for the proposed method which gives a detailed results to select the best alternative based upon the ranking orders.

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1. INTRODUCTION

Zadeh(1965) created the idea of fuzzy set theory to analyse uncertain mathematical data that is classified by the degree to which an element belongs to a real number in the range [0, 1]. This theory is highly used in a variety of domains, including robotics, operations research, artificial intelligence, control systems, decision analysis, and medical diagnostics.

An intuitionistic fuzzy set is a generalized version of the fuzzy set that was developed by Atanassov (1986) in order to more accurately represent uncertainty. This is done by simultaneously taking into account membership and non-membership degrees in the range [0, 1], with the objective that their sum should be less than 1. With the help of both membership degrees, Atanassov's intuitionistic fuzzy set theory diverged into several application domains in the context of uncertainty.

As an extension of both fuzzy sets and intuitionistic fuzzy sets, Smarandache (1998) introduced the idea of neutrosophic set theory as a mathematical tool to cope with situations comprising inconsistent, ambiguous, and incomplete information in the real world (Smarandache 2005). The truth-membership, indeterminacy-membership, and falsity membership properties of neutrosophic sets are each independently defined philosophically as falling inside the real standard or non-standard unit interval $-]0,1[^{+}$. In practical applications, it might be challenging to utilise the stated neutrosophic set operators on a neutrosophic set whose values come from a genuine standard or non-standard interval $-]0,1[^{+}$. Single-valued neutrosophic sets (also known as SVNSs), whose components are single-valued numbers and whose value is drawn from the unit interval [0, 1], were established by Wang et al. (2010) to make the neutrosophic set easier to implement in practical settings. A single-valued neutrosophic set is a particular instance of the neutrosophic set as a result. Numerous areas have used and investigated the numerous features of neutrosophic sets and single-valued neutrosophic sets.

The characteristics of distance and similarity measurements on single-valued neutrosophic sets were defined by Broumi and Smarandache in 2013. The hamming and Euclidean distance measurements on single-valued neutrosophic sets were established by Majumdar and Samanta (2014).Cosine similarity was studied in relation to multi-attribute decision-making problems by Biswas et al. (2015). With its use, Mondal and Pramanik (2015) developed the tangent similarity measure. For single-valued neutrosophic sets, Biswas et al. (2016) established a number of distance measures once again and contrasted their approach with other ones already in use to address multi-attribute decision-making challenges.

A single-valued neutrosophic set application in medical diagnostics was established by Shahzadi et al. (2017). In multi-criteria decision-making situations, Ye and Zhang (2014) used single-valued neutrosophic cross-entropy and single-valued neutrosophic similarity metrics. For single-valued neutrosophic sets, Chai et al. (2021) have proposed novel distance and similarity metrics with applications in pattern recognition and medical diagnosis issues.

A multi-criteria group decision-making technique was created by Karaaslan and Khizar (2018) and is based on various operations on neutrosophic matrices. In addition, Karaaslan (2018a) created a decision-making method for medical diagnoses by defining Gaussian numbers for single-valued neutrosophic numbers. By incorporating the correlation coefficient measures between the neutrosophic sets, the interval-neutrosophic sets, and the neutrosophic refined sets, Karaaslan (2018b) offered a multi-criteria decision-making technique. The Heronian mean operator, geometric Heronian mean operator, neutrosophic cubic number-improved generalised weighted Heronian mean operator, and neutrosophic cubic number-improved generalised weighted geometric Heronian mean operator were all introduced by Gulistan et al. (2019) as part of a multiple attribute group decision-making method. On the basis of