Chapter 12
Neutrosophic Decision Making on Teaching Methods With Indeterminacy Quantifications

Nivetha Martin
Arul Anandar College (Autonomous), Karumathur, India

Ramila N. Gandhi
PSNA College of Engineering and Technology, India

P. Pandiammal
GTN Arts College, India

Florentin Smarandache
https://orcid.org/0000-0002-5560-5926
University of Mexico, Mexico

ABSTRACT

The dynamic requirements of the learners are redefining the process of teaching and learning and keeping the processes in the state of transience. The learning shall be made more effective by the right choice of the teaching method and it is necessary for every teaching method to possess certain essential attributes of flexibility, time efficiency, learner centeredness, and many other attributes. In this chapter, a decision-making problem with five criteria and eight alternatives of teaching methods is considered and the method of neutrosophic TOPSIS (technique for order preference by similarity to ideal solution) is applied to find the optimal ranking of the methods. In this research work the notion of single valued neutrosophic set with linguistic components is introduced as a means of making decision process more pragmatic, realistic, and feasible. This extended notion will certainly set a paradigm shift in decision making with linguistic representations.

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INTRODUCTION

Smarandache developed the theory of neutrosophy which created a new genre of neutrosophic based decision making models. A neutrosophic set is a triplet comprising of three components such as truth function, indeterminate function and falsity function. The truth function represents the degree of truthfulness of the proposition. The falsity function represents the degree of falsity of the proposition and the indeterminate function represents the degree of indeterminacy of the proposition. One of the greatest advantages of neutrosophic sets is the presence of indeterminate component which plays a vital role in representing the real phenomenon of the decision-making problem. The indeterminate component is usually denoted by I. In neutrosophic cognitive maps the indeterminacy is represented by I and the connection matrices comprises of the values of {-1,1,0,I}. The neutrosophic representations are more comprehensive in comparison to intuitionistic sets developed by Atanssov, fuzzy sets introduced by Zadeh and crisp sets and henceforth neutrosophic sets are considered to be highly feasible in decision-making.

A neutrosophic multi-criteria decision-making (NMCDM) environment is characterized by alternatives and criteria with neutrosophic representations of criterion satisfaction. Researchers generally have used the representations ofsingle valued or interval valued neutrosophic sets to obtain optimal solutions to diverse problems. To mention a few, Ye et al (2018) used the method of correlation coefficient,cross-entropy, similarity measures with single valued neutrosophic sets and interval valued neutrosophic sets. On other hand Deli and Broumi (2015) have applied neutrosophic soft matrices to make optimal decisions on group decision-making problem. Inspite of several neutrosophic multi-criteria decision-making methods, the researchers have widely used the method of TOPSIS. Nădăban and Dzitac (2016) have presented a general view of neutrosophic TOPSIS and this method is applied by the researchers with different neutrosophic representations such as, Interval valued neutrosophic sets by Chiu and Liu (2013) Sharma et al (2019),Tian et al (2017,2016),Roy et al (2020) single valued neutrosophic with incomplete weight information by Zhang and Wu (2020), single valued neutrosophic linguistic numbers by Ye (2015), generalized neutrosophic sets by Dey et al (2015), Sahin &Yigider (2016), Abdel et al (2019), Nabeeh et al (2019), Karasan et al (2019),Junaid et al (2019), Zulqarnain et al (2020,2021),Pinda et al (2021), type –2 neutrosophic number by Basset et al (2019),single valued neutrosophic soft expert set by Pramanik et al (2015), rough neutrosophic sets by Mondal et al (2016), single valued neutrosophic sets by Biswas et al (2016,2019),Garg (2019), Arias et al (2020), Gul et al (2021),Cañizares et al (2021), Rıdvan et al (2021), Sun et al (2021),Pehlivan et al (2022), Chopra et al (2022). linguistic neutrosophic numbers by Liang et al (2017),trapezoidal fuzzy neutrosophic numbers by Tan and Zhang (2017), single valued neutrosophic numbers by Pouresmaeil et al (2017),Sener et al (2020),Mollaoglu et al (2022).

Simplified neutrosophic representations by Elhassouny and Smarandache (2016), simplified neutrosophic information by Peng et al (2017), interval trapezoidal neutrosophic number by Giri et al (2018), bipolar neutrosophic sets by Akram and Smarandache (2018), neutrosophic hypersoft set by Saqlain et al (2019), Samad et al (2021),single-valued neutrosophic sets with hamming distance by Karabašević et al (2020),neutrosophic soft set by Saqlain et al (2020),Neutrosophic N-soft sets by Riaz et al(2020), neutrosophic set with unknown weight information by Thong et al (2020), Nonagonal Neutrosophic representations by Jafar et al (2020), two level interval valued neutrosophic sets by Gulum et al (2021), single-valued neutrosophic N-soft by Ashraf et al (2021), single valued neutrosophic with neutrality aggregation operator by Aydemir et al (2021), fuzzy neutrosophic representations by Sbastian et al (2021), interval-valued intuitionistic neutrosophic hypersoft by Bobin and Chinnadurai (2022).