A ADVANCED JOURNAL IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TRENDS IN BIOLOGICAL SCIENCES
Open Journal

Review

A Novel Approach to Reducing Matrix Size in a Fuzzy Setting: The Mean Ranking Method for Solving Traveling Salesman Problems

Tekalign R. Ashale*

Department of Mathematics, Jimma University, Ethiopia

****Corresponding author***
Tekalign R. Ashale
Department of Mathematics, Jimma University, Ethiopia

Article information
Received: June 4th, 2024; **Revised:** July 1st, 2024; **Accepted:** August 15th, 2024; **Published:** September 20th, 2024

Cite this article
Ashale TR. A novel approach to reducing matrix size in a fuzzy setting: The mean ranking method for solving traveling salesman problems. 2024; 3(2).
doi: https://doi.org/10.70705/ppp.bioai.2024.v03.i02.pp41-43

ABSTRACT

With all inputs being fuzzy numbers, this study proposes an improved matrix reduction method to solve the fuzzy transportation issue. Fuzzy trapezoidal numbers are transformed into crisp sets utilizing Mean approaches, and the provided solution for the fuzzy transportation issue is used, as ranking fuzzy numbers is a useful tool for decision making. Along with comparing the ideal value to various methods, we provide a numerical example that is appropriate for imbalanced. Based on the results, the suggested strategy under the robust ranking method outperforms the other way when it comes to the optimal profit of transportation problems. Interesting novel approach to transportation issue management based on fuzzy algorithms is shown in the numerical illustration.

Keywords
Mean; Mean of trapezoidal fuzzy numbers; Trapezoidal fuzzy numbers; Transportation problem; Fuzzy transportation problem.

INTRODUCTION

Transportation issues arise in our day-to-day lives when we try to solve difficulties like determining the price of products, the profit for sellers, balancing the needs of customers and suppliers, and making judgments for real-life multi-objective functions. The numerous situations that arise as a result of factors such as ambiguity, inaccurate measurements, lack of confidence, computational mistakes, high information cost, and if conditions are all worth considering. This is why the concept of fuzziness was proposed by Zadeh (1978) [1]. An approach to the fuzzy transportation issue that takes into account the fact that transportation costs are unknown [2]. We also provide a parametric method to solve the transportation issue under fuzziness [3]. The basic transportation issue about the delivery of a commodity from several sources to multiple locations was first introduced by Hitchcock in 1941 [4].

Using the zero-point and zero-suffix methods to get the minimal cost is a solution to transportation challenges. After comparing it to Vogel's Approximation and the modified distribution methods, Mohideen and Kumar (2010) found that the zero-point approach of multiplication operation was superior [6].

As the symmetric process for transportation issues, the zero-point method is easily applicable to any form of transportation problem with an objective function, whether it's a maximum or minimum function (Sharma et al., 2012). This approach gives you the choices that promote the most effective resolution of transportation-related logistical issues. To get the best value for the objective function, Pandian and Natarajan (2010) used the zero-point approach with a trapezoidal fuzzy number to solve a transportation issue [7]. In order to address the many different kinds of logistical issues that include fuzzy parameters, this technique provides a systematic process for making judgments. Samuel (2012) investigated the growing zero point approach in relation to the fuzzy transportation issue and found it to be easier and more efficient than VAM, SVAM, GVAM, RVAM, and BVAM [8]. According to him, this approach was straightforward and gave the best result. The zero suffix approach is now the subject of study into transportation solutions. Fuzzy cost achieves optimum when the zero suffix approach is performed under the Robust Ranking method (Fegade et al., [9]). By combining robust ranking with the zero-suffix approach, (Christi, & Kumari) were able to successfully find the best solution to fuzzy issues [10]. Transportation costs, supply, and demand are all represented as trapezoidal fuzzy numbers in the novel algorithm zero-point technique introduced by Pandian and Natarajan [7]. The iteration count, allocations, and optimal solutions of completely Using a robust ranking strategy, we can solve fuzzy transportation issues using either the Zero Suffix or Zero Point techniques. The Zero Suffix method requires fewer iterations, but both methods provide the same allocation and least optimal solution [11]. Using a state-of-the-art zero suffix strategy in a fuzzy environment, Dinagar and Keerthivasan are resolving transportation problems [12]. A completely fuzzy transportation issue with a hexagonal fuzzy number [13] was solved by Kalyani and Nagarani. Another recommended range technique for tackling fuzzy transportation problems utilizing pentagonal fuzzy numbers is suggested by Geetha and Selvakumari [14].

Definition for interval number

Let R, it is the set of real numbers and then a closed interval [a, b], it is said to be an interval number, where □ , □ □ R with □ ≤ □

Convex normalized fuzzy set

A fuzzy number □ , it is a convex normalized fuzzy set of the crisp set such that for only one

□□□ and □□ (□) = 1 and □□ (□), it is piecewise continuous

Support of Fuzzy number

Let u, it is a fuzzy number and then the support of □ is defined

The present study was proposed a new way of solving transportation problem, named Improved Matrix Reduction Method Using Mean Method to solve the fuzzy transportation problem [11, 14].

Preliminaries Definition

Fuzzy Transportation problem (FTP) is a linear programming problem with the specific structure. If in a transportation issue, all parameters and variables are fuzzy, then it includes fuzzy transportation issues. The fuzzy transportation issue (FTP) is formulated as follows:

Mean Technique

What Is Mean?

A mean is the simple mathematical average of a set of two or more numbers. The mean for a given set of numbers can be computed in more than one way, including the arithmetic mean method, which uses the sum of the numbers in the series, and the geometric mean method, which is the average of a set of products. However, all of the primary methods of computing a simple average produce the same approximate result most of the time. The arithmetic mean is the simplest and most widely used measure of a mean, or average. It simply involves taking the sum of a group

of numbers, then dividing that sum by the count of the numbers used in the series. For example, take the numbers 34, 44, 56, and 78. The sum is 212.

The arithmetic mean is 212 divided by four, or 53.

Mathematical Formulation

Proposed Algorithm

Step1. Construct the transportation table and examine whether total demand equals total supply then go to step 2. If it is not balanced add the dummy source then go to step 2.

Step2. By using Mean technique, convert the fuzzy cost into crisp values to the given transportation problem

Step3. For the row-wise difference between maximum and minimum of each row, and it is divided by the number of columns of the cost matrix.

Step4. For the column-wise difference between maximum and minimum of each column, and it is divided by the number of rows of the cost matrix.

Step5. We find the maximum of the resultant values and find the corresponding minimum cost value and do the allocation of that particular cell of the given matrix. Select any one if more than one maximum consequent value is there.

Step6. Repeated procedures 1 to 5 until all the allocations are completed.

Result and Discussion

Numerical Example

Consider the Fuzzy Transportation Problem that is a company has three sources they are □ , □ , □ and three destinations, they are□ , □ , □ and the fuzzy transportation cost for unit quantity of the product from ith source and jth destination, it is given by

Conclusion

Here, we treat the transportation costs as hazy, imperfect estimates. In this case, the Mean Method had successfully turned a fuzzy transportation issue into a crisp one. From both the crisp and fuzzy perspectives, we can get the ideal total cost for the provided scenario. The comparative results reveal that the suggested technique outperforms the zero-point method and the zero suffix method, with an ideal value of 553,750.

REFERENCES

Firstly, Zadeh (1978). Using fuzzy sets as a chance theory foundation. "Fuzzy sets and systems" (volume 1, issue 1), pages 3-28.

2. Kaur and Kumar (2012) said as much. Using generalized trapezoidal fuzzy numbers, a novel method is introduced for eliminating ambiguities in transportation. Articles 1201–1213 published in the journal Applied Soft Computing.

Thirdly, Saad and Abass (2003). A research on transportation problems in fuzzy environments using parametric analysis. Vol. 11, No. 1, pp. 115–124, Journal of Fuzzy Mathematics.

In 1941, Hitchcock wrote a book. Shipment of a product to many locations from multiple suppliers. The abstract is from the Journal of Mathematics and Physics, volume 20, issue 1, pages 224–230.

5. In a 2010 publication, Mohideen and Kumar were names. A comparative analysis of transportation issues in a fuzzy setting. The article is published in the International Journal of Mathematics Research and has the following page numbers: 151-60.

6. Gupta, V. K., Abbas, S. H., and Sharma, G. (2012). A transportation problem is best solved using the zero-point algorithm. The article is published in the International Journal of Engineering Research & Technology and has the following articles: 1–5.

Seventh, Pandadi and Natarajan (2010). An innovative method for solving transportation-related fuzzy optimization issues. Publication: Applied Mathematical Sciences, Volume 4, Issue 2, Pages, 79–90.

Samuel (2012), number eight. Transportation issues may be better addressed using the improved zero point technique (IZPM). Applied mathematical sciences, volume 6, issue 109, pages 5421–5426.

9. The authors of the article are Fegate, Jadhav, and Muley (2012). Applying zero-suffix and robust-ranking approach to solve the fuzzy transportation issue. 2(7), 36–39. IOSR Journal of Engineering.

Christie and Kumari (2015) provided the citation. A symmetric trapezoidal fuzzy two-stage transportation issue

article. International Journal of Engineering and Technology, 4, 7–10.

Ngastiti and Surarso (2018) published a paper in May of 2018. Full fuzzy transportation issues can be solved using zero point and zero suffix approaches that include robust ranking. Volume 1022, Issue 1, page 012005, Journal of Physics: Conference Series. Published by IOP.

Dinagar and Keerthivasan (2020, October) published a paper. Presenting a state-of-the-art zero suffix strategy for transportation issue solving in a fuzzy setting. Volume 22, Issue 1, page 030060 of the AIP Conference Proceedings. Publishing by AIP, LLC.

13. Kalyanani and Nagarani (October 2020). An entirely fuzzy transportation issue with a fuzzy number that is hexagonal in shape. Volume 22, Issue 1, page 030078 of the AIP Conference Proceedings. Publishing by AIP, LLC.

14. In a publication by Geetha and Selvakumari (2020). A novel approach to the use of pentagonal fuzzy numbers in the solution of fuzzy transportation problems. Articles 171–174 published in the Journal of Critical Reviews, volume 7, issue 9.