Chapter 7
A Comparative Study of Fuzzy Linear and Multi-Objective Optimization

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ABSTRACT

A new paradigm for the solution of problems involving single- and multi-objective fuzzy linear programming is presented in this chapter. As opposed to complex arithmetic and logic for intervals, the method offered uses basic fuzzy mathematical operations for fuzzy integers instead. Using fuzzy numbers to express variables and parameters in a fuzzy linear programming issue (FLPP) is common. However, the authors only talked about FLPP with fuzzy parameters here. Triangular fuzzy numbers are used as fuzzy parameters. Ranking functions are used to convert fuzzy problems into clear ones. Crisp optimization techniques have been used. The proposed solution is tested on a variety of real-world examples that address both of these concerns.

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INTRODUCTION

The acceptance value of elements in fuzzy logic can range from 0 to 1, making it a type of many-valued logic (*Zadeh 1988*, n.d.) When dealing with the concept of incomplete truth, it is utilised. In Boolean logic, however, elements can only accept the exact values 0 and 1. Fuzzy sets are comparable to sets in which the elements have varying degrees of membership (Goguen, 1973), but they are not identical. In an attempt to expand the concept of accumulation, Dieter Klaua and Lotfi A. Zadeh created Fuzzy Sets in 1965.

The use of operational research has already been formally accepted as a means of enhancing optimization. LPPs aid in the efficient utilisation of existing mechanisms. In this way, we can better respond to the existing environment. Profitability is the key issue here. Optimization is a method of analysis in the field of optimization. Optimization is a mathematical technique used to achieve an objective function. It is a scientific idea that has emerged since World War 2, when a number of factors had to be maximised based on a set of challenges. Transporting large amounts of materials is a serious concern for him. Optimization is a theoretical strategy for resolving specific problems within a system of equations (Sharma et al., 2022a), (Kumar et al., 2022), (Sharma et al., 2022b), (Ding et al., 2022), (Kanwal et al., 2022), (Alferaidi et al., 2022).

Management can make better decisions with the help of linear programming. Operational research employs this method frequently. Using this mathematical method, a company can make the best use of its limited resources. The following terms are commonly used in linear programming: In order to make a decision, we need to know what variables we need to look for. Decision variables must meet certain constraints before they can be used. The term "objective function" refers to a process in which we must strive to improve. Linear relationship situations in which the optimization problem and the constraints are expressed mathematically. A workable solution in which the variables meet the criteria (Zeidabadi et al., 2022), (Yadav et al., 2022), (Swain et al., 2022), (Viriyasitavat et al., 2021), (Prasanna et al., 2021), (Oliva et al., 2021). The best feasible value for the goal function represents the ideal solution. A simple LPP can

$$\text{maximum or minimum } Z = \sum_{k=1}^{n} \mathrm{C_k}\, \mathrm{D_k} \tag{1}$$

be represented as: