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**Abstract** In this article, we propose the Newton method to find a non-dominated solution of an unconstrained multi-variable fuzzy optimization problem. For this purpose, we use the Hukuhara differentiability of fuzzy-valued functions and partial order relation on set of fuzzy numbers.

**Keywords** Fuzzy numbers · Hukuhara differentiability · Newton method

## 1 Introduction

The concept of fuzzy set was introduced in [1]. After this, many applications of fuzzy sets have been developed. One of them is fuzzy optimization, which accounts for any imprecision in the optimization problems. Bellman and Zadeh [2] introduced fuzzy optimization problems where they have stated that a fuzzy decision can be viewed as the intersection of fuzzy goals and problem constraints. Afterward, a lot of articles dealing with fuzzy optimization problems were published. We refer here to some recent works have been done in this direction. Fuzzy mathematical programming using unified approach has been studied by [3]. Lodwick and Bachman [4] have studied large scale fuzzy and possibilistic optimization problems. Distinctions and relationships between fuzzy and possibilistic have been studied by Lodwick et al. in [5] and [6], respectively. Buckley and Abdalla [7] have considered Monte Carlo methods in fuzzy queuing theory. The basic introduction to the main models and methods in

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