

Application of Interval-valued Intuitionistic Fuzzy R -norm Entropy in Multiple Attribute Decision Making

Rajesh Joshi and Satish Kumar

Maharishi Markandeshwar University

Abstract

The theory of interval-valued intuitionistic fuzzy sets (IVIFSs) is well suitable to deal with the vagueness and hesitancy. In the present communication, we have considered an interval-valued intuitionistic fuzzy (IVIF) R -norm entropy with both uncertainty and hesitancy degrees expressed in terms of IVIFS. Using this IVIF R -norm entropy, we have solved a multiple attribute decision making (MADM) problem in which attribute values are expressed as IVIFSs. In MADM problem, we mainly encounter with two types of problems. First is when we don't have any information regarding attribute weights and second is when we have little information about attribute weights, *i.e.*, they are partially known to us. In this paper, we have considered both the cases with examples. For the first case, we have used an extension of entropy weight method to calculate the attribute weights and in second case attribute weights are calculated by using the minimum entropy principle method which is based on solving a linear programming model. The two methods are effectively explained by taking real life examples.

Keywords: Intuitionistic fuzzy entropy, IVIFS, IVIF R -norm entropy, similarity measure, MADM, TOPSIS.

1. Introduction

Since the time Zadeh [36] introduced the concept of fuzzy set, many theories and approaches concerning imprecision and vagueness came into existence. Intuitionistic fuzzy sets (IFSs) proposed by Atanassov [1] and IVIFSs introduced by Atanassov and Gargov [2] are the two primary generalizations of conventional fuzzy set theory. Both of them pointed out the drawbacks of Zadeh's fuzzy set theory and proved to be extremely helpful in dealing with uncertainty and vagueness. Entropy is an important concept in the study of fuzzy set theory and its extensions to IFSs and IVIFSs. For the first time, the idea of fuzzy entropy was introduced by Zadeh [36]. Then Yager [33], Szmidi and Kacprzyk [25], Kaufman [21] proposed the various entropies on fuzzy sets. In 1996, Bustince and Burillo [3] firstly introduced the notion of intuitionistic fuzzy entropy and in 2001, Szmidi and Kacprzyk [25] introduced a non-probabilistic type intuitionistic fuzzy