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Case Study

Intuitionistic Trapezoidal Fuzzy Prioritized Operators: Algorithms for the Selection of Suitable Treatment for Lung Cancer

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Abstract

Lung cancer is the second most common type of cancer among cancers and the major cause of cancer deaths over the globe. Due to the advancement in the field of medical science, different types of treatments/therapies are made available for the treatment of the deadly disease. Multiple attribute group decision making (MAGDM) with the help of intuitionistic trapezoidal fuzzy (ITrF) information has wide applications in decision making processes especially in the field of medical science. In this chapter, we will discuss intuitionistic trapezoidal fuzzy prioritized operator techniques favored with the concept of MAGDM for the selection of most appropriate treatment from the available set of treatments for lung cancer as per the attributes. Once the disease has been diagnosed, by the help of the algorithms: intuitionistic trapezoidal fuzzy prioritized weighted geometric (ITrFPWG) operators and intuitionistic trapezoidal fuzzy hybrid aggregation (ITrFHA) operator, we can select the most suitable treatment for Lung cancer. Finally, we demonstrate the method by taking a hypothetical case study and get an approach by which we can rank our treatments and select the most suitable result.

Keywords: Intuitionistic Fuzzy Set (IFS); Multiple Attribute Group Decision Making (MAGDM); Intuitionistic Trapezoidal Fuzzy (ITrF) Number; Intuitionistic Triangular Fuzzy (ITF) Numbers; Intuitionistic Trapezoidal Fuzzy Hybrid Aggregation (ITrFHA) Operator; Fuzzy Prioritized Operators; Intuitionistic Trapezoidal Fuzzy Prioritized Weighted Geometric (ITrFPWG) Operator; Lung Cancer

Introduction

Cancer is a universal term used for large group of diseases that affect any part of the body. Other similar terms used for the disease are malignant tumours and neoplasms. One important feature of the cancer is the exponential growth of abnormal cells which grows beyond the usual boundaries and spread to other organs, the process is called as metastasizing. Metastases are the major cause of death. According to WHO report 2015, worldwide there are 8.8 million deaths caused due to cancer. USA alone has 221,200 new lung cancer diagnoses and 158,4040 lung cancer related deaths by the end of 2015. As the life advances, many lethal diseases are growing at an exponential pace over the globe. Therefore, the number of patients is increasing day by day and the numbers of doctors are not sufficient to treat the diseases. The evolution of innovative technologies tackles the problem of decision making and enhances the efficiency of doctors. Medical decision making with the help of computational techniques is an efficient tool for doctors to execute best treatment to patients. There are many techniques and tools used for the purpose of better decision making, among these, generalized fuzzy set theory is considered as an useful tool to prescribe best treatment for the diseases among the existing ones. The concept of Multiple Attribute Group Decision Making (MAGDM) has been broadly used in real life problems. When this concept is associated with generalized fuzzy sets, it gives more strength to the theory of decision making and gives promising results.

Atanassov [1] proposed the notion of an Intuitionistic fuzzy sets (IFSs) for dealing with the issues of imperfect and imprecise information. The domains of the both intuitionistic fuzzy sets and fuzzy sets are discrete in nature. Using IFSs, Li [2] and Lin [3], discussed various multi attribute decision making (MADM) models for decision making purposes. Wang [4], explained that intu-

itionistic trapezoidal fuzzy numbers (ITrFNs) are the extension of intuitionistic triangular fuzzy numbers (ITFNs). Wang [5] discussed the elaborative method for multi-criteria decision making problems with imprecise and incomplete information and defined explicitly the expected values of ITrFN. Subsequently, Wang [6,7], discussed intuitionistic trapezoidal fuzzy weighted arithmetic averaging (ITrFWAA) operators over the expected values of ITrFN for the purpose of better decision making. He explained that intuitionistic triangular fuzzy information measures provides better outfit in dealing with the problems of MAGDM. Wan [8] discussed various operators of ITrF, its hybridization and explained the expected score of ITrFNs in terms of geometric point. Yager [9-11] described the notion of priority operators in hesitant fuzzy environment to deal with the problems of decision making. Wei [12] discussed the generalization of prioritized aggregation operators in hesitant fuzzy environment as explained by Yager [9-11] and developed hesitant fuzzy prioritized aggregation operators. Yu [13] investigated the fact of prioritization relationship between attributes over MAGDM under intuitionistic fuzzy information environment and present some intuitionistic fuzzy aggregation prioritized operators to tackle the situation of MAGDM. But these operators have certain shortcomings, they cannot be used when the input is expressed in ITrFNs. Also, it is difficult to implement these operators in the problems of MAGDM, where the attributes and decision makers are in different priority level. To overrule these shortcoming, Gani [14] and Zhang [15] proposed some ITrF priority operators. Gani [14], proposed weighted average rating (WAR) method for decision making problems using ITrFHA operator. Zhang [15] proposed some intuitionistic trapezoidal fuzzy prioritized operators, which are not only compatible with the situations in which the input arguments are ITrFNs but also considering prioritization among the input arguments. Shu [16] proposed the concept of intuitionistic triangular fuzzy numbers(ITFNs) and their operations. Wu [17] explains intuitionistic trapezoidal fuzzy weighted geometric (ITrFWG) operator and its hybrid version. In this paper, we will discuss an algorithmic approach of ITrFHA proposed by Gani [14] and algorithmic approach of intuitionistic trapezoidal fuzzy prioritized weighted geometric (ITrFPWG) operators proposed by Zhang [15], the algorithms used for the selection of suitable treatment for Lung Cancer over certain attributes. These attributes are given in the form of ITrFNs. Once the disease has been diagnosed, it is difficult for a doctor to choose the appropriate treatment from the available set of treatments. The present work helps the doctors to select the appropriate treatment for the said disease and rank it as per the requirement. For this purpose, we are taking hypothetical case study to explain the algorithm.

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Bibliography