Chapter 3 Analytical Review of the Applications of Multi-Criteria Decision Making in Data Mining

Iman Raeesi Vanani Allameh Tabataba'i University, Iran

Mir Seyed Mohammad Mohsen Emamat Allameh Tabataba'i University, Iran

ABSTRACT

In recent years, multi-criteria decision making (MCDM) is a significant part of operations research (OR) and has become an interesting topic to researcher who works in the data mining (DM) field. The aim of this chapter is to provide an in-depth presentation of the contribution of MCDM in the field of DM. In order to develop a reliable knowledge base on accumulating knowledge from previous studies, we present a review of the usage of MCDM methods in DM field. The chapter presents methodology and application. The result shows that the most usage of MCDM in DM consists of evaluating classification algorithms, weighting criteria, and ranking association rules and clusters. Finally, some future research directions are suggested at the end of chapter.

INTRODUCTION

Since 1990, the most crucial tool for discovering knowledge from large databases has been data mining (DM) (Khademolqorani & Hamadani, 2013, p. 389). DM is a broad umbrella term that is used to describe collecting, cleaning, processing, analyzing and gaining useful insights from data (Aggarwal, 2015, p. 1).

DOI: 10.4018/978-1-5225-5137-9.ch003

As Data mining techniques (DMT) is an interdisciplinary research topic, so it can be integrated with different methods. This integration may open new insights into the problems associated with DMT (Liao et al., 2012, p. 11307).

From a range of various DM algorithms, data clustering is an important part of DM which provides many clues and insights into how data can be grouped into meaningful segments. Clustering algorithms, group similar observations in the same group (Bramer, 2016, p. 8; Güçdemir & Selim 2015, p. 1023). Using clustering we can group observations, however it does not give any information about the priority of clusters. Multi-Criteria Decision-Making (MCDM) can be useful to be combined with clustering algorithms. In fact, MCDM can be used to rank clusters (Güçdemir & Selim 2015, p. 1026). Using the combination of MCDM and DM is not limited to ranking clusters.

The aim of this chapter is to examine the applications of MCDM in DM algorithms. It is very important to understand previous studies and trends. The chapter contains various MCDM methods like MADM category (AHP, TOPSIS, VIKOR, and ELECTRE), MODM category, DEA category and DM methods like Clustering (K-means, 2 Steps), classification algorithms, association rules mining and other related algorithms. In fact, the aim of this chapter is presenting new suggestions for future studies by considering various types of problems.

Figure 1 presents the chapter framework. As it shows, in the first step we tried to gather papers related to both MCDM and DM. For achieving this aim we start searching by these keywords: data mining and name of popular data mining methods (for instance classification algorithms, decision tree, Naïve Bayes, k-nearest neighbors, machine learning, neural network, SVM, clustering and association rules) and multi-criteria decision-making and name of popular MCDM methods (for



Figure 1. Chapter framework

25 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: <u>www.igi-</u> <u>global.com/chapter/analytical-review-of-the-applications-of-</u> <u>multi-criteria-decision-making-in-data-mining/218740</u>

Related Content

Social Recommendations: Mentor and Leader Detection to Alleviate the Cold-Start Problem in Collaborative Filtering

Armelle Brun, Sylvain Castagnosand Anne Boyer (2012). *Social Network Mining, Analysis, and Research Trends: Techniques and Applications (pp. 270-290).* www.irma-international.org/chapter/social-recommendations-mentor-leader-detection/61523

Personalized Disease Phenotypes from Massive OMICs Data

Hans Binder, Lydia Hopp, Kathrin Lembckeand Henry Wirth (2016). *Big Data: Concepts, Methodologies, Tools, and Applications (pp. 2316-2337).* www.irma-international.org/chapter/personalized-disease-phenotypes-from-massive-omicsdata/150267

Finding Explicit and Implicit Knowledge: Biomedical Text Data Mining

Kazuhiro Seki, Javed Mostafaand Kuniaki Uehara (2010). *Intelligent Soft Computation and Evolving Data Mining: Integrating Advanced Technologies (pp. 370-386).*

www.irma-international.org/chapter/finding-explicit-implicit-knowledge/42369

ETL Logs Under a Pattern-Oriented Approach

Bruno Oliveira, Óscar Oliveiraand Orlando Belo (2021). International Journal of Data Warehousing and Mining (pp. 29-47).

www.irma-international.org/article/etl-logs-under-a-pattern-oriented-approach/290269

Data Mining in the Investigation of Money Laundering and Terrorist Financing

Ibrahim Georgeand Manolya Kavakli (2013). *Data Mining: Concepts, Methodologies, Tools, and Applications (pp. 2193-2207).*

www.irma-international.org/chapter/data-mining-investigation-money-laundering/73541