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Multi-Dimensional Cloud Model-Based Assessment and Its Application to the Risk of Supply Chain Financial Companies

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ABSTRACT

The multi-dimensional cloud model is proposed as the expansion of the one-dimensional cloud model. The features of ambiguity and stochasticity in complex information situations are considered; thus, this optimized model can be utilized upon multiple value classifications and ordering via which the objects' attributes of physical and social can be reflected. Therefore, this promoted model is wildly used. This paper provides a knowledge graph by reviewing the theoretical research of the multi-dimensional cloud model and its related bibliographies, and Cite Space is applied here to give a visualization conclusion. In recent years, a multitude of theories and methods have emerged to address the challenges posed by fuzzy and stochastic uncertainty in various domains, such as image segmentation, data mining, prediction techniques, and comprehensive evaluation of multiple metrics and dimensions using uncertain linguistic variables.

KEYWORDS

Cloud Model, Fuzzy Sets, Multi-Dimensional Cloud Model, Natural Language

INTRODUCTION

The cloud model has been applied in various domains, including decision-making, pattern recognition, data mining, and expert systems. It allows for the modeling and reasoning of uncertain and imprecise information, enabling more accurate and robust analysis of complex problems. Many concepts in real-world problems need to be described by multiple metrics, i.e., multi-attribute, multidimensional problems. The traditional cloud model normally suffers from an evaluation process, thus as the size of the data set increases, its operation efficiency decreases; there also exists a dilemma that biased evaluation results may yield when there is a large difference in the scales of each evaluation level interval. To solve such problems, a multidimensional cloud model can be considered (Li & Du, 2017).

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Further, CiteSpace visualization is used here to present the structure, and distributional characteristics for the research of a multidimensional cloud model. CiteSpace information visualization software can present the new dynamics of a certain scientific field in future developments (Chen, 2006) and draw a visual analysis chart of literature author collaboration, research institution collaboration, and literature keyword co-occurrence. By analyzing the size and number of nodes in the graph, as well as the density of connecting lines between nodes, the current research hotspots and future research trends in this field are analyzed.

Keywords are a cluster of natural language words with substantial meaning that express the thematic characteristics of the content of the article. Reading the literature first, locating the keyword section can yield the article's theme, research object, research methodology, etc. Similarly, search keywords can realize the paper's information to find and summarize. Thus, the node information is set as keywords in CiteSpace and visualized as a graph; secondly, a series of intuitive knowledge graphs are used to show the hot keywords of the multidimensional cloud model and their evolution direction in foreign research. Keyword co-occurrence analysis graph in Web of Science (WoS) regarding multidimensional cloud modeling (see Figure 1), where intricate solid lines come together to form dots (nodes) that indicate how many keywords appear in the literature. The larger the dot, the higher the frequency of the keyword, and the thickness of the solid line connecting the dots indicates the strength of the link between the keywords; the thicker the solid line, indicating that the keywords appear in the same article, the greater the intensity (Chen, 2016).

Figure 1 demonstrates the co-occurrence graph of the terms *cloud model*, *cloud computing*, *multidimensional*, *multidimensional cloud*, and *data mining*. Other keywords are centered on the

Figure 1. Multidimensional cloud model (WoS) keyword co-occurrence graph