Multidimensional Fuzzy Association Rules for Developing Decision Support System at Petra Christian University

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Abstract. Academic records of student candidates and students of Petra Christian University (PCU) which have been stored so far have not been used to generate information. PCU’s top-level management needs a way to generate information from the records. The generated information is expected to support the decision-making process of top-level management.

Before starting the application development, analysis and design of the student academic records and the needs of top-level management are done. The design stage produces a number of modeling that will be used to create the application.

The final result of the development is an application that can generate information using multidimensional fuzzy association rules.

Keywords: Application, Data Mining, Decision Support System, Multidimensional Fuzzy Association Rules.

1 Introduction

During this time, PCU has stored academic records of student candidates who enroll in PCU, such as math and english grades at their schools. In addition, after entering the university, PCU will save GPA of all students.

Academic records of student candidates and students that have been kept, have not been used to produce valuable information. PCU’s top-level management needs a way to generate information from the records. The generated information is expected to support the decision-making process of top-level management.

With academic records of student candidates and students, information can be generated in the form of relationship between students’ data using multidimensional fuzzy association rules. The students’ data that can be used are schools, math, and english grade in their schools, specialization (science, social, literature, etc.), GPA, faculty, majors, gender, religion, and batch. Therefore, PCU need a software that can generate information needed by top-level management related to academic records of student candidates and students.

2 Data Mining

Data mining is one of the most important steps of the knowledge discovery in databases process. It is considered as significant subfield in knowledge management. Research
in data mining continues growing in business and in learning organization over coming decades[8]. Data mining is a process of extraction of useful information and patterns from huge data. It is also known as knowledge discovery process, knowledge mining from data, knowledge extraction or data/pattern analysis[9].

The development of Information Technology has generated great amount of databases and huge data in various areas. The research in databases and information technology has resulted in approach to store and manipulate this precious data for further decision making. The important reason that attracted many attentions in information technology and the discovery of meaningful information from large collections of data industry towards field of “Data mining” is due to the perception of “we are data rich but information poor”. There is huge volume of data but we hardly able to generate them in to meaningful information and knowledge for decision making process in business[10].

Data mining derives its name from the similarities between finding valuable business information in a large database for example, finding linked products in gigabytes of store scanner data and mining a mountain for valuable ore. Both processes require either sifting through a great amount of material, and intelligently probing it to find exactly where the value resides. Given databases of sufficient size and quality, data mining technology can generate new business advantages and opportunities[10].

3 Multidimensional Association Rules

Association rule finds interesting association or correlation relationship among a large data set of items [1,2]. The discovery of interesting association rules can support decision making process.

Multidimensional association rules are association rules that involve two or more dimensions or predicates. Conceptually, a multidimensional association rule, \( A \Rightarrow B \) consists of A and B as two datasets, called premise and conclusion, respectively.

Formally, A is a dataset consisting of several distinct data, where each data value in A is taken from a distinct domain attribute in D as given by

\[
A = \{a_j \mid a_j \in D_j, \text{ for some } j \in N_n \},
\]

where, \( D_A \subseteq D \) is a set of domain attributes in which all data values of A come from.

Similarly,

\[
B = \{b_j \mid b_j \in D_j, \text{ for some } j \in N_n \},
\]

where, \( D_B \subseteq D \) is a set of domain attributes in which all data values of B come from.