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## Market Basket Analysis: Identify the changing trends of market data using association rule mining

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### Abstract

Market Basket Analysis(MBA) also known as association rule learning or affinity analysis, is a data mining technique that can be used in various fields, such as marketing, bioinformatics, education field, nuclear science etc. The main aim of MBA in marketing is to provide the information to the retailer to understand the purchase behavior of the buyer, which can help the retailer in correct decision making. There are various algorithms are available for performing MBA. The existing algorithms work on static data and they do not capture changes in data with time. But proposed algorithm not only mine static data but also provides a new way to take into account changes happening in data. This paper discusses the data mining technique i.e. association rule mining and provide a new algorithm which may helpful to examine the customer behaviour and assists in increasing the sales.

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### 1. Introduction

Today, the large amount of data is being maintained in the databases in various fields like retail markets, banking sector, medical field etc. But it is not necessary that the whole information is useful for the user. That is why, it is very important to extract the useful information from large amount of data. This process of extracting useful data is

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known as data mining or A Knowledge Discovery and Data (KDD) process. The overall process of finding and interpreting patterns from data involves many steps such as selection, preprocessing, transformation, data mining and interpretation.<sup>1,2,3</sup>

Data mining helps in the business for marketing. The work of using market basket analysis in management research has been performed by Aguinis et al.<sup>1</sup> Market basket analysis is also known as association rule mining. It helps the marketing analyst to understand the behavior of customers e.g. which products are being bought together. There are various techniques and algorithms that are available to perform data mining.<sup>4</sup>

### 1.1. Techniques of Data Mining

There are many data mining techniques and algorithms are available to discover meaningful pattern and rules. These techniques have been discussed by Saurkar et al.<sup>5</sup>

There are many different techniques are as follow:

**Classification:** In classification, first examine the features of newly presented object and assign it to a predefined class for example classify the credit applicants as low, medium or high risk.<sup>5</sup>

**Association:** The main goal of association is to establish the relationship between items which exist in the market. The typical examples of association modeling are Market basket Analysis and cross selling programs. The tools used for association rule mining are apriori algorithm and weka tool kit.<sup>6,7,8</sup>

**Prediction:** In this functionality, prediction of some unknown or missing attributes values based on other Information. For example: Forecast the sale value for next week based on available data.<sup>8,9</sup>

**Clustering:** In this, Data Mining organizes data into meaningful sub-groups (clusters) such that points within the group are similar to each other, and as different as possible from the points in the other groups. It is an unsupervised classification. An effective dynamic unsupervised clustering algorithmic approach for market basket analysis has been proposed by Verma et al.<sup>2</sup>

**Outlier Analysis:** In this, Data Mining is done to identify and explain exceptions. For example, in case of Market Basket Data Analysis, outlier can be some transaction which happens unusually.<sup>10</sup>

### 1.2. Association Rule Mining

Association rule mining is useful for discovering interesting relationships hidden in large data sets. In the following example, there are some transactions of the shop have been taken as shown in Table 1.

Table1. An example of Market Basket Transactions.

Transaction ID (TID)	Items
1.	Butter, Cheese, Burger
2.	Milk, Cheese, Butter
3.	Butter, Milk

The Interesting relationships can be represented in the form of association rules as shown below:

Milk  $\rightarrow$  Butter

The above rule shows that there is a strong relationship between milk and butter. It shows that many customers buy milk and butter together. These rules can be helpful for retailers to understand buying nature of customers.

One of the most popular data mining approaches is to find frequent item sets from a transaction dataset and derive association rules.<sup>7</sup>

The survey on association rule mining has been performed by Zhao et al.<sup>11</sup>. In this survey, different types of mining such as association rule mining, classification, clustering and other techniques have been discussed. Further two basic measures have been discussed for association rules i.e. support and confidence.

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