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Market Basket Analysis for a Supermarket based on Frequent Itemset Mining

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Abstract

Market basket analysis is an important component of analytical system in retail organizations to determine the placement of goods, designing sales promotions for different segments of customers to improve customer satisfaction and hence the profit of the supermarket. These issues for a leading supermarket are addressed here using frequent itemset mining. The frequent itemsets are mined from the market basket database using the efficient K-Apriori algorithm and then the association rules are generated.

Keywords: *Association Rules, Frequent Itemsets, K-Apriori, Market Basket Analysis.*

1. Introduction

One of the challenges for companies that have invested heavily in customer data collection is how to extract important information from their vast customer databases and product feature databases, in order to gain competitive advantage. Several aspects of market basket analysis have been studied in academic literature, such as using customer interest profile and interests on particular products for one-to-one marketing [1], purchasing patterns in a multi-store environment [2] to improve the sales. Market basket analysis has been intensively used in many companies as a means to discover product associations and base a retailer's promotion strategy on them.

Informed decision can be made easily about product placement, pricing, promotion, profitability and also finds out, if there are any successful products that have no significant related elements. Similar products can be found so those can be placed near each other or it can be cross-sold.

A retailer must know the needs of customers and adapt to them. Market basket analysis is one possible way to find out which items can be put together. Market basket analyses gives retailer good information about related sales on group of goods basis Customers who buy s bread often also buy several products related to bread like milk, butter or jam. It makes sense that these groups are placed side by side in a retail center so that customers can access them quickly. Such related groups of goods also must be located side-by-side in order to remind customers of related items and to lead them through the center in a logical manner.

Market basket analysis is one of the data mining methods [3] focusing on discovering purchasing patterns by extracting associations or co-occurrences from a store's transactional data. Market basket analysis determines the products which are bought together and to reorganize the supermarket layout, and also to design promotional campaigns such that products' purchase can be improved. Hence, the Market consumer behaviors need to be analyzed, which can be done through different data mining techniques.

Data mining finds interesting patterns from databases such as association rules, correlations, sequences, classifiers, clusters and many more of which the mining of association rules is one of the most popular problems. Association rule mining finds interesting association or correlation relationships among a large set of data items. Association rules are derived from the frequent itemsets using support and confidence as threshold levels. The sets of items which have minimum support are known as Frequent Itemset. The support of an itemset is defined as the proportion of transactions in the data set which contain the itemset. Confidence is defined as the measure of certainty or trustworthiness associated with each discovered pattern. Association rules derived depends on confidence. Frequent itemset generation is done using data mining algorithms like Apriori [4], FP-Growth Algorithm [5], Eclat [6] and K-Apriori [7]. Apriori algorithm for frequent itemset mining is given below.