A Survey on High Utility Item Set Mining

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Abstract: *Data Mining, also called knowledge Discovery in Database, is one of the latest research area, which has emerged in response to the Tsunami data or the flood of data, world is facing nowadays. It has taken up the challenge to develop techniques that can help humans to discover useful patterns in massive data. One such important technique is utility mining. Frequent item set mining works to discover item set which are frequently appear in transaction database, which can be discover on the basis of support and confidence value of different itemset .Using frequent itemset mining concept as a base, many researchers have also proposed different new concept on utility based mining of itemset. This paper presents a comprehensive systematic literature review of present techniques used for mining high utility item sets from huge data set.*

Keywords: *Data Mining, KDD Process, High Utility Mining, Minimum Utility.*

1. INTRODUCTION

Data mining [1] has become an essential technology for businesses and researchers in many fields, the number and variety of applications has been growing gradually for several years and it is predicted that it will carry on to grow. A number of the business areas with an early embracing of DM into their processes are banking, insurance, retail and telecom. More lately it has been implemented in pharmaceutics, health, government and all sorts of e-businesses.

One describes a scheme to generate a whole set of trading strategies that take into account application constraints, for example timing, current position and pricing [2]. The authors highlight the importance of developing a suitable back testing environment that enables the gathering of sufficient evidence to convince the end users.

These organization sectors include retail, petroleum, telecommunications, utilities, manufacturing, transportation, credit cards, insurance, banking, decision support, financial forecast, marketing policies, even medical diagnosis and many other applications, extracting the valuable data, it necessary to explore the databases completely and efficiently.

Due to its versatility (figure 1), we can also define data mining as a woven combination of statistics, artificial intelligence and machine learning.

Data mining addresses two basic tasks: verification and discovery. The verification task seeks to verify user's hypotheses. While the discovery task searches for unknown knowledge hidden in the data. In general, discovery task can be further divided into two categories, which are descriptive data mining and predicative data mining. Descriptive data mining presents general summary of data and interesting patterns too. Predictive data mining constructs one or more models to be later used for predicting the behavior of future data sets.

Figure 1: What is Data Mining [3]

There are a number of algorithmic techniques available for each data mining tasks, with features that must be weighed against data characteristics and additional business requirements. Among all the techniques, in this research, we are focusing on the association rules mining technique, which is descriptive mining technique, with transactional database system. This technique was formulated by [4] and is often referred to as market-basket problem.

2. TABLES

In utility mining [5] we concentrate on utility value of itemset while in frequent item set mining we concentrate that how frequently items appears in transactional database. With the help of following example describe in table 1, can easily differentiate utility mining and frequent item set mining:-

Table 1: Transactional Database D1

Transition	Quantity of item sold in Transaction		
T1	0	0	1
T2	2	0	2
T3	1	1	4
T4	0	1	1
T5	5	1	3

Unit profit related with each item is described in table 2 as follows:

Table 2: unit profit associate with items

Item Name	Unit profit
A	6
B	120
C	45

Now with the help of internal utility, external utility and how many times item or itemset appears in transaction, we can calculate support and profits which describe in table 3 as follows:

Table 3: Support and profits for all items

Itemset	Support (%)	Profit (INR)
A	60	48
B	60	360
C	100	495
AB	40	276
AC	60	768
BC	60	720
ABC	40	456

If [5] minimum support = 40 % only A, B, C, AC, BC qualify as frequent itemsets. ({ABC}) = (1×6+1×120 +4×45) + (5×6+ 1×120+3×45) = 456.If we specified user threshold

value =310 then ABC is a high utility itemset but it is not a frequently accessible itemset.

3. LITERATURE REVIEW

CT-PRO is also the variation of classic FP-tree algorithm [6]. It is based upon the compact tree structure [6, 7]. This algorithm uses bottom up approach for performing tree traversal. This is not a recursive method. Compress tree structure is also the prefix tree in which all the items are stored in the descending order of the frequency with the field index, frequency, pointer, item-id [8].

In 2010 the author ZHOU Jun et al. [9] proposed this algorithm by considering the space as an important factor. Authors used an improved LRU (Least Recently Used) based algorithm. Proposed algorithm omits the infrequent items before taken for the processing. Method increases the stability and the performance. Method is used to find out the frequent items as well as the frequency of those items.

Most of the existing algorithms uses a measure known as TWU (Transaction Weigheted Utility). This measure was introduced Liu et al. [10], also they follow the process of two phase candidate generation. The work done in [11] proposed an isolated item discarding strategy. If any size k item set does not contain an item I then item I is termed as an isolated item.

Authors in [12] proposed a projection based method for mining high utility items. This is improvement of two phase algorithm. It speeds up the execution of two phase algorithm. Authors in [13] proposed a hybrid algorithm, a combination of antimonotonicity of TWU and pattern growth approach.

Work done in [14] proposed a FP tree based algorithm, this algorithm uses a tree to maintain the TWU information. It also uses the concept of pruning to eliminate the useless items from the first phase of the algorithm.

4. CONCLUSION

High utility frequent pattern mining has a wide range of real world applications. That's why it is one of the most favorite topic of research. Utility mining helps in mining of items which are worthy. This paper presented a systematic literature survey of present high utility frequent pattern mining algorithms. This paper also elaborated the notion of high utility mining in lucrative manner. It is found that although a lot of work is going on in the field of high utility mining but still there is enough scope to improve the performance.

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