ISSN XXXX XXXX © 2017 IJESC

IJESC

Research Article Volume 7 Issue No.6

An Efficient Soft Set Approach for Association Rule Mining Using Constraints

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Abstract:
Here propose a new approach for finding association rule mining. In our proposed methodology we apply Soft set theory with constraints for finding the association rule. In previous paper a Soft set approach is used to find the association rule. In soft set approach first the transactional database is transferred into the Boolean valued information system because soft set is apply only on the Boolean valued information system and then uses the concept of parameter co-occurrence in a transaction we define the association rule. In this method the input is transactional database that contains the redundant and missing information therefore the final result generated is not accurate and contains some redundant information. To deal with such condition and to produce result that is free from such redundant result we propose a new approach which is based on Soft set theory with constraints that is used to deal with redundant and uncertain data that is present in transaction database.

Key Words: Association rule, Soft set, Boolean value information system, Data mining, Parameter co-occurrence.

I. INTRODUCTION

Association rule is a popular and most research area in data mining techniques for discovering interesting relationship between large database and has received considerable Attention, particularly since the publication of the AIS and Apriori algorithms and FP-tree algorithms [2,3] . This is an important aspect for data mining. The relationship is not depending on functional dependencies but rather based on co-occurrence of data item.The best example association rule mining is market basket and many other domains like astronomy, crime privation, clinical medicines and many more. The association rules are considered effective if it satisfies certain constraints, i.e. Predefined minimum Support (min_sup) and minimum confidence (min _conf) thresholds. For Rule X→Y their support and confidence is calculated as:

$$Sup(X \rightarrow Y) = \frac{(XUY).Count}{N}$$

N = Total number of transaction

$$Conf(X \rightarrow Y) = \frac{(XUY).Count}{X.count}$$

In this X is ascendant and Y is consequent. The rule X→Y has support s% in the transaction set D if s% of transactions in D contain XUY. The rule has confidence c% if c% of transactions in D that contain X also contain Y. The goal of association rule mining is to find all the rules with support and confidence exceeding user specified thresholds. Many algorithms of association rules mining have been proposed. The association rules method was developed particularly for the analysis of transactional databases. A huge number of association rules can be found from a transactional dataset. The rules that satisfy the minimum support threshold and minimum confidence threshold is called the strong association rules and rest of the rules is discarded. Soft set theory [7], proposed by Molodtsovin 1999, is a new general method for dealing with uncertain data. Soft setsare called (binary, basic, elementary) neighborhood systems. As for standard soft set, it may be redefined as the classification of objects in two distinct classes, thus confirming that soft set can deal with a Boolean-valued information system. Molodtsov [7] pointed out that one of the main advantages of soft set theory is that it is free from the inadequacy of the parameterization tools, unlike in the theories of fuzzy set [8].Since the „„standard" soft set (F,E) over the universe U can be represented by a Boolean-valued information system, thus a soft set can be used for representing a transactional dataset. Therefore, one of the applications of soft set theory for data mining is for mining association rules. However, not many researchers have been done on this application. Moreover Association rule mining is defined as a pair (F,E) is called a soft set over U, where F is a mapping given by:

$$F: E \rightarrow P(U)$$

In other words, a soft set over U is a parameterized family of subsets of the universe U. For e belongs E, F(e) may be considered as the set of e-elements of the soft set (F,E) or as the set of e-approximate elements of the soft set. Clearly, a soft set is not a (crisp) set. To illustrate this idea, let we consider the following example. Example. Let we consider a soft set (F, E) which describes the "attractiveness of houses" that Mr. X is considering to purchase. Suppose that there are six houses in the universe U under consideration,

U = { h1, h2, h3, h4, h5, h6}and
E = { e1, e2, e3, e4, e5}

is a set of decision parameters, where e1stands for the parameters "expensive", e2stands for the parameters "beautiful", e3stands for the parameters "wooden", e4stands for

the parameters “cheap”, e5stands for the parameters “in the green surrounding”. Consider the mapping from equation
F: E → P (U),
Given by “houses (.)”, where (.) is to be filled in by one of parameters e belongs to E. Suppose that

F (e1) = {h2, h4}
F (e2) = {h1, h3}
F (e3) = {h3, h4, h5}
F (e4) = {h1, h3, h5}
F (e5) = {h1}

Therefore F(e1)means “houses (expensive)”, whose functional value is the set { h2 ,h4}. Thus, we can view the soft set (F, E) as a collection of approximations as below

$$(F,E)=\left\{\begin{array}{l}\text{expensive houses}=\{h_2,h_4\},\\ \text{beautiful houses}=\{h_1,h_3\},\\ \text{wooden houses}=\{h_3,h_4,h_5\},\\ \text{cheap houses}=\{h_1,h_3,h_5\},\\ \text{in the green surrounding houses}=\{h_1\}\end{array}\right\}$$

Figure.1. Soft set Example

Each approximation has two parts, a predicate p and an approximate value set v. For example, for the approximation “expensive houses = { h2 ,h4 } ”, we have the predicate name of expensive houses and the approximate value set or value set { h2 ,h4 } .Thus, a soft set (F, E) can be viewed as a collection of approximations below: (F,E)= { p1 = v1, p2 = v2 ,p3 = v3,….., pn = vn },Binary representation can be represented as:

Table.1. Soft set in Boolean system

U	e1	e2	e3	e4	e5
h2	1	0	0	0	0
h3	0	1	1	1	0
h4	1	0	1	0	0
h5	0	1	1	0	0
h6	0	0	0	0	0

Now here we summarize our paper Second section describe the review of literature. Section 3 describe our proposed approach and section 4 describe our implementation and result of proposed ECSS approach and section 5 conclusion and feature work.

II. REVIEW OF LITRATURE

Number of extensive research effort has been conducted on Association rule mining here we briefing some previous approach for rule mining. In the previous work a soft set approach for association rule mining there is direct applicability of soft set on the Boolean valued information system that contains large number of false frequent item and also contains rare items whose support is less than initial support. Due to the presence of such items in database the previous approach is slow in result generation. These false frequent item and rare item is neither being frequent and no interesting rule is generated with the help of these items. These items are removed when we generated the frequent pattern latter in the process with the help of min_sup. If these item not deleted from input transaction then time complexity and space complexity of the approach is increased. Therefore previous approach has high time and space complexity [1]. In the previous app methods proposed to found out association rule from the transaction dataset. These method is based on Rough set [16] to find association rule. In these method rough set is used to find the association rule on the basis of decision table .In these methods first of all find the conditional attribute and on the basis of which we construct the decision table. This decision table is used to find the association rulesin the IF-THEN context. With the help of Rough set for association rule we find rule with less response time than traditional techniques [14, 15] of association rule mining. But in the rough set based approach the decision table is maintain and then association rule is derived from that decision table is also time consuming in rule generation.

III. PROPOSED EVBOR SYSTEM FOR 3-D OBJECT RETRIVAL

A. Proposed Architecture

In our proposed approach we reduce the size dataset with the help of initial red_sup.Due to this the false frequent items and rare items is eliminated or removed from the input transaction dataset. Due to this response time of rule generation is increased .The overall algorithm step of our proposed approach is depicted as.

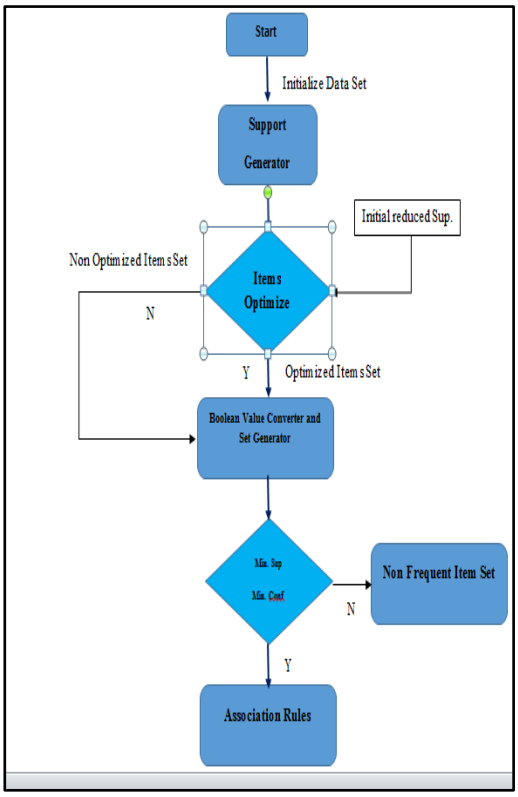

Figure.3. Architecture of Proposed Algorithm for Association rule mining

Algorithm Steps:

Step 1:- Scan the dataset D for all transaction 1 to N and calculate the Support for all items.

Step 2:- for all items in dataset If initial reduced sup is greater than item support than remove that item from transaction dataset. Therefore we get the more accurate and reduced form of dataset.

Step 3:- Convert the reduced dataset obtained into Boolean valued information system S= (U, A, V {0, 1}, F) and generate item sets.

Step 4:- Apply the soft set (F,E) on the Boolean valued information system S .

Step 5:- Apply the principle of parameter co-occurrence (min sup and min conf) and calculate the count of various itemsets.

Step 6:- Generate the association rule from the frequent pattern and check with min_conf threshold to find out the rule is strong or not.

Step:-7 End.

IV. RESULT ANALYSIS

In this section, we compare the proposed method for association rules mining with the algorithm of [1]. The proposed approach and Previous approach is executed on derived dataset. The algorithm of the proposed approach is implemented in MATLAB. A Dataset derived from the widely used Reuters-21578.It contains 30 transactions with TIDs 1 to 30 and contains 10 items labelled P1 to P10.Now we show the execution time graph between our approach and existing Soft set approach. In execution graph the X-axis indicate the 6 function of approaches and Y-axis indicate time in second. After which we show the bar graph of memory used between our approach and Soft set approach and ultimately we give the table that compare execution time differences as the Min_sup and Min_conf threshold is change.

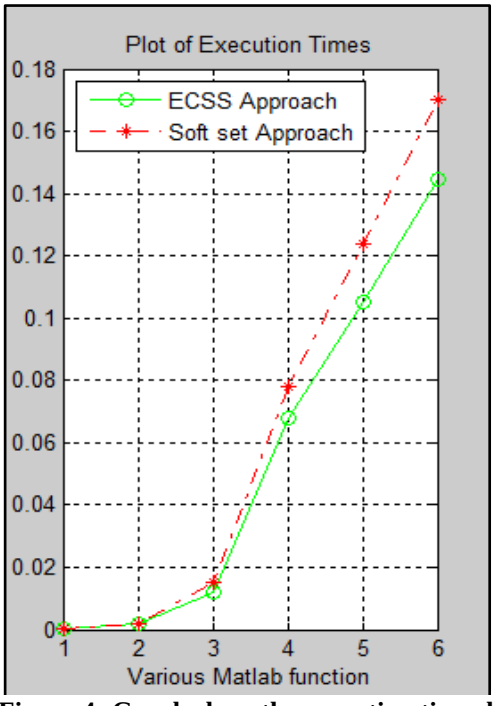

Figure 4: Graph show the execution time difference between previous soft set approach and our proposed approach when min_sup=2 and min_conf=0.6

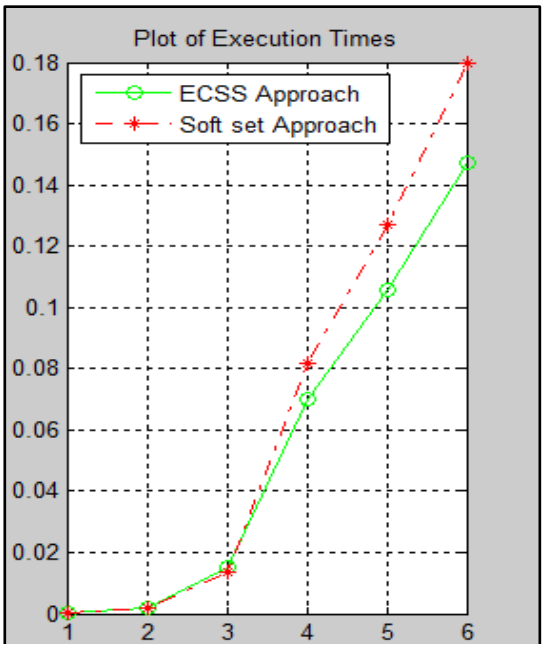

Figure 5: Graph show the execution time difference between previous soft set approach and our proposed approach when min_sup=3 and min_conf=0.6

V. CONCLUSION AND FUTURE WORK

In our approach, this is one of the very efficient method for finding association rule .With the help of our approach we can handle the find and handle uncertainty which is in the dataset. The existing approach take more time and space and make the things complex and inefficient so there is more chance to inaccurate result because of the presence of some false frequent items and rare items. In our proposed approach firstly we reduce uncertain items from transaction dataset with the help of the constraints and then convert that reduced dataset in to Boolean valued information system. In the next step we apply soft set to handle uncertainty of information system. Now we apply the parameter co-occurrence on the soft set to generate the count of various item set and then generate the resulting strong association rule. So, the reduction in size of transaction dataset in our approach, make more efficient, and more accurate result and take less time and memory space than previous approach[1].In future we can automate it for making better and automatic generate association rule for decision making.

Table.1. Table show result of both soft set approach and our approach when taking different supports and generate result in term of execution time in sec.

Minimum support threshold	Minimum confidence threshold	soft set approach (execution time in sec)	ECSS approach (execution time in sec)
2	0.6	0.283	0.0625
3	0.6	0.05314	0.03952
4	0.6	0.04404	0.02727
5	0.6	0.0508	0.0216

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