An Overview of Classification Rule and Association Rule Mining

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ABSTRACT

In this study, we focused on how data mining can be applied in Market Basket Analysis to identify new trend sand purchasing patterns of customers. Data Mining is the process of extracting useful information from a large dataset. We are here using Association Rule to identify the relationship between different products and Classification Rule on the consumers to distinguish them on the basis of pre-defined parameters. The most important information discovered from the combination of these two algorithms supports the retailers in decision making and hence increase their sales.

Keywords: Classification Rule, Association Rule, Clustering, Outlier Analysis

I. INTRODUCTION

In this day and age large measure of data is generated every day and this data is maintained in database in different fields, for example, healthcare, education, market basket analysis, etc. With this increasing data size, there is a need to understand large and complex data and reach necessary determinations. The process of extracting necessary data from large pre-existing databases is called Data Mining. It is very troublesome for the neighborhood retailers to pull in customers, so it is their need to understand the shopping trends of the customers.

Numerous consumers prefer online shopping. With the development of the e-commerce websites, retailers tend to neglect to pull in more and more consumers. This problem can be eliminated by applying data mining techniques to analyze new patterns and trends. The data mining techniques are applied to the gathered data associated to customer behavior pattern, with the goal that retailers will be able to know the new patterns and trends.

A. STEPS INVOLVED IN DATA MINING
   a. Identifying the source information
   b. Picking the data points that need to be analyzed
   c. Extracting the relevant information from the data
   d. Identifying the key values from the extracted data set
   e. Interpreting and reporting the results

II. DATA MINING TECHNIQUES

A. Association Rule

This rule is incorporated for establishing the relationship between different objects that exist in
the market. [1] This rule is very helpful in Market Basket Analysis.

B. Classification
This rule is used to arrange a data item into predefined classes. For example we can use this rule to differentiate autos into different categories (KUV, Sedan, and SUV). Same principles can be applied to consumers, for e.g. by recognizing them into income, age and social gathering.

C. Clustering
With this Clustering technique, data is organized and classified into meaningful subgroups or clusters.

D. Prediction
This technique is used to predict new information from a set of existing data. For example Sales in future week can be predicted using this rule.

E. Outlier Analysis
This technique identifies and explains exceptions. For example in Market Basket Data Analysis, Outlier can be some transactions which happen uncommon.

III. EXISITING ALGORITHM

There are so many algorithms used in Market Basket Analysis for identifying the changes in purchasing trends of customers. Some algorithms are only focused on the customers while others are focused only on the products.

IV. PROPOSED METHOD

In this paper, we combine Association Rule and Classification Rule which will focus on both the products and the customer's. Association Rule will be implied on the products and Classification Rule will be implied on the customers. So this will be more affectionate for the retailers to determine the purchasing trends of customers.

V. ASSOCIATION RULE

This rule is especifically used for making the relationship between two or more items. This rule can be used for tracing customers buying habits. We can observe that when a consumer always purchases shoes then he purchases socks also and therefore we can suggest that in future when he purchases shoes he might also want to purchase socks.

Example:

<table>
<thead>
<tr>
<th>Transaction ID (TID)</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Butter, Cheese, Burger</td>
</tr>
<tr>
<td>2.</td>
<td>Milk, Cheese, Butter</td>
</tr>
<tr>
<td>3.</td>
<td>Butter, Milk</td>
</tr>
</tbody>
</table>

Here we can identify the relationship between the Butter and Milk. Here the Association rule shows us that whenever a customer buys Milk he always buys butter along with it.

Milk->Butter

This rule is helpful for retailers to identify the obtaining patterns of the customers. And they will hence come to think about what the customer needs. Understanding Association rule with example

The dataset below contains the products purchased from a retailer.
For the above dataset we can establish the following relations between the different items:

**Rule no 1:** IF Bread is bought, THEN butter is also bought.

**Rule no 2:** IF butter is bought, THEN Bread is also bought.

**Rule no 3:** IF Bread and butter is brought, THEN Jam is also brought in 60% of the transactions.

“IF THEN” format is followed in Association Rule. These terminologies that are defined are adapted from Data Mining for Business Intelligence, by Galit Shmueli and others [4].

**Support:** This rule signifies the effect in terms of overall size. In the event that exclusive a few number of exchanges are affected, the rule might be of less use. For e.g. the help of “IF Bread and Butter THEN Jam” is 3/5 i.e. 60% of the aggregate exchanges.

**Confidence:** This determines functional use of the rule. Transactions that are having confidence greater than 50% are selected. For e.g., confidence of Bread, butter and Jam given can be written as:

\[
P(\text{Butter and Bread and Jam})/P(\text{Butter and Bread}) = 3/5 = 60\%
\]

Thusly, we can make a conclusion that the association rule is having a confidence of 60%.

### VI. CLASSIFICATION RULE

Here classification rule mining can be used for differentiating customers or items on the basis of different parameters. Here the Classification rule can be used to differentiate the customers by frequency of visits, age, income, marital status, etc. Classification rule helps the retailers to take decisions easily.

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Marital Status Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 20</td>
<td>30</td>
<td>Single 45</td>
</tr>
<tr>
<td>20-40</td>
<td>50</td>
<td>Married 45</td>
</tr>
<tr>
<td>Above 40</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income</th>
<th>Frequency</th>
<th>Gender</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 Lakh</td>
<td>20</td>
<td>Male</td>
<td>70</td>
</tr>
<tr>
<td>1Lakh-5Lakh</td>
<td>45</td>
<td>Female</td>
<td>50</td>
</tr>
<tr>
<td>&gt;5 Lakh</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Retailers will have the knowledge about the customers according to these defined parameters, in this case age, marital status, income, gender.

Suppose in an area if there are more number of students (age <20) so the retailer will focus more towards the needs of the student like stationary items and sports items.

### VII. CONCLUSION

Data Mining has played a very important role in Market Analysis and various other fields. The most important point to succeed in a marketing strategy is to create an accurate customer analysis [2]. The motivation for applying data mining approach on Market Basket Analysis is to learn about buying patterns and retailers can use this information so more no of consumers are attracted towards them.

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