

Mathematical Analysis of Retail Product Rating Using Data Mining Techniques

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Abstract: In this paper a new product rating approach for analyzing retail market of same type of products from different manufacturers is proposed. In Asian retail market there is no specific customer rating record. Instead, the retailers provide a feedback about the products based on the sales analysis. By providing minimum threshold hypothesis using Product Rating Retail algorithm (PRR), retailers rating analysis is ranked. Hungarian algorithm is used to provide the mathematical approach to solve the problem. This provides a global pattern from the random database without losing the potentiality of the original database.

Key words: Data mining, Multiple database, marketing, Product rating, Threshold values, Hypothesis, Hungarian Algorithm

I. INTRODUCTION

Data mining can be performed in different kinds of databases and data repositories. The descriptive and productive are the classification of finding pattern through mining data. Through descriptive characterize the general properties of the data. By performing current data to predict some knowledge in predictive method. To find level of abstraction in business world, data mining provide more functionality. Those efficient mining methods address the wholesale business, business trends, business analysis, CRM, ERP, etc. Those functionalities moderately touch the retail business data. In a retail business world, companies/manufacturers want to know about their products sales efficiency and its customer satisfaction. Many companies promoting products to the target different kind of customers. For that many number of products same in nature but from different companies. Sales behaviors of some product are good and some of them are not much up to that level. To analyze the rating and ranking of such products by customer credit ratio the proposed algorithm evaluates loose coupling data mining in a randomized data.

II. MULTIDATABASE

Multidatabase is database which is centralized and accessed by other sources and the transactions of those sources at least thousands per day. Consider Wal-Mart as the example for centralized source and more number of clients/customers access the source. In general multidatabase mining is different from single data base mining. Rather than the raw data mine the patterns is the data privacy. Asian retail market the manufacturers and marketers are looking about their potential customer's satisfaction. This indirectly affects the manufacturers by the retention ration of their products with the customers. Researchers are looking for the techniques which predicts global pattern through local data without losing potential of the original database.

III. DATA MINING TECHNIQUES

3.1 Definition

Analyzing the buying behavior of x from A,B,C products, the buying pattern of x may not identified as interesting because of , x may not interest in A due to frequent buying patterns of other customers. Buying pattern of x may not capture due to identifying patterns from multidatabase.

3.2 Definition

The retail industries is a sector of economy, (i.e.) comprised of individuals and companies engaged in the selling of finished products to end user customers. Retail is the sale of goods to end users, not for resale but for use and consumption by the purchaser. The retail transaction is at the end of supply chain. Manufacturers sell large quantities of products to wholesales and they sell those products to different retails, and the same processed by different purchases. A total retail sale of the retail products leads the department of commerce by including food service and automotive. It indicates the economic recovery is in underway and the future economy will expand instead recession.

There are researches made in the retail business based on the product assortment by association rules, mining frequent item sets, etc., but there is limited research in the process of retail products sales behavior which induces the manufacturing companies' means of its production based on the customer rating on the ranked products.

3.3 Retention ratio of the product:

Each and every organization, the human resource will maintain some retention ratio, based on the performance of the employee. Likewise in business world we can't hold the products without selling out (or) out of market; instead we can make it more by means of its requirement based on the customer. In general the calculation of retention ratio is,

1. Determines companies earning per share and dividend per share.
2. Subtract the dividend per share value from the earning per share value.
3. Divide the result by the earnings per share value.

Multiply the result by 100 to see the retention ratio.

IV. ASSOCIATION RULE

In mining technique, threshold is the approximate measure to analyze the values as the starting point or new state to calculate. (ie) support and confidence. To find the ranking of products from the sales database the following will the minimum measure of value.(ie) confidence level of measure.

- (i)Total number of sales for each product.
- (ii)Number of customers bought individual products
- (iii)By means of number of products sold in an increasing manner.
- (iv)Associated products when a customer purchases other products.

Based on this measure we select the largest number of products sold in a daily sales analysis report/weekly report.

4.1 Product Rank Based on the Retailer's Feedback: Hypothesis 1

Calculate the products rank from the sales based on the retailer's feedback.

In general, Indian Retailers getting feedback from the customers about their service and products availability, feasibility, cost of the product price with competitors, services provided by their employees, etc... Based on this the retailers improve their sales behavior through the feedback as well as they may get an analysis/review/idea of the associated retail product which the customers purchase. (Association Rule). Researches provides more in specific products sales, buying behavior of customers in retail outlet products and also results in the manner of classifying customers individual products and purchase behavior, also there is solutions for marketing analysis in business. There is only smaller number of research based on the retail products ranking by retailers credit rating.

Random Sales data values

Product Name	Sold Quantity	Company/Manufacturer	Customer Code
P1	5	MF1	C1
P1	7	MF2	C2
P1	12	MF3	C3
P1	15	MF4	C1

The general rules to measure the rank of retail products from the above sales database by following.

- total number of sales of each product
- number of customers bought individual products
- By means of number of products sold in weekly sales report.
- Associated products when customer purchases other products.

Large number of quantity sold from the daily sales database

4.2 Rating by customer /retailer - Hypothesis 2

The following measures to be considered for rating the retail products.

- Customer satisfaction by means of performance of the product.
- Life period & availability of the product in the market analyzed by the

Customer/retailer

- price of the product
- expiry of the product

The average credit rates calculated by this hypothesis 2 and fix a minimum threshold value of 8.

Customer/Retailer	Products purchased	Credit Point	Transactions count	Quantity of sales
C1	P1,p2,p3	7	-	P1=2,p2=1,p3=3
C2	P6,p4,p1	8	-	P4=1,p5=1,p6=3
C3	P2,p9,p10,p6	6	-	P7=1,p8=1,p9=1,p10=1
C4	P3,p5,p7,p8	8	-	
C5	P5,p3,p2,p6	7	-	

	P1	P2	P3	P4	P5
C1	3	2	-	1	-
C2	2	5	1	2	-
C3	1	2	4	3	4

From the above table the minimum threshold value 8 satisfies the products **p1,p3,p4,p5,p6,p7,p8** manufactured by the companies **cy1,cy2,cy3,cy4,cy5**. The rating of each and every product gets different by the feedback analysis. According to the Indian market analysis each and every individual buying behavior is a unanimously changing pattern. Meantime the consumption of the product is differing with each other. According to the survey of Indian customers buying behavior associated product purchase is also differ with one another. In that the more number of products consumed and more number of customers purchased gets higher priority that the other products sales and rating.
 P1,p3,p4,p5,p6,p7,p8 – 8 – cy1,cy2,cy3,cy4,cy5

4.3 Product Rating for Retail Items (PRRI)

The PRRI algorithm is used to identify the top rated products based on the sales of the respective product and the total credit points accompanied by the product from the user.

Here each customer gives rating for each products i.e., $C_n(n)_{i=(1...n)}$

Where,

n – Number of products

Cn - number of customers.

The Threshold applied in the algorithm is,

Minimum number of customers=Mcn

Minimum number of Credit Points=Mcp

The product will be considered for the rating if and only if it satisfies the above specified threshold value. Thus the appropriate credit points can be generated using, $C_n(R)$ for all $(n)_{i=(1...n)}$

For Example

Consider.

For each item set in the product database

{

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Order the top products based on the top sales;
}
Set count=0;
For each item set in product database
{
If (count not equals to 15)
{
Get the customer count i.e. Cn and the credit point's i.e. Cp of the product;
If (Cn>Mcn && Cp>Mcp)
{
Add the item set to top rated database;
}
Else
{
Skip;
}
}
}
For each item set in top rateddatabase
{
Display the Product Details;
}
}
Here 26 products of 7 organizations are taken into this algorithm; finally top 15 products are displayed based on this PRRI algorithm.

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V. ILLUSTRATIVE EXAMPLE:

Consider 3 customers buying analysis in a randomized data for 5 products are given in the following matrix form. The Problem is easily solved by Hungarian Algorithm with the help of optimization soft wares such as TORA, LINDO, LINGO, etc and the result obtained is same as that of the solution obtained by PRRI algorithm.

VI. Conclusion:

In this paper we provide Product Retail Rating Items algorithm, to identify the products rating by preprocessing the sales data with minimum threshold using Association rule and rank the products. As an illustration, a sample Hungarian operation research problem with customized data has been illustrated and solved based on the algorithm.

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