

Price Negotiator Chatbot Operating on Consumer Purchase Behaviour Mining

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Abstract— This paper provides the overview of a AI ChatBot for price negotiation. The proposed system can be used for presenting personalized offers and prices. This system can be implemented to any shop in the locality or to multinational branded shops having retail outlet chains. This paper also explores the possibility of using purchase history for extraction of users purchase behavior through Data Mining. The negotiation also inherits the advantages of previous activity of the user for implementation of proposed system.

Keywords: Data Mining, Chatbot, Behavior Mining, Artificial Intelligence-Natural Language Processing

I. INTRODUCTION

In the last few years e-commerce and online shopping became more and more popular. The number of new online shops and website cannot be quantified any more. Many people change their shopping behavior. Instead of visiting local stores or shopping malls they do a large amount of their daily purchases online. This change to e-commerce has a major impact on the stationary and retail trade. One of the essential requirements in today's business scenario is to realize and evaluate the bargaining power of customers. As the modern supermarkets are expanding the customer have lost their right of negotiation for the best price they can get for a deal. The Idea of creating a better solution for business in supermarkets by using behavior mining of customers is the main motivation behind this project.

II. LITERATURE SURVEY

Hanjong Choi, Takeshi Hamanaka et al in paper titled as “ Design and implementation of interactive product manual system using chatbot and sensed data” in 2017 IEEE 6th Global Conference on Consumer Electronics (GCCE) the paper discuss about the Current electric appliances provide various functions to make users' lives more comfortable and fruitful. However, product instructions have become complicated with the increasing number of functions and the users take a long time to understand each electric appliance. To solve this problem, they have proposed an interactive product instruction system using a chatbot. They have developed an interactive system that uses a chatbot, which talks to users through messaging applications, to provide instructions on how to use the electric appliance, to control it via a wireless network (Wi-Fi), and to visualize data collected using networked sensors and represent the data using relevant graphs and charts. To demonstrate a user-friendly system for delivering usage instructions of electrical appliances, they implemented the proposed system for a networked humidifier. The system provides a product manual for the humidifier with words and pictures, and the users can ask questions regarding the functionality and usage of the appliance. The same idea of creating interactive system like chatbot for customers shopping in supermarkets can be

implemented. The limitation of system is that the cost of implementation of chatbot is increased because of use of costly sensors and RFID. [1]

W.Amer , Y Attique et al in paper titled “Comprehensive e-Monitoring, e-Management and e-Billing (eM2B) System with Zoom-In and Zoom-Out Capabilities to Reduce Electricity Distribution Losses for Developing Countries.” published in 2017 International Conference on Sustainable Information Engineering and Technology (SIET) , the paper presents in detail the idea of implementing the e-billing management using the electronic systems design. It consists of e-Billing module which sends billing information directly to the customer mobile phone/internet using M2M technology. The limitation of proposed system is cost effectiveness of the electronic systems [2]

J Moura, S Daher et al in paper titled as “Using psychophysiological data to investigate differences by gender and negotiation styles in e-negotiation “ published in 2017 IEEE International Conference on Systems, Man, and Cybernetics (SMC) . This study considers a negotiation support system and an eye-tracking apparatus to analyze how is the cognitive workload of men and women when assessing information about the opponent to formulate a counteroffer. The study investigated the pupillary variation of individuals during a specific task in an online negotiation. An experiment was conducted to investigate differences in gender and negotiation styles. Different styles of negotiation in general life have been explained in this paper. But this research has some limitations. First, the homogeneity of the sample since participants is in a very similar social condition. Second, the experiment was not a real negotiation and so, participants even demonstrating compromise with the research were dealing with a fictitious (and so less stressful) scenario [3]

A. Setiawan, G. Budhi et al in the paper titled as “Data Mining Applications for Sales Information System Using Market Basket Analysis on Stationery Company” published in the 2017 International Conference on Soft Computing, Intelligent System and Information Technology (ICSI), have developed the application for retail store which uses the market basket analysis for generating association rules between the goods and items in the retail store. Application can perform the recording in accordance with the stock purchase and sales. The application can notify the owner of retail store about the stock items that are running low. Applications can perform data mining process based on existing sales data. Then program can help decide when to make the process of bundling. The same idea of developing application for seller and manager of retail store has extended in our paper which will help the seller, manager for the management of the stocks according to generated association rules for supermarkets items [4]

III. SYSTEM OVERVIEW

The system will consist of two parts, one will be the user interface in the form of a chat application of a particular supermarket which will help users negotiate the offers which are provided by the chat bot, The second part of the system includes the backend functionalities in which a server is set including different modules such as billing and behavior mining, so that the seller aspects are maintained such as (profit/loss) ratio and the stock which is in the rack. Since it is a Data mining based web application it has to store the data somewhere for that the database is used along with the server. The main perspective of the product is to provide negotiation to the users and a fast billing process to sellers as well as customers. With the help of developed web application including the bot negotiator, the users will be able to Negotiate on the products they want to buy. There are several criteria's to present offers to the customers and it will be possible for the administrator of the system to manage the options for those criteria which will develop the offers. The result of the application would be the behavior mining based chat application which will have an acceptance feature if the user wants to take the offer provided by the web application system whose functions will actually implement the data using data mining algorithms and implement the seller customer interaction in the supermarket.

IV. METHODOLOGY

A. Algorithm for Finding Purchase Sequence of User:

1) Apriori Algorithm

Apriori algorithm is an algorithm for frequent item set mining and association rule learning over transaction databases. Its followed by identifying the frequent individual items in the database and extending them to larger and larger item sets as long as those item sets appear sufficiently often in the database. The frequent item sets determined by Apriori can be used to determine association rules which highlight general trends in the database.

To select interesting rules from the set of all possible rules, constraints on various measures of significance and interest can be used. The best known constraints are minimum thresholds on support and confidence

a) Support

The support $\text{supp}(X)$ of an item set X can be defined as proportion of transactions in the data set which contain the item set.

$$\text{Supp}(X) = \frac{\text{no. of transactions which contain the item set 'X'}}{\text{total no. of transactions}}$$

b) Confidence

Confidence is an indication of how often the rule has been found to be true.

The confidence value of a rule, $X \Rightarrow Y$ with respect to a set of transactions T , is the proportion of the transactions that contains X which also contains Y .

Confidence is defined as:

$$\text{Conf}(X \Rightarrow Y) = \frac{\text{Supp}(X \cup Y)}{\text{Supp}(X)}$$

Association rules are usually expressed in the form:

{bread, butter} \rightarrow {milk} (support = 40%, confidence = 75%). This rule means 75% of transactions including bread, butter also contain milk. Also, 40% of all transactions contain

the third item. Association analysis is defined as a process to find all association rules that meet the minimum requirements to support (minimum support) and the minimum requirements for confidence (minimum confidence). If support \geq minimum support and confidence \geq minimum confidence, then the rule can be expressed as interesting rule.

2) Pseudo code for Apriori algorithm

Apriori(T, ϵ)

$L_1 \leftarrow \{ \text{large 1-itemset that appears in more than } \epsilon \text{ transactions} \}$

$K \leftarrow 2$

While $L_{k-1} \neq \emptyset$

$C_k \leftarrow \text{Generate}(L_{k-1})$

For transaction $t \in T$

$C_t \leftarrow \text{Subset}(C_k, t)$

For candidates $c \in C_t$

$\text{Count}[c] \leftarrow \text{Count}[c] + 1$

$L_k \leftarrow \{ c \in C_k \mid \text{Count}[c] \geq \epsilon \}$

$k \leftarrow k + 1$

return $\cup L_k$

B. Algorithm To Display Offers On Products:

- 1) Find the purchase sequence using above Apriori algorithm.
- 2) Get Last date of purchase.
- 3) Set the value of D as threshold number of days.
- 4) If (Difference is greater than D days).
- 5) "Display according to purchase sequence".
- 6) else
- 7) "Display last transactions remaining departments && star offers."
- 8) end

C. Algorithm to Negotiate for Better Deals:

- 1) Get Product details
- 2) Set profit_margin1, profit_margin2
- 3) Accept user response and apply NLP.
- 4) If (user accepts the offer) then "add product to cart"
- 5) else
calculate $d = \text{MRP} - \text{CP}$
deduct profit_margin n% of d from MRP and increase the quantity by m
- 6) if (user accepts the offers) "add products to cart"
- 7) else
deduct profit_margin n* % of d from MRP and increase the quantity by $m*$ && show some subcategory options
- 8) //Increase the negotiation step based on mining.

D. Algorithm to Generate User Cart Bill:

$$\text{TOTAL BILL AMOUNT} = \sum_{i=1}^{i=n} ((\sum Q_i P_i - dp_i))$$

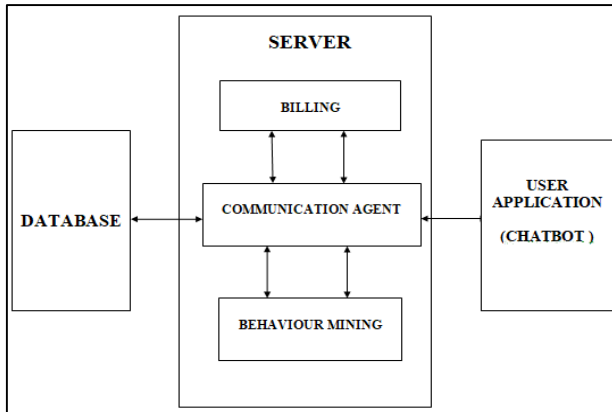
Where,

P_i - price of the product per item

Q_i - quantity of the product i

Dp_i - discount price on the product i

V. SYSTEM ARCHITECTURE



VI. ADVANTAGES

- 1) Negotiation between consumers and sellers using a chatbot expanding business strategies.
- 2) Precise prediction of user next purchase sequence by applying new methodologies.
- 3) Data-driven and user-centric approach for market basket prediction

CONCLUSION

The system proposed by this paper will help users negotiate the prices of the products in real time with chatbot. Hence providing better shopping experience to the customers as well as a better business enhancing opportunity to the shopkeepers.

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