



# SMART ADS RECOMMENDATION IN E COMMERCE BASED ON CUSTOMER SEGMENTATION USING MACHINE LEARNING

Sahana G<sup>1</sup>, Mohan Kumar H.P<sup>2</sup>

Department of Computer Science and Engineering, PES College of Engineering Mandya, Karnataka, India<sup>1-2</sup>

**Abstract:** The application for malls or e commerce platform that divide the customers into profitable and non-profitable customers plays a vital role in the marketing sector. The administrator within the shopping centers chooses to promote methods and client division points to form a relationship with the first profitable clients by arranging the foremost appropriate marketing procedure. Numerous methods are applied to separate the advertising, but outstandingly tremendous data is uncommonly effective in decreasing their adequacy. Many works used association rule learning is used to establish a relationship between variables. With the use of an appropriate algorithm in this, we find what items customers frequently buy together by generating the set of rules and can be used those rules for various market strategies. By using that rules, we also develop a recommender framework that will offer assistance the mall managers or e commerce managers to empowering the market strategies. This not only helps customers have a better choice but also gives advice to businesses selling products with reasonable prices. Customer segmentation is done based on their interest using association learning algorithms like Apriori algorithm or ECLAT algorithm or SFIT algorithm.

**Keywords:** Clustering techniques used k means, Fuzzy c means algorithm

## I. INTRODUCTION

In real time we have 2 different ways of shopping, online shopping and offline shopping nothing but manual shopping. The major goal of any business is to get good profits and also customer satisfaction is important. It is important factor for any kind of business to provide services as per the customer needs. If business provides services as per the customer tastes and needs, definitely business will get profits. Both in manual shopping and online shopping it is important to attract the customers and impress customers by providing some offers, discounts, coupons etc. so that customers will be more impressed and attracted which leads to business profits.

Advertisements is a platform to reach consumers. We can publish advertisements in many modes like TV, 2 publishing ads in social media, newspaper, business websites etc. While posting advertisements it is important to find the target customers for the business[2]. In current system advertisements will be posted universal means all different types of customers will get the advertisement posts both in online shopping and manual shopping. Advertisements plays a vital role in attracting suitable customers and improvises the business. In real time customers taste differs, it vary from customer to customer. So it is very important to find what customer wants[8].

Detecting customers' tastes is a challenging task in the current business sector. Both in online shopping and real time shopping it is very important to predict the customer area of interest means customers buying behavior. Many existing e commerce websites provides many customer based features such as recommending products based on customer browsing history, recommending similar products, frequently bought together products, rating for the purchased products. But all these recommendations are universal, published to all category of customers.

## II. OBJECTIVES

1. Proposed system is a new e commerce application which provides services as per customer needs.
2. Proposed system is a GUI based application where customers can browser products, can add products into cart and can buy the products.
3. System major objective is to predict the target customers based on their transactions for advertisements.
4. System is an Ads based Recommendation system for customers using machine learning algorithms[4].



5. System uses unsupervised learning algorithms to process the customer transactions datasets and predicts the customer's area of interest and taste.
6. System uses algorithms such as FP growth algorithm, Apriori algorithm or ECLAT algorithm or SFIT algorithms to find the target customers for advertisements.
7. System is a browser based application where using browsers we can access.
8. In real time we require internet connection to access[5].

### III. LITERATURE REVIEW

**1. Customer Segmentation Using Credit Card Data Analysis:** AUTHORS: Saikat Raj , Santanu Roy, Surajit Jana, Soumyadip Roy ,Takaaki Goto ,Soumya Sen. Customer segmentation is a separation of a market into multiple distinct groups of consumers who share the similar characteristics. Segmentation of market is an effective way to define and meet Customer needs and also to identify the future business plan. In this research work the spending of different customers who have credit cards are analyzed to segment them into different clusters and also to plan further business improvements based on the different characteristics of these identified clusters.

**2. Mall Customer Segmentation Using Machine Learning: A Comprehensive Review:** *Author(s): Arjun Mukherjee, Sushmita Roy, and Karan Singh (2018)* This paper provides a comprehensive review of deep learning approaches for waste classification. The authors discuss various neural network architectures, including Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and hybrid models. They highlight the strengths and limitations of each approach and provide a comparative analysis of their performance on benchmark datasets. The review underscores the superiority of CNNs in handling image-based classification tasks and suggests future directions for improving model accuracy and robustness.

**3. Customer Segmentation Using Machine Learning.:** YEAR OF PUBLICATION: 2022 AUTHORS: V. Lakshman Narayana; S. Sirisha; G. Divya; N. Lakshmi Sri Pooja; Sk. Afraa Nouf. Take our hypothetical firm as an example, and you're trying to figure out how well a particular product will perform from a marketing perspective. Customers might be segmented based on their market behavior. Identify client segments to focus on the possible user base by using clustering techniques (K- means, Agglomerative, and Mean Shift). As a result, they segment customers into groups based on similar factors such as gender and age as well as interests and spending habits Clustering techniques used k means, Fuzzy c means algorithm.

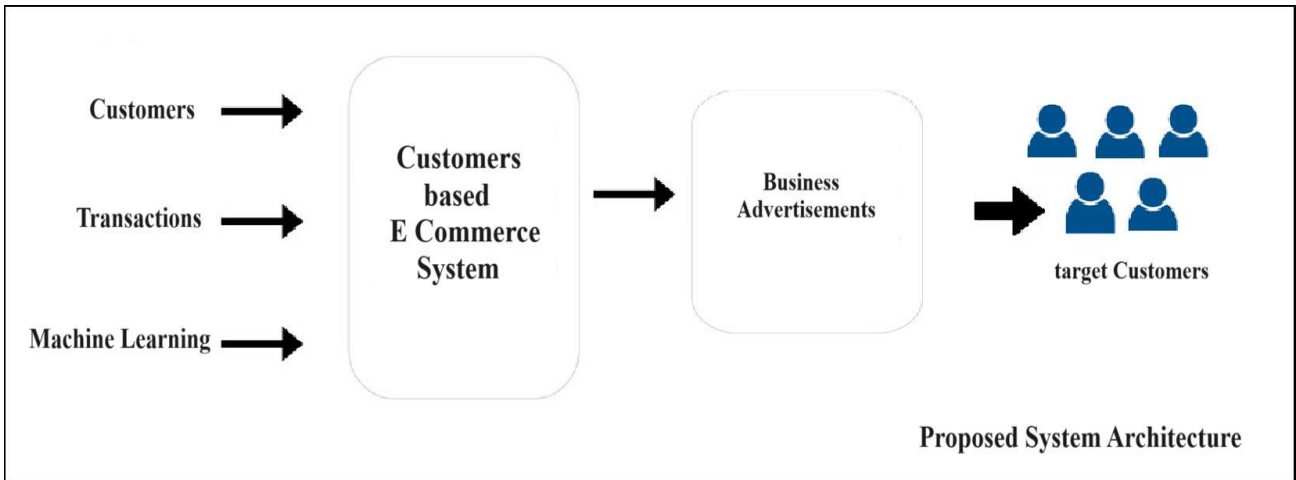
**4. Recommender Systems for E-commerce in online video advertising: Survey.** YEAR OF PUBLICATION: 2021 AUTHORS: Heba Adnan Raheem; Tawfiq A. al-assadi. Recommendation systems (RS) have become very widely used in recent years. They assist clients in getting data and making selections when they lack the knowledge required to judge on certain item. They can help the customer in efficacious information sorting. They are software system techniques that make suggestions supporting the client's taste to find new things acceptable for them from a huge amount of data by filtering personal information. The user's likes and preferences should precisely be identified in order to make the most appropriate suggestions. Recommendation systems have a crucial role in online video advertisement through introducing new products onto the market.

### IV. METHODOLOGY

Association (or relation) is probably the better known and most familiar and straightforward data science technique. Here, we make a simple correlation between two or more items, often of the same type to identify patterns.

For example, Market-basket analysis, where we track people's buying habits, we might identify that a customer always buys cream when they buy strawberries, and therefore suggest that the next time that they buy strawberries they might also want to buy cream.

System uses algorithms such as FP growth algorithm, Apriori algorithm or ECLAT algorithm or SFIT algorithms to find the target customers for advertisements.



**Step 1:** Required data extracted from the server. In our project we extract customer transactions (orders) from the server.

**Step 2:** data preprocessing is done, where we remove the irrelevant data and extract the required data for processing. In our project irrelevant data means customer id, name, mobile etc.. all these are irrelevant data.

**Step 3:** once data preprocessing is done, desired data is inputted to the efficient unsupervised learning algorithms such as Apriori algorithm and Eclat algorithm for processing.

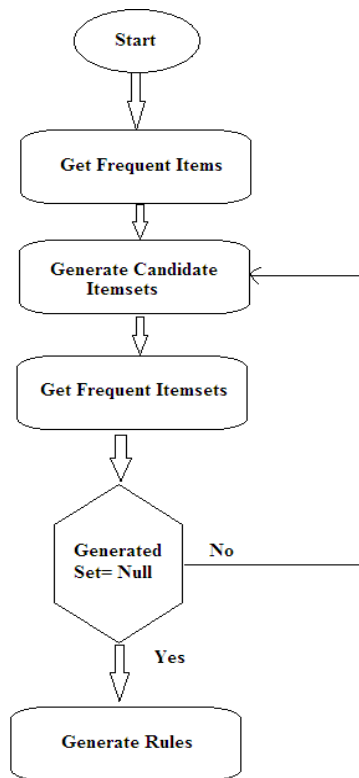
**Step 4:** Algorithms process the data and finds the customers area of interest, means desired customers for the recommendation of Ads.

**Step 5:** both the algorithms are tested and results are compared to find the best algorithm.

**Step 6:** Efficiency of both algorithms compared and best algorithm is chosen.

**Step 7:** Using that best algorithms Ads will be recommend for the desired customers (target customers).

**Apriori Algorithm**



Flow of the Algorithm

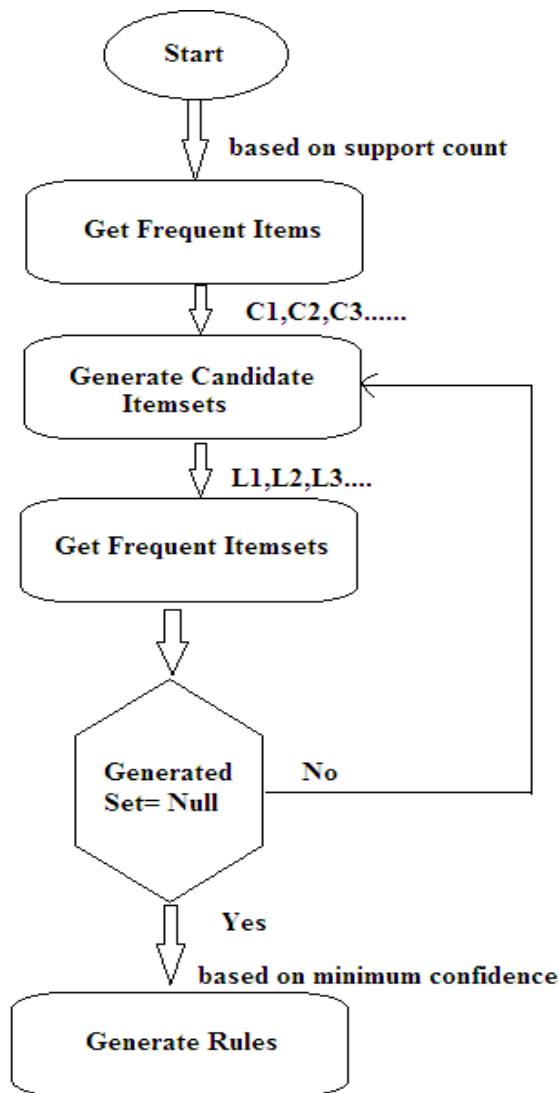


**Apriori Algorithm Pseudo-code**

```

Apriori (T, minSupport)
C1 = {candidate 1-itemsets}; L1 = {c∈C1|c.count≥ minsup};
FOR (k=2; Lk-1≠∅; k++) DO BEGIN
Ck=apriori-gen(Lk-1);
FOR all transactions t∈D DO BEGIN Ct=subset (Ck,t);
FOR all candidates c∈Ct DO c.count++;
END
Lk={c∈Ck |c.count • minsup} END
Answer=* Lk;
    
```

**Eclat Algorithm**



**Flow of the Algorithm**

**Apriori TID Algorithm Steps**

- STEP 1: Scan the data set and determine the support(s) of each item. STEP 2: Find C1'
- STEP 3: Generate L1 (Frequent one item set). STEP 4: Find C2', C3' .....
- STEP 5: Use Lk-1, join Lk-1 to generate the set of candidate k - item set.



STEP 6: Scan the candidate k item set and generate the support of each candidate k – item set by comparing with previous step (but not with the original data-set as we did in apriori algorithm).

STEP 7: Add to frequent item set, until C=Null Set.

STEP 8: For each item in the frequent item set generate all non empty subsets.

STEP 9: For each non empty subset determine the confidence. If confidence is greater than or equal to this specified confidence .Then add to Strong Association Rule.

## V. RESULTS & DISCUSSION

K-means is a scalable algorithm for large datasets, boasting nearly linear time complexity and compact storage needs. It's a straightforward and efficient method that shines when data points are well-separated, but falters with overlapping or non-linear data. A key drawback is the need to specify the number of clusters ('k') in advance. Hierarchical clustering, on the other hand, eliminates the need for a predefined 'k' value, allowing the optimal number of clusters to emerge from the dendrogram. Nevertheless, its suitability for large datasets is hindered by its cubic time complexity and quadratic memory requirements, stemming from the need to store the dendrogram. Amazon achieved a 20-30% increase in sales using a recommender system (Schafer et al.) Recommendation systems help e-commerce websites maximize profits .Personalized recommendations lead to increased customer satisfaction. Online video advertising is an effective way to display product ads. Machine learning and deep learning technologies improve recommendation accuracy.

## VI. CONCLUSION

Both in real time shopping and online shopping there is no customer based services and it lacks to satisfy the customers. As it is important to know the customer tastes and requirements and providing the services as per their need to improve the business and attain best business profits. Current system is universal recommendation and publishing ads for all types of customers which may lead to more time consumption, expensive and lacks customer satisfaction.

Future work:

Efforts may be directed towards developing real-time garbage classification systems that can operate efficiently on edge devices or embedded systems. This would enable applications such as smart waste bins or garbage sorting robots to classify items on the spot without relying on cloud or server-side processing. Integrate more sophisticated machine learning models, such as deep learning and neural networks, to improve the accuracy of customer interest predictions. Implement real-time analytics to dynamically adjust advertisements and recommendations based on current customer.

## REFERENCES

- [1]. T. Kansal, S. Bahuguna, V. Singh and T. Choudhury, "Customer Segmentation using K-means Clustering," 2018 International Conference on Computational Techniques, Electronics and Mechanical Systems (CTEMS), 2018, pp. 135-139, doi: 10.1109/CTEMS.2018.8769171.
- [2]. Dolnicar, Sara. "Market segmentation for e-Tourism." Handbook of eTourism (2020): 1-15.
- [3]. "Intelligent and Fuzzy Techniques in Big Data Analytics and Decision Making" Proceedings of the INFUS 2019 Conference, Istanbul, Turkey, July 23-25, 2019
- [4]. Ezenkwu, Chinedu Pascal, Simeon Ozuomba, and Constance Kalu. "Application of K-Means algorithm for efficient customer segmentation: a strategy for targeted customer services." (2015).
- [5]. Sari, J.N., Nugroho, L.E., Ferdiana, R. and Santosa, P.I., " Review on customer gio, and Geoffrey Hinton (2015). "Deep Learning." *Nature*, vol. 521, pp. 436-444.