

A TWO-LAYER CUSTOMER CLUSTERING MODEL PROVIDING A MACRO AND MICRO PERSPECTIVE TO ASSIST MOBILE-CUSTOMER-RELATIONSHIP MANAGEMENT

Reddy Rani V¹, Anjan Babu G²

¹PG Student, Department of Computer Science, Sri Venkateshwara University Tirupati

²Professor, Department of Computer Science, Sri Venkateshwara University Tirupati

Abstract

In the recent years with vast number of data mining and Big Data applications enumerated in various areas. Customer division gives a viable and proficient approach to acquire experiences into customer qualities and conduct inclinations. So as to improve customer relationship the board and to concentrate on a progressively changing commercial centre, we have assembled a two-layer clustering model for versatile telecom customer investigation. The principal layer distinguishes the group by area master as per the commitment of the essential level of customer division. The second layer utilizes bunching calculations to assemble together profoundly homogeneous gatherings and distinguish agent bunches so as to clarify the attributes of the gathering. It at that point constructs a portable customer grouping model dependent on customer traits, commitment to help ventures see changes in customer esteem and conduct. The clustering after effects of this examination are coherent, have promoting suggestions, and are instinctive. They can be joined with the item to help showcasing staff with successful promoting. After confirmation, this strategy achieves the ideal outcomes.

Keywords: Clustering, Data Mining, Big Data.

I. INTRODUCTION

With the improvement of enormous information and information mining innovation, the mass stockpiling of inward venture data can be examined adequately by utilizing the shrouded client esteem that can be found by mining. Advancement of promoting exercises and relationship support is likewise founded on a formerly broad advertising model that was advanced to focus on the client base, get top to bottom comprehension, and fit the requirements of the client base of accuracy promoting. An undeniably imperative issue is the way to incorporate the promoting assets, and how to legitimately disseminate and coordinate individual client premiums and inclinations with the best profit by showcasing exercises, just as mining appealing items or administrations [1]. Information bunching and grouping calculations give a

productive method to aggregate exceedingly homogeneous people furthermore, relegate disparate people to the suitable sections [2]. In industry and the scholarly community, there are numerous instances of bunching investigation being utilized to set up bunch attributes: "client gathering examination" is a well known application [3].

By breaking down client properties, practices, and inclinations, the high homogeneity of individual bunches, and the high level of difference of people given the suitable portion. Notwithstanding adequately control the homogeneity of the attributes of high client base, can likewise be utilized as ventures for the constrained client base to create the executive's methodologies and advertising standards of the establishment to help client relationship the executives.

Clustering algorithms can be divided into the following general categories:

- 1) hierarchical—the data points are merged or split to form the target clusters;
- 2) partitional—the number of clusters to be formed is specified in advance, and the data points are assigned iteratively to the respective clusters;
- 3) density-oriented—clusters are formed by concatenating the data space distribution density thresholds in line with the data points;
- 4) grid oriented—the data space is quantized into a grid structure in accordance with the grid-based units for clustering;
- 5) model-based—existing models (often statistical ones) are used to cluster data points individually [4]. Cluster analysis is widely used for multivariate data analysis in fields such as medicine, economics, text mining,

and commercial applications. There have been many studies on cluster analysis for separating data characteristics and detecting data clustering phenomena. There are many business applications, such as target/direct marketing based on customer grouping and clustering, customization services, good customer-relationship management, as well as customer behavior, attributes, and preferences.

II EXISTING SYSTEM

In existing system, Data clustering and clustering algorithms let us group highly homogeneous individuals and assign dissimilar individuals to the appropriate segments. By analyzing customer attributes, behaviors, and preferences, we can determine the high homogeneity of individual clusters, and the high degree of dissimilarity among individuals, given the appropriate segments. In addition to effectively controlling the homogeneity of characteristics among the mass customer base, this analysis can also be used for limited customers—for example, to develop management

strategies and marketing principles to assist in customer relationship management (CRM).

Disadvantages

1. It is not a cost-effective solution, as it needs a good server design which can be a bit expensive.
2. Server clustering is not much flexible, as not all the server types can be clustered
3. There are many applications which are not supported by the clustered design.

III PROPOSED SYSTEM

In this study, we propose a two-layer clustering model based on the analysis of customer attributes, customer contributions, and cluster segmentation. We cluster the value of mobile customers and execute customers' characteristics on a regular basis in a systematic way. Our model can also be applied to other business areas that track consumer behavior, such as membership cards used in retail sales (as with Costco) or bank-issued credit cards. Through such cards, organizations can record and identify customer consumption and use our proposed clustering model for business analysis. Preference analysis can help a company view changes in customer value and behavior and, at any time, adjust its product strategy to retain high-quality customers. Our model provides a way for companies to plan for long-term CRM and retain high-quality customers. In addition, short-term marketers can use this modeling approach to promote products or services accurately.

Advantages:

1. Server clustering is completely a scalable solution. Resources can be added to the cluster accordingly.
2. Server clustering is specifically designed for high availability solution.

IV METHODOLOGY

A telecoms business can have as many as 10 million mobile customers. If there is no further customer segmentation in accordance with the business, characteristics and other conditions to distinguish. Not only is it difficult to grasp the dynamic changes in customer management, the retention for customers will also cause huge maintenance costs. Therefore, this study will provide telecommunications companies based on operational needs (including mobile, data, and other business) in accordance with the two-layer clustering model for customer segmentation. Figure 1 shows a flowchart of the two-layer clustering model.

This method begins by collecting and segmenting the contribution of individual customers, their personal preferences, overall customer profile, and other factors. The overall customer segmentation for a number of customers is in the order of 105–106 clusters. These clusters are then used to develop a general strategy for customer-relationship management, which forms the first layer of clusters. After the first layer of the target has been clustered, the characteristics of the subgroups are described and interpreted by the subdivision of the second layer clustering algorithm. With the big data platform data cross-analysis function, to further develop the maintenance of each group of customers, as well as effective marketing programs to form the second layer of customer clustering analysis.

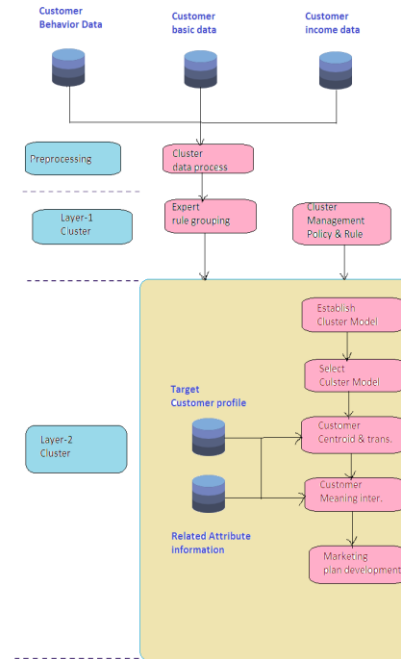


Fig: Two Layer Clustering Model

The aims of the proposed two-layer clustering model are as follows:

- (1) To provide real-time, diverse, and rich customer information through pre-planned, pre-analysis to strengthen the target customer base and reduce the workload of marketing staff;
- (2) To evaluate the customer segmentation strategy for each group to improve the effectiveness of activity planning and the customer-relationship management strategy;
- (3) To use data mining technology to tap potential target customers, increase the feasibility of marketing products and services, and improve the accuracy of precision marketing.

Layer 1 Clustering Architecture

The first-layer cluster architecture (hereinafter referred to as the L1 cluster) uses mean and divides the customers into two groups according to two-dimensional attributes, as shown in Fig. 2. The

horizontal axis divides the overall mobile-customer base in the range 0–99 (i.e., a total of 100 rankings) according to the customer’s contribution to the company’s revenue. The higher the value, the higher the contribution on behalf of the customer, and the higher the customer’s value to the company. The vertical axis is based on voice-leased monthly bills. The higher the voice-call monthly fee, the greater the customer’s reliance on the telecom’s mobile service, and the higher the demand for mobile calls.

Layer 2 Clustering Architecture

The second-level grouping (hereinafter referred to as the L2 cluster) is structured under the L1 cluster of expert rules. Subgroups are subdivided for each L1 cluster, as shown in Fig. 2. First of all, we aggregate for each L1 cluster by calculating the customer’s communication-use behavior to distinguish between the behavior of customer preferences and their business habits. The cluster variables used by the L2 cluster subdivision may vary depending on whether the customer belongs to different L1 clusters. Taking mobile-customer segmentation as an example, in general postpaid customers S1–S6 group. In order to find out the main sources of communication behavior and customer contribution, thus adding the inter/intra network traffic minutes, the number of called objects, the ratio of each sub-item to the total bill and other variables.

The components of our proposed model are given by

1. Clustering Server:

- (a) we can determine the high homogeneity of individual clusters, and the high degree of dissimilarity among individuals, given the appropriate segments.

- (b) a two-layer clustering model based on the analysis of customer attributes, customer contributions, and cluster segmentation. We cluster the value of mobile customers and execute customers’ characteristics on a regular basis in a systematic way.
- (c) through such cards, organizations can record and identify customer consumption and use our proposed clustering model for business analysis. Preference analysis can help a company view changes in customer value and behavior and, at any time, adjust its product strategy to retain high-quality customers.

2. Customer:

- (a) In addition to effectively controlling the homogeneity of characteristics among the mass customer base, this analysis can also be used for limited customers—for example, to develop management strategies and marketing principles to assist in customer relationship management (CRM).
- (b) Our model provides a way for companies to plan for long-term CRM and retain high-quality customers. In addition, short-term marketers can use this modeling approach to promote products or services accurately.
- (c) Business applications include targeted or direct marketing based on customer grouping and clustering, customization services, good CRM, and customer behavior, attributes, and preferences.

3. Marketing:

- (a) customers form appropriate segments, which helps the company focus on its target customers and then develop CRM,

marketing strategies, and promotional activities.

- (b) The big data platform cross-analysis function maintains each group of customers and, along with effective marketing programs, forms the second layer of customer clustering analysis.
- (c) provide real-time, diverse, and rich customer information through preplanned pre-analysis to strengthen the target customer base and reduce the workload of marketing staff.
- (d) use data mining technology to tap potential target customers, increase the feasibility of marketing products and services, and improve the accuracy of precision marketing.

ALGORITHM

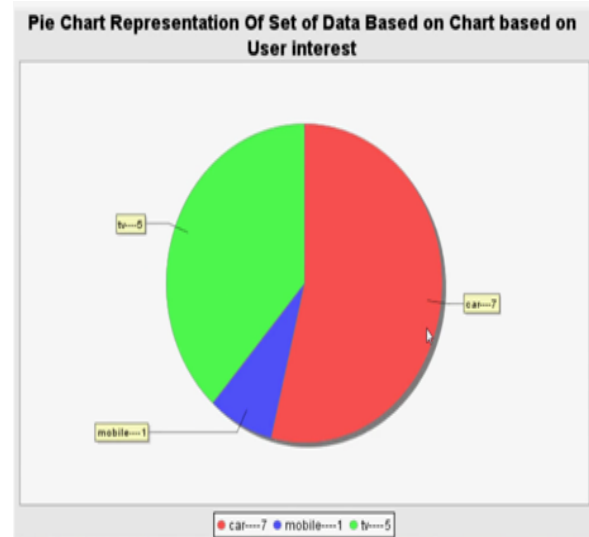
Hierarchical Clustering:

1. In the first case data are grouped in an exclusive way, so that if a certain datum belongs to a definite cluster then it could not be included in another cluster.
2. Instead, a hierarchical clustering algorithm is based on the union between the two nearest clusters. The beginning condition is realized by setting every datum as a cluster. After a few iterations it reaches the final clusters wanted. Finally, the last kinds of clustering use a completely probabilistic approach.

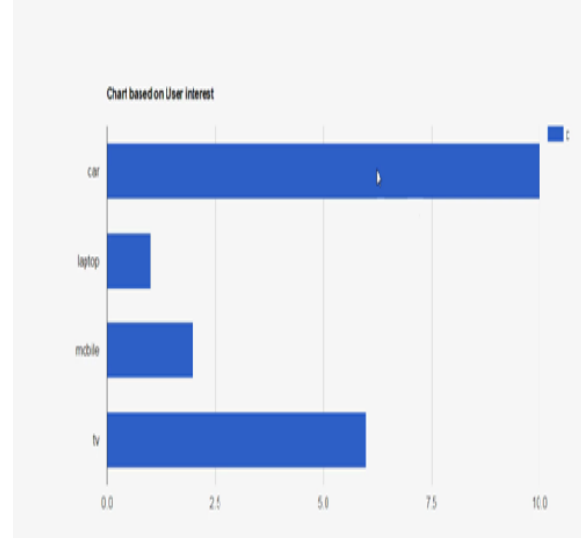
Outlier Processing:

Replace the outliers using the ceiling or floor method to avoid bias due to extremes that affect the clustering algorithm in determining customer attributes.

The results are compared with the following parameters and represented in pie and bar charts as follows:



A Two-Layer Clustering Model for Mobile Customer Analysis



V CONCLUSION

We present a two-layer customer clustering model is proposed, providing a macro and micro perspective to assist mobile-customer-relationship management. Marketers can use the technology of pre-analysis and data mining to target their customers and sell the company’s products and services with accurate marketing. In addition, the expert-rule L1 subgroup can also help companies to

develop their general direction of customer relationship management to enhance the purpose of customer service quality. Customer bunching is just incorporated into group demonstrating through versatile voice, information utilization conduct, client commitments, and client base information. In future work, we plan to expand the gathering of the client factors determination work. For various advertising or business needs, a client bunching model will be set up to build the adaptability of client grouping applications. Moreover, as per changing client bunch structures to accomplish a set edge esteem, we mean to build up restart of the bunch demonstrating process or alter the advertising system of the notice component to improve the dynamic criticism show gathering benefits.

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VUGGARARAPU REDDY RANI she is a master of Computer Science (M.Sc) pursuing in Sri Venkateswara University, Tirupati, A.P. She received Degree of Bachelor of Science in 2017 from Sri Venkateswara University, Tirupati. Her research interests are Networking, Cloud Computing, and Digital Electronics.