ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11 , Iss 09, 2022

Dynamic Churn Prediction Using Machine Learning Algorithms Predict Your Customer Through Customer Behaviour

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Abstract

In current days, the customers are getting more attracted towards the quality of service (QoS) provided by the organizations. However, the current era is evidencing higher competition in providing technologically advanced (QoS) to the customers. Nevertheless, efficient customer relationship management systems can be advantageous for the organization for gaining more customers, maintaining customer relationships and improve customer retention by adding more profit to the organizational business. Furthermore, the machine learning models such as support vector machine algorithms can add more value to the customer retention strategies.

I. Introduction

Customers always play vital role in increasing profit and revenue of every organization; hence, to gain customer satisfaction it is important for the organizational managers to maintain one efficient customer relationship management system by selecting the target customers and maintaining effective relationship with them. Moreover, the CRM system will be helpful for the organization in identifying the most prominent group of customers and their behavior; which will become beneficial for the organization in understanding the retention strategies in a better way. Additionally, higher the customer loyalty, lesser is the customer churn rate; hence using machine learning algorithm such as support vector algorithm can add value in preventing the customer churn. This report will focus on the customer retention with the usage of support vector machine learning in gaining customer loyalty and increasing retention.

II. Literature Survey

1) The Roles Of Justice And Customer Satisfaction In Customer Retention: A Lesson From Service Recovery
AUTHORS: Noel Y. M. Siu

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Customers complain because they want to be treated fairly by the company when a service failure occurs. The role of perceived complaint justice and its relation to customer satisfaction has been discussed and researched. However, a static view is mostly adopted in previous literature. We argue that satisfaction is cumulative and both prior satisfaction and post-recovery satisfaction should be looked at in relation to complaint justice in the context of service recovery. This study attempts to fill the gap by investigating the mediating role of justice in the relationship between prior satisfaction and post-recovery satisfaction (both with the recovery and with the organization) and examining the mediating role of post-recovery satisfaction in the relationship between the dimensions of justice and customer retention. Hypotheses were tested using a sample of 200 customers that had service failure experience at Chinese restaurants in Hong Kong. Justice dimensions (distributive justice, procedural justice, and interactional justice) were found to fully mediate the relationship between prior satisfaction and satisfaction with recovery. All dimensions, except the interactional justice, were also found to be partial mediators in the relationship between prior satisfaction and post-recovery satisfaction with organization. Findings also revealed the mediating roles of two post-recovery satisfaction variables in transferring the justice dimensions into behavioral intention, with the two variables playing almost opposite roles. Discussion and recommendations are provided for future development and improvement in building long-term relationship with customers.

2) Influence Of Customer Satisfaction On Loyalty: A Study On Mobile Telecommunication Industry

Authors: Hossain

The mobile telecommunication companies uphold their service quality and change their marketing core strategies to retain their existing customers by enhancing and optimizing the customer loyalty. Therefore, it becomes significant for telecom companies to identify factors of services that influence customer loyalty and in turn creates loyal customers by satisfying t hem. This present study aims to explore the influence of customer satisfaction on customer loyalty in the context of Bangladesh. This study focused on six factors such as communication, price structure, value-added service, convenience, sales-promotions and customer service. Both primary and secondary information were collected to test the pre-set hypotheses. Descriptive statistics and simple linear regression were employed to analyse the data. Result shows that five factors: communication, price structure, value-added service s, convenience and customer service/care have positive correlations with customer loyalty.

3) A Comparison Of Machine Learning Techniques For Customer Churn Prediction

AUTHORS : T.Vafeiadisa,K.I.Diamantaras

We present a comparative study on the most popular machine learning methods applied to the challenging problem of customer churning prediction in the telecommunications industry. In the first phase of our experiments, all models were applied and evaluated using cross-validation on a popular, public domain dataset.

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In the second phase, the performance improvement offered by boosting was studied. In order to determine the most efficient parameter combinations we performed a series of Monte Carlo simulations for each method and for a wide range of parameters. Our results demonstrate clear superiority of the boosted versions of the models against the plain (non-boosted) versions. The best overall classifier was the SVM-POLY using AdaBoost with accuracy of almost 97% and *F*-measure over 84%.

4) Social interactions in customer churn decisions: The impact of relationship directionality

AUTHORS : MichaelHaenlein

The impact of social factors on individual-level decision making has been a subject of general interest within the marketing field. However, studies analyzing social interactions and social contagion have, to a great extent, focused on the importance of social interactions in the customer acquisition process and have relied on the use of undirected networks. Our study contributes to the literature stream by focusing on two elements that have been analyzed less frequently. Specifically, we focus on the importance of social interactions in the customer retention process within a directed social network. Using the customer base of a mobile phone provider, we rely on call detail records to investigate the churn behavior of 3431 focal actors. We provide evidence for social interactions in customer churn decisions and show that, at any given point in time, a focal actor is significantly and substantially more likely to defect from a provider if other individuals to whom that actor is socially connected have previously defected from the provider. However, this effect is limited to social contacts with whom the focal actor has *outgoing* calling relationships and who have churned relatively recently (in our sample, less than 5 weeks prior to the point in time that is under examination). We therefore provide empirical evidence demonstrating that social effects do play a role in customer retention but only when tie directionality and churn recency are taken into account.

5) Churn prediction using comprehensible support vector machine: An analytical CRM application

AUTHORS: M.A.H.Farquadabc,VadlamaniRavi

Support vector machine (SVM) is currently state-of-the-art for classification tasks due to its box" model, i.e. it does not reveal the knowledge learnt during training in human comprehensible form. The process of converting such opaque models into a transparent model is often regarded as *rule extraction*. In this paper we proposed a hybrid approach for extracting rules from SVM for customer relationship management (CRM) purposes. The proposed hybrid approach consists of three phases. (i) During first phase; SVM-RFE (SVM-recursive feature elimination) is employed to reduce the feature set. (ii) Dataset with reduced features is then used in the second phase to obtain SVM model and support vectors are extracted. (iii) Rules are then generated using Naive Bayes Tree (NBTree) in the final phase. The dataset analyzed in this research study is about Churn prediction in bank credit card customer (Business Intelligence Cup 2004) and it is

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highly unbalanced with 93.24% loyal and 6.76% churned customers. Further we employed various standard balancing approaches to balance the data and extracted rules. It is observed from the empirical results that the proposed hybrid outperformed all other techniques tested. As the reduced feature dataset is used, it is also observed that the proposed approach extracts smaller length rules, thereby improving the comprehensibility of the system. The generated rules act as an early warning expert system to the bank management..

III.SYSTEM ANALYSIS

EXISTING SYSTEM:

One of the most direct and effective approaches to keep the current customers is that the company should be able to foresee potential churn in time and react to it quickly. Recognizing the indications of potential churn; satisfying customer needs, restoring and re-establishing loyalty are actions supposed to help the organization minimize the costs of gaining new customers. A big problem that encounters businesses, especially telecommunications business is 'customer churn'; this occurs when a customer decides to leave a company's landline business for another cable competitor. Therefore, our existing system beyond this study to build a model that will predict churn customer through defining the customer's precise behaviors and attributes. We will use data mining techniques such as clustering, classification and association rule.

DISADVANTAGES OF EXISTING SYSTEM:

- The difficulties faced by researchers in this study such as the value of missing data or inconsistent data.
- Using datamining techniques we cannot predict exact results.
- Algorithm: Data mining Techniques

PROPOSED SYSTEM:

Machine learning can be considered as the effective application of the artificial intelligence, which has been widely used by the telecom industries in evaluating and nullifying the customer churn. Support vector machine learning is one vital machine learning algorithm that efficiently performs the data analysis for predicting the churn. Examining the customer attrition rate in an organization implies the process of churn analysis. In the telecommunication industries, the churn can be identified as the number customers who had discontinued their subscription in a certain time period . A typical churn rate measures the number of customers moving in and out within a given time period. Moreover, for the telecommunication industry, the movement of the customers from one company to another, iscalled churn . The current scenario is evidencing a higher number of churn customers as the particular industry is trying hard to retain more profitable customers. The algorithm the train our data set and efficiently performs the data analysis for predicting the churn.

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ADVANTAGES OF PROPOSED SYSTEM:

- Using machine learning algorithm such as support vector algorithm can add value in preventing the customer churn.
- support vector machine can turned out advantageous for predicting the churn rate.

  Algorithm: Support Vector Machine (svm)

  SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:
System: Intel Core i5.
Hard Disk: 500GB.
Monitor: 15'' LED
Input Devices : Keyboard, Mouse
Ram : 16GB.
SOFTWARE REQUIREMENTS:
Operating system: Windows 10.
Coding Language: Python
Tool: PyCharm, Visual Studio Code
Database: SQLite

IV.SYSTEM STUDY:

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.Three key considerations involved in the feasibility analysis are,

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY: This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY: This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY: The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with

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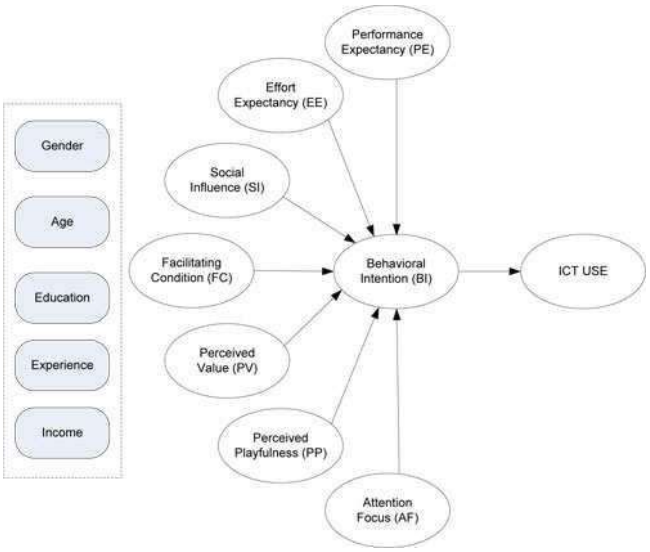
it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

V. SYSTEM DESIGN

SYSTEM ARCHITECTURE:



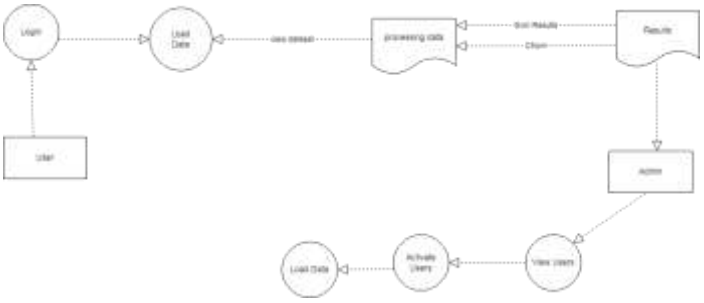
DATA FLOW DIAGRAM:

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.

The data flow diagram (DFD) is one of the most important modelling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.

DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.



UML DIAGRAMS

UML stands for Unified Modelling Language. UML is a standardized general-purpose modelling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modelling Language is a standard language for specifying, Visualization,

ISSN PRINT 2319 1775 Online 2320 7876

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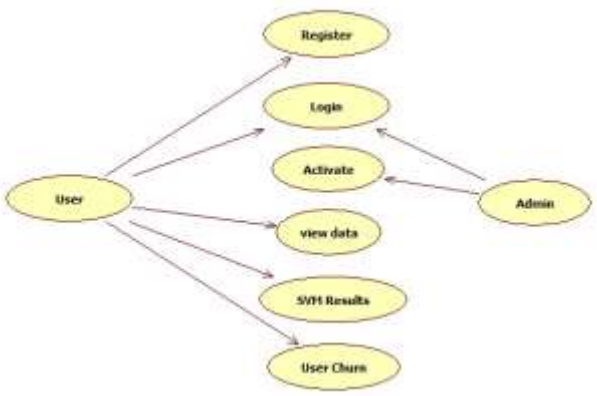
Constructing and documenting the artefacts of software system, as well as for business modelling and other non-software systems.
The UML represents a collection of best engineering practices that have proven successful in the modelling of large and complex systems.
The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.



GOALS:

The Primary goals in the design of the UML are as follows:
Provide users a ready-to-use, expressive visual modelling Language so that they can develop and exchange meaningful models.
Provide extendibility and specialization mechanisms to extend the core concepts.
Be independent of particular programming languages and development process.
Provide a formal basis for understanding the modelling language.
Encourage the growth of OO tools market.
Support higher level development concepts such as collaborations, frameworks, patterns and components.
Integrate best practices.

A use case diagram in the Unified Modelling Language (UML) is a type of behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

CLASS DIAGRAM:

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

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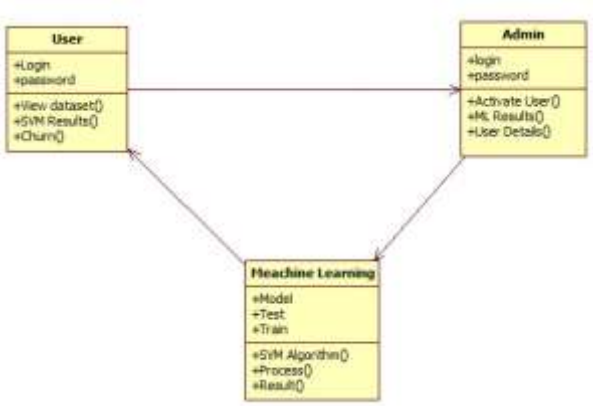
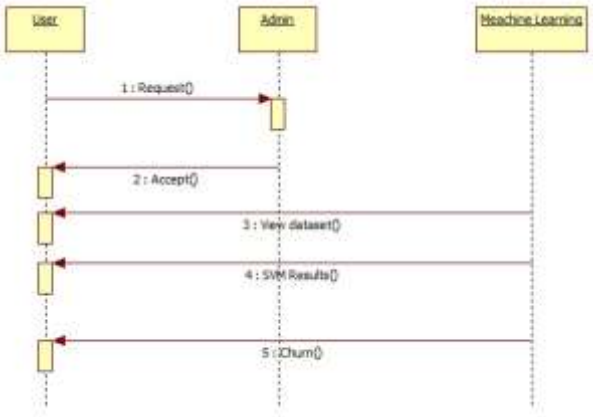


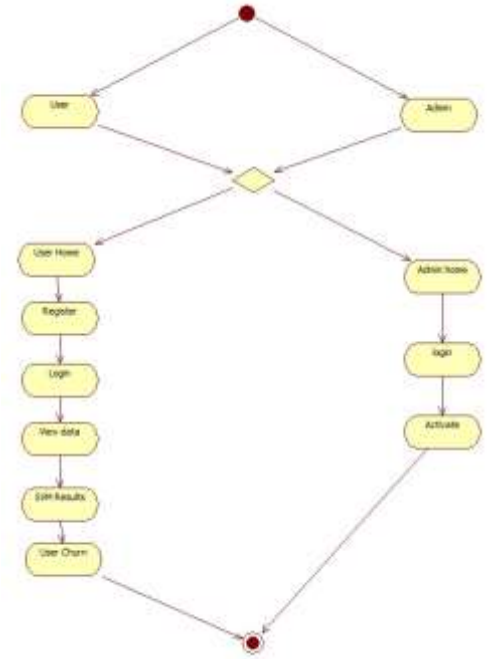
SEQUENCE DIAGRAM:

A sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams



ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.



VIII.MODULES DESCRIPTION:

MODULES:

- User
- Admin

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- Data Pre-processing
- Machine Learning

User:

The User can register the first. While registering he required a valid user email and mobile for further communications. Once the user register then admin can activate the user. Once admin activated the user then user can login into our system. User can upload the dataset based on our dataset column matched. For algorithm execution data must be in float format. Here we took Three Customer Behaviour dataset for testing purpose. User can also add the new data for existing dataset based on our Django application. User can click the Classification in the web page so that the data calculated Accuracy and F1-Score, Recall, Precision based on the algorithms. User can click Prediction in the web page so that user can write the review after predict the review that will display results depends upon review like positive, negative or neutral.

Admin:

Admin can login with his login details. Admin can activate the registered users. Once he activate then only the user can login into our system. Admin can view the overall data in the browser. Admin can click the Results in the web page so calculated Accuracy and F1-Score, Precision, Recall based on the algorithms is displayed. All algorithms execution complete then admin can see the overall accuracy in web page.

Data Preprocessing:

A dataset can be viewed as a collection of data objects, which are often also called as a records, points, vectors, patterns, events, cases, samples, observations, or entities. Data objects are described by a number of features that capture the basic characteristics of an object, such as the mass of a physical object or the time at which an event occurred, etc. Features are often called as variables, characteristics, fields, attributes, or dimensions. The data preprocessing in this forecast uses techniques like removal of noise in the data, the expulsion of missing information, modifying default values if relevant and grouping of attributes for prediction at various levels.

Machine learning:

Based on the split criterion, the cleansed data is split into 60% training and 40% test, then the dataset is subjected to four machine learning classifiers such as Support Vector Machine (SVM). The accuracy, Precision, Recall, F1-Score of the classifiers was calculated and displayed in my results. The classifier which bags up the highest accuracy could be determined as the best classifier.

IX. CONCLUSION

Therefore, from the above discussion, it can be concluded that, regardless of the type of organization, every organization need to concern about the customer churn. Customer retention is the process of maintaining the loyalty of the customer by

Understanding the customer demand and serving the accordingly. Powerful churn prediction model will help the organizational

ISSN PRINT 2319 1775 Online 2320 7876

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management to predict the customer churn. Depending on the complex data of the telecommunication industry, support vector machine can turned out advantageous for predicting the churn rate. The above report has focused on the concept of customer retention along with the churn
Prediction. Apart from that, the use of support vector machine in order to enhance the churn prediction process has been discussed here along with the algorithm.

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