

Churn Prediction in Customer Relationship Management via GMDH-Based Multiple Classifiers Ensemble

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Abstract

Customer relationship management has become a widely used tool to handle interactions with current and future customers. By this the customers who contribute the most to the companies profit can be pin-pointed by the managers

using CRM. With increasing competition among companies it is costly and difficult to convince customers to stick to their products and services. Customer churn is basically when a customer shifts from one company to another. To avoid such customer churn, companies require churn prediction algorithms. It is very important for the company to know what factors lead to a customer churn and what are the counter actions the company can take to prevent such a situation. The prediction algorithms work on basis of a pattern recognition which works on GMDHBased MCE that can predict the factors affecting the customers and can analyse future churners by analysis of their behaviour.

Keywords: CRM- Customer Relationship Management, GMDH- Group Method of Data Handling MCE- Multiple Classifier Ensemble

I. INTRODUCTION

The relationship between a customer and a company is unique. Both parties require each other in different ways. A customer requires a company to purchase a product or obtain a service and the company requires a customer for its business. But a customer always has multiple options when looking for a company. Hence, it is important for a company to satisfactorily manage its relationship with a customer. This necessitates the existence of a Customer Relationship Management or CRM wing. CRM is an approach to managing a customers interaction with current and potential customers. It is the analysis of a customers interactions with the company to improve business partnerships. The end goal of CRM is to drive sales growth.

One of the main aspects of customer relationship management is the compilation of communications done with a customer. This data can be found over a number of channels that were used to get in touch with the customer, which may include the companys website, telephonic conversations, marketing materials and so on. Through the CRM approach and the systems used to facilitate it, companies learn more about their customers and are able to cater to their needs.

A. Types of CRM

There are three main types of Customer Relationship Management:

Operational: The primary objective of customer relationship management is the integration and automation of sales, marketing and customer support. A dashboard is created that gives an overall view of these three functions on a single page for each customer that a company has. The dashboard may provide important details such as client information, past sales, previous marketing efforts and more.

Analytical: The role of analytical CRM is to analyze customer relationship data obtained

through the various different channels used to interact with customers. Various processes such as data mining, correlation and pattern recognition are used in this process.

Collaborative: The third primary aim of CRM systems is to integrate external stakeholders such as suppliers, vendors and distributors and share customer relationship data across organizations.

II. EXISTING SYSTEM

Customer relationship management is a system that exists in companies to handle customer feedback and to interact with customers and cater to their requests. The existing system are either manual record entry based which are difficult to maintain or compiled into a single electronic system which is not reliable. The manual record based system is where the employee maintains a handwritten record of customer feedback and requests and how they have been handled. It is difficult to communicate this information as there is no record available in digital format to transfer. Any information or data that is to be communicated to the customer has to be done either by post or a phone call making it time consuming and inefficient. The CRM which run on a single machine are very unreliable as a single malfunction can lead to complete data loss. Moreover data saved on that system cannot be easily shared as its not suitable to be a server system and so data has to be copied to removable drives which can lead to corruption of data during transfer. There is no continuous link between the owner of the company, the companies employees and their customers.

III. THE PROPOSED SYSTEM

The system proposed is an Android application, which integrates the interactions of the customer, employee and the administrator. The app. The administrator is in charge of the entire CRM system and has full access rights to the database. The administrator can entrust an employee with login details and also revoke access. The administrator can view an employees interactions with a customer and the customers feedback on these interactions. The employee has rights over the database, but they are limited to the customers that are assigned to him/her. The employee can use this access to interact with customers, to send them updates regarding services offered or such. These can be sent through SMS or email. When an employee logs in to the system, a notification is sent about any upcoming meetings with the customer. A customer need not install any application. They will directly receive information from the company, through the administrators or employees. The proposed CRM system is automated internally and the administrator just needs to update the system once and the information is distributed equally among the employees.

IV. MODULES

A. Administrator Module

An administrator is the person who has unrestricted access throughout the system using his Admin ID and Password. The administrator can add new employees by filling the employee details and will provide identity number to the employee to access the system. The Administrator can view employee details. Administrator can view number of leads converted by any particular employee as well as the impact the employee has made on the profit and loss of the company. The module provides the administrator with all the facilities required to monitor the progress of the employees such as the scheduled meetings with the customers. The number of meetings an employee is being a part of per week and how many leads are converted. The entire statistical data is made available to the administrator. The administrator also has the right to change or modify employee meetings about which the employees are notified instantly over the applications notification board. This allows the administrator to attend important meetings where their presence is required.

B. Employee Module

The employee will access the system using the user ID provided by the Administrator and will get an E-mail about the meeting with the customer that is going to be held during the day. Employees will add lead to the database by filling in details into a form. The data from the form is saved in a back end sql database from where the data can be retrieved for future reference. After the meeting with the customers the Employee can convert the lead if the lead is going to be confirmed. The confirmation of the converted lead works on a transaction basis by which there is fault in the data entry. An unconfirmed lead with a wrong entry in the database will lead to a lot of trouble for the employee and administrator not to forget the loss of the company will face. Hence the lead will be updated to the database only after it is confirmed to have been converted. The employees will be provided with an interface which allows them to check the meetings that have been scheduled for them throughout the day. They will also receive instant updates from the administrator and if there were any changes or if any of the time schedules were modified.

C. Customer Module

The customer module regards to only the information that is stored about the customer on the database and there is no interface that the customer can interact with. The information stored about the customer is from the details that the employee feeds into the forms. This information can include the general name and contact of the customer and the description of the topic of discussion with the customer and the meetings

scheduled with the customer. Any information that needs to be communicated to the customer can be done by sending an SMS or email through the app. The information also features a dashboard for every individual customer showing the status of the meetings.

D. Database Module

The database module consists of a Relational Database

Management System (RDBMS) to which the data is fed using Structured Query Language (SQL). The database stores login credentials of the administrator and the employees and also the details about the customers and the topics of discussion of the customers. It also stores the progress of every meeting with the customer and indicates records if the customer is converted or is still pending confirmation. The database system works on Transaction Query Language keeping the records up to date without any discrepancies.

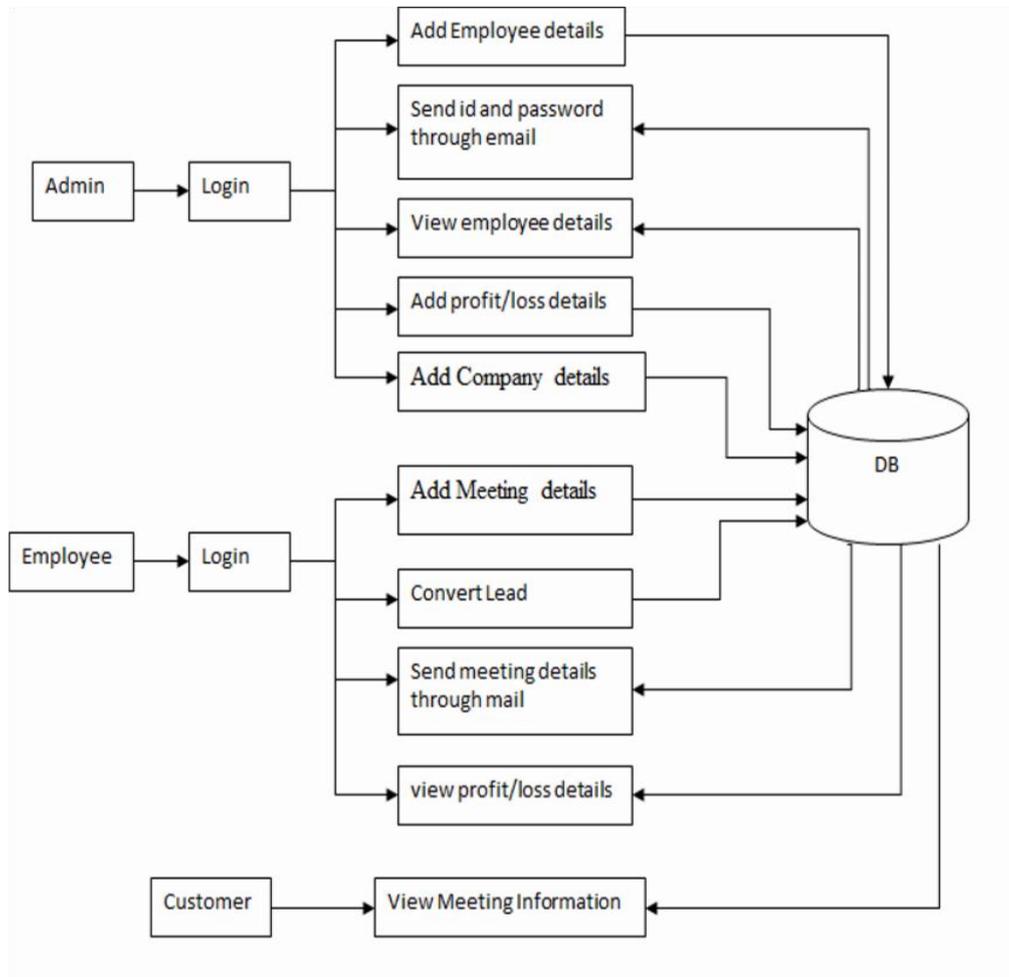
V. PATTERN RECOGNITION ALGORITHM

The pattern recognition algorithm is the key aspect of the application and runs on the back end side of the application and provides constant statistical data to the employees about the customers that they are dealing with. The algorithm starts by sourcing the data from the database which has been populated by the employees. The data is then sorted according to services provided to employees and the response to those services. The response can be either a point of general discussion, a query, a complaint or appreciation of service. Once sorted the pattern recognition algorithm checks for basic trends of complaints and queries about a particular service. This data is then displayed to the employees giving them a better idea the overall acceptance or rejection of the service by the customers and how they can make changes for the betterment.

VI. RESULT ANALYSIS

Customer relationship management via GMDH- based Multiple classifier ensemble has allowed us to increase the efficiency with which customer queries and requests are accepted, analysed and solved. The overall system is compact and does not take up large amount of storage space. Unlike the existing system, our system is reliable and accountable since at any given point of time any data or information regarding the employee or customer can be referred from the the centralised database that is synced with every application user. The existing system does not have a dedicated communication link between the administrator and the employees and uses third party systems. Our application removes this stumble block by providing instant notification

updates to the employees and the admin about modification for any information regarding the customer. The pattern recognition algorithm can trace customer behaviour and response to different services provided by the company and inturn provide the employees with statistical data about how the services of the company have affected customer churn and how to prevent any negative effects.



VII. CONCLUSION

The customer relationship management application is of very good use to companies for handling customer queries and topics of discussion. The management application is helpful in organizing the meetings and posting statistics about the employees and the profit statements. It is an integrated environment for the administrator and employees to use to fix agendas and meetings for the betterment of the services of the company.

REFERENCES

- [1] A. Ghorbani, F. Taghiyareh, and C. Lucas, The Application of the Locally Linear Model Tree on Customer Churn Prediction, Proc. Intl Conf. Soft Computing and Pattern Recognition, 2009, pp. 472477.
- [2] Y. Richter, E. Yom-Tov, and N. Slonim, Predicting Customer Churn in Mobile Networks through Analysis of Social Groups, Proc. SIAM Intl Conf. Data Mining, 2010, pp. 732741.
- [3] L. Rokach, Ensemble-Based Classifiers, Artificial Intelligence Rev., vol. 33, nos. 1 and 2, 2010, pp. 139.
- [4] J. Zhao and X.H. Dang, Bank Customer Churn Prediction Based on Support Vector Machine: Taking a Commercial Banks VIP Customer Churn as the Example, Proc. 4th Intl Conf. Wireless Communications, Networking and Mobile Computing, 2008, pp. 14.
- [5] A. Berson, S. Smith, and K. Thearling, Customer Retention Building Data Mining Applications for CRM, McGraw-Hill, 2000.
- [6] A.G. Ivakhnenko, Heuristic Self-Organization in Problems of Engineering Cybernetics, Automatica, vol. 6, no. 2, 1970, pp. 207219.
- [7] A. Marqus, V. Garca, and J. Snchez, On the Suitability of Resampling Techniques for the Class Imbalance Problem in Credit Scoring, J. Operational Research Soc., vol. 64, no. 7, 2013, pp. 10601070.
- [8] J.A. Muller and F. Lemke, Self- Organising Data Mining: An Intelligent Approach to Extract Knowledge from Data, Libri, 2000.
- [9] A. Lemmens and C. Croux, Bagging and Boosting Classification Trees to Predict Churn, J. Marketing Research, vol. 43, no. 2, 2006, pp. 276286.
- [10] K.W. De Bock and D. Van den Poel, Reconciling Performance and Interpretability in Customer Churn Prediction Using Ensemble Learning Based on Generalized Additive Models, Expert Systems with Applications, vol. 39, no. 8, 2012, pp. 68166826.
- [11] K. Coussement and K.W. De Bock, Customer Churn Prediction in the Online Gambling Industry: The Benefi cial Effect of Ensemble Learning, J. Business Research, vol. 66, no. 9, 2013, pp. 16291636.
- [12] C. Chen, A. Liaw, and L. Breiman, Using Random Forest to Learn Imbalanced Data, tech. report 666, Dept. Statistics, Univ. California, Berkeley, 2004.
- [13] Y.Y. Xie et al., Customer Churn Prediction Using Improved Balanced Random Forests, Expert Systems with Applications, vol. 36, no. 3, 2009 , pp. 54455449.

