

Analytical CRM

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Abstract— Customer Relationship Management has been an important ally to companies willing to improve their customer experiences. Lately, Machine Learning and its techniques have been transforming the way companies interact with their customers through data analysis. This paper brings to light a CRM software developed using various Machine Learning techniques to improve different CRM processes and provides an overview of used techniques and their application to each CRM dimension and element. In addition, the practical implications are analyzed based on recent developments of CRM tools in the field of Machine Learning. The paper delivers insights for future studies as well as for CRM tools willing to improve their analytical and automated services and features. It also highlights in particular how Analytical CRMs improving ability to predict customer lifetime value will generate an inexorable rise in implementing adapted treatment of customers, leading to greater customer prioritization and service discrimination in markets.

Keywords: CRM, Machine Learning, SVM, k-NN, Random Forest, AdaBoost, ANN

I. INTRODUCTION

CRM systems compile data from a range of different communication channels, including a company's website, telephone, email, live chat, marketing materials and more recently, social media. They allow businesses to learn more about their target audiences and how to best cater for their needs, thus retaining customers and driving sales growth. CRM may be used with past, present or potential customers. CRM is typically of three types named as Collaborative, Operational and Analytical.

Collaborative: Collaborative types of CRM can include various company divisions, such as marketing, sales, customer service, technical support, external customers, vendors, and distributors. The primary role of this CRM is to simplify workflows and processes through organizational structures and hierarchies. It automates the back-office operation, customer interactions, and business management, which means more transparency among the organization's teams.

Operational: Operational CRM, a platform that focuses on simplifying sales and marketing interactions with clients that also offers automation of the process, specifically, the ability to perform tasks more effectively and with fewer steps.

Analytical: This type of CRM analyses the received data to provide insights and intelligence to help businesses to operate effectively. It uses analysis to help in various aspects of relationship management such as lead generation, acquisition, monetization and also customer retention and development.

II. MOTIVATION

The legacy CRM platforms face various challenges in today's time which lead to their failure. Major reasons for the failure of CRM software projects:

- Implementing software before creating a customer strategy
- Rolling out the software before changing the organization
- Assuming that more technology is better
- Trying to build relationships with the wrong customers

III. PROPOSED APPLICATION

A CRM capable of automating workflows for easier client onboarding along with many features such as email integration, better task management to analyze existing and potential customer's data to enhance lead and customer management, helping company to achieve better results.

A. Overview

Our system focuses on how to manage and maintain customer relationships, track case leads etc and help in delivering actionable data. It will provide the user with improved informational arrangement, interactions & progress, enhanced interplay, task automation, improved customer support, improved reporting analysis, and team work efficiency. The Application is capable of,

- Automation of workflows such as follow-up emails, pre-consultation information, client onboarding processes, and setting up important alerts, email integration, automated calendar sync, etc.
- Analysis of contact's activity through machine learning to boost predictive lead scoring and increase ROI, conversion rate.



Fig. 1: Lead Management Lifecycle

For ease of usage, we have designed a web portal through which user can interact with the system. It includes,

- Interface for managing client cases, managing and monitoring ongoing and completed task under a specific and the allotted employees.
- Interface for managing and monitoring employees, cases, monthly reports, company assets, etc.
- Interface for tracking and monitoring of delivery confidential documents, notices, etc.
- Interface to create and edit workflow automation pipeline, filters for analysis, etc.

B. Lead Management

Leads are the lifeblood of any company. Lead represents a record about a potential customer that typically includes some contact information like an email address and phone number, and possibly additional attributes about the customer. There's not always a connection between loyalty and product's price or brand's reputation. It's influenced by location, family preferences, local trends and a whole host of other factors. Thus, a significant amount of time, money and effort is spent on lead management. There are three key phases of lead management,

- *Lead generation* refers to the generation of an initial long list of leads on which further development can possibly be done. This is often done by deploying marketing campaigns to make the potential clients aware, and let them indicate their interest in products that the business is selling.
- *Lead qualification* is concerned about analyzing and prioritizing the leads on the basis of predefined criteria. This may include, the likelihood of a customer saying "yes" to the product, whether the business has the necessary resources and capabilities to deliver the product to the customer as required, size of the profit margin that the business can achieve as a result of a highly differentiated offering and the customer's high willingness-to-pay, whether selling to the particular customer segment is in line with the company's strategy.
- *Lead monetization* looks at possible ways of extracting revenue from qualified leads. Opportunities for monetization will typically be determined by the scope of the business and the potential scalability. The potential scalability will be constrained by supply-side factors and demand-side factors.

Lead generation and Lead monetization are often viewed similar to Customer Identification and Customer Attraction.

C. Customer Management

CRM provides the critical linkages throughout the supply chain. For each supplier in the supply chain, the ultimate measure of success for the CRM process is the growth in profitability of an individual customer or segment of customers over time.

In addition to trends in past profitability, "current and projected profits of customers (existing and potential) need to be analyzed and forecast". For each customer, the most comprehensive measure of success for the supplier relationship management process is the impact that a supplier or supplier segment has on the firm's profitability.

- *Customer Identification* consists on the first step of the CRM framework. It seeks to target possible customers by identifying most profitable ones and involves their classification or segmentation.
- *Customer Attraction* allocates resources to attract the identified target groups. Customer attraction involves the use of an appropriate method of communication and the elimination of any sort of wasted effort.
- *Customer Retention* intends to realize the customer expectations satisfaction with customer perceptions of satisfaction is the basic condition for maintaining the customer. Elements of this dimension include one-to-one marketing, loyalty and bonus programs, and complaints management.
- *Customer Development* focuses on increasing transaction intensity, transaction value, and individual customer profitability. The main elements of this dimension are customer lifetime, value analysis and up/cross selling.

IV. ML TECHNIQUES APPLIED

Machine learning is about predicting the future based on the past. Machine learning is a remarkable technique to get better with time as it learns and automates a new paradigm of customer identification, attraction, retention, and establishing the customer lifetime value. The role of machine learning techniques is significant in CRM due to its predictive analytics capabilities. The conventional CRMs only offer perceptions about customer data patterns based on past or present data. Machine learning is one of the game-changing tools in business that are mostly customer-centric. The various machine learning techniques used in our project that can enhance the capability of the CRM life cycle are,

A. Random Forest

The core unit of random forest classifiers is the decision tree. The decision tree is a hierarchical structure that is built using the features (or the independent variables) of a data set. Each node of the decision tree is split according to a measure associated with a subset of the features. The random forest is a collection of decision trees that are associated with a set of bootstrap samples that are generated from the original data set. The nodes are split based on the entropy (or Gini index) of a selected subset of the features. The subsets that are created from the original data set, using bootstrapping, are of the same size as the original data set.

B. AdaBoost

AdaBoost, short for Adaptive Boosting, is a statistical classification meta-algorithm formulated by Yoav Freund and Robert Schapire. It can be used in conjunction with many other types of learning algorithms to improve performance. The output of the other learning algorithms ('weak learners') is combined into a weighted sum that represents the final output of the boosted classifier. AdaBoost is adaptive in the sense that subsequent weak learners are tweaked in favor of those instances misclassified by previous classifiers. In some problems it can be less susceptible to the overfitting problem than other learning algorithms. The individual learners can be weak, but as long as the performance of each one is slightly better

than random guessing, the final model can be proven to converge to a strong learner.

C. Support Vector Machines

Support Vector Machine (SVM) is a supervised machine learning algorithm which can be used for both classification and regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

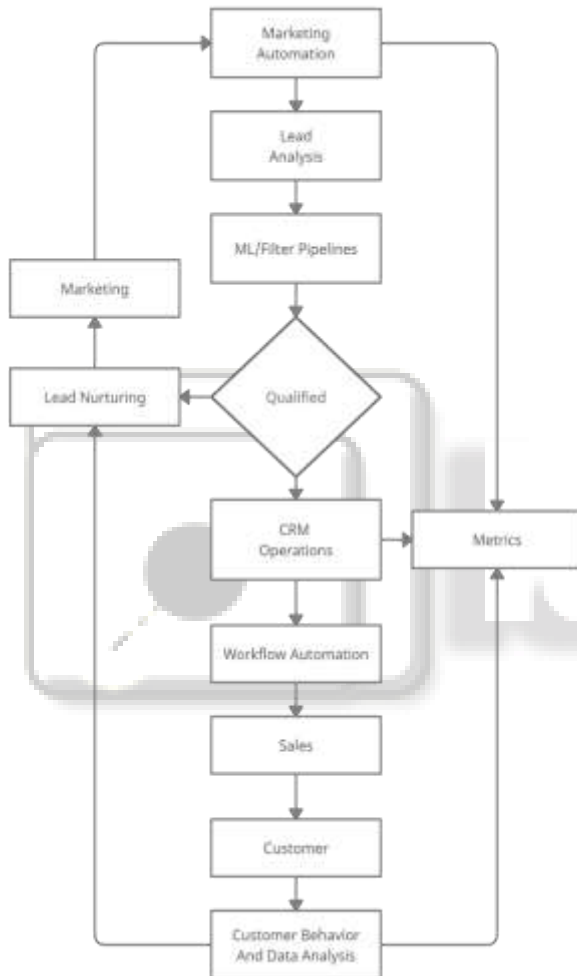


Fig. 2: Application Process Flow Diagram

Support Vectors are simply the co-ordinates of individual observation. The SVM classifier is a frontier which best segregates the two classes (hyper-plane/ line).

D. K-Nearest Neighbors

KNN algorithm is a simple, supervised machine learning algorithm that can be used to solve both classification and regression problems. The input of the algorithm consists of the k closest training examples in data set.

k-NN is a type of classification where the function is only approximated locally and all computation is deferred until function evaluation. Since this algorithm relies on distance for classification, if the features represent different physical

units or come in vastly different scales then normalizing the training data can improve its accuracy dramatically.

E. Artificial Neural Networks

ANN algorithm is a biologically inspired computing code with the number of simple, highly interconnected processing elements for simulating human brain working & to process information to develop algorithms that can be used to model complex patterns and prediction problems. Artificial neural networks also have neurons that are linked to each other in various layers of the networks known as nodes.

V. PRACTICAL IMPLICATIONS

A. Customer Attraction,

- Online stores can develop promotional marketing and offer personalized service for e-customers.
- Knowledge gain of customer sentiments and improvements on customer service to attract more customers and generate more profits.

B. Customer Development,

- Precise supply strategies for different customer categories to target high potential customers.
- Simulation of a system that predicts good demand for an enterprise's inventory according to sales.
- Technique considerably reduces computational costs, providing more accurate prediction.
- Customer behaviour analysis to understand needs and establish strong relationships (fast food sector Marketing and services processes are more effective, by improving performance of segmentation.
- A model to forecast demand of various items to improve inventory performance.

VI. CONCLUSION

This research paper provides an overview of research using ML techniques to solve and/or automate tasks for CRM. Moreover, it provides an overview of the recent developments in current CRM tools. This analysis delivers a better understanding of the practical implications when using ML to improve analysis and processes in CRM.

Besides the literature review, the study provides an analysis of the practical implications and relates these practices to the CRM dimensions. These results are important to understand how ML can improve the processes and which tasks in CRM current literature have been targeting. Additionally, it provides insights for companies using ML to develop CRM solutions. This overview can support researchers and practitioners to understand how ML can practically improve CRM activities, as well as the less-focused CRM dimensions.

VII. LIMITATIONS AND FUTURE SCOPE

This research paper explains the development of analytical CRM software built using ML techniques to solve and automate tasks for CRM. A deeper analysis could validate these benefits with experts in the fields of CRM and provide better explanation on how ML techniques are incorporated to CRM systems.

This research paper also has potential limitations. The various analytical methods applied in the project are based on numerous Machine Learning algorithms that require large sets of data. As there was an insufficient sample size for statistical measurement, it is subject to biases and confounding that may have influenced our model estimates.

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