



# Machine Learning Techniques for Customer Relationship Management

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## Abstract

For a long time now, customer relationship management has been a crucial part of organizations aiming at enhancing their customer experience. In recent years, machine learning and its varying techniques have changed how organizations interact with their customers through data analytics or analysis. Machine learning is a branch of artificial intelligence that has increased its reputation and evolved into a very successful and powerful technology in recent years. As such, the use of machine techniques in customer relationship management systems can prove very advantageous and robust, which can ultimately lead to higher customer satisfaction rates, reduce the churn rate, and even increase revenues. This research paper examines the ways that machine learning techniques are used in customer relationship management. Further, the article also discusses the advantages of using machine learning in CRM and how customer relationship management has changed in recent years. Therefore, this paper major aims at answering the questions of how and why machine learning and its techniques are used in customer relationship management.

**Keywords :** Machine Learning, Management, CRM, Data Analysis and

## Introduction on Machine Learning Techniques for Customer Relationship Management

For a business, customers are the most crucial basis for revenue and success. Organizations now have become more aware of the critical role customers play, aiming to gain their satisfaction. Customer relation management is now vital for organization success and is gaining a competitive advantage. Machine learning has in recent years become the mainstay feature in customer relationship management as it helps unlock additional data that companies gather on their customers (Zerbino et al., 2018). Machine learning techniques for customer

relationship management has several advantages for organizations, both large and small. Machine techniques such as regression analysis, decision tree-based, ensemble learning, and instance-based learning, among various others, are used to support and enhance customer relationship management.

Customer experience and satisfaction in the current business world are crucial to retain and attract new customers. However, customers get confused by the unlimited sources of marketing and information through the internet. As such, organizations require an all-inclusive strategy to offer their current and potential customers channels for direct communications and a good experience. Hence, organizations must remain consistent in how they focus on selling processes, create new products and services, and even communicate company messages, among other factors. Information technology has been proven to give organizations various advantages within the customer relationship management area (Anshari et al., 2019). Organizations can enhance their customer experience through a customer relationship management system by fostering and enhancing customer loyalty and satisfaction. Additionally, a customer relationship management system also provides the organization with a competitive edge while increasing revenue and sales.

Therefore, a customer relationship management system was used as a tool for managing, collecting, and storing customer information databases that contain their personal and contact details. However, in recent years, customer relationship management systems have been equipped with new technologies advancing them to a stage where they are being utilized to maintain and create interactions and relationships with existing and potential customers. New customer relationship management systems are now an integral part of digital transformation as organizations implement customer-centered focus (Anshari et al., 2019). These systems offer three key pillars, including marketing automation, customer analytics, and a centralized and integrated customer hub. CRM systems now consolidate all data in customers such as service history, contact information, and even internet activity providing the company with a holistic view of their customers.

Customer analytics allow for customer history and interactions analysis providing insights that can be leveraged to resolve service problems, target unique offers, enhance satisfaction, improve marketing strategies, and even foster personalized customer experiences. Additionally, modern CRM systems usually automate processes, including service tracking, lead management, post-sales support and service, and marketing project development, ultimately resulting in enhanced experiences and efficiencies (Swift, 2001). This consolidated data from CRM systems can prove a vital and resourceful source of new insights and information, allowing organization management to adopt based on discovered trends. These insights and trends can prove beneficial and resourceful for employees and management alike.

### **Customer Relationship Management Dimensions**

Customer relationship management is a process of understanding customer behavior to support the organization to enhance profitability, customer acquisition, and customer retention. CRM software usually uses analytical models and business intelligence to identify the most profitable consumer groups and target them to achieve higher retention rates. Business analytics and intelligence models can predict customers with a high likelihood to churn based on analysis of customer's behavioral, demographic, and personal data to provide customer-oriented and personalized marketing campaigns to achieve high satisfaction rates (Ngai et al., 2009). The customer relationship lifecycle in business has four main stages, including customer acquisition, customer attraction, customer retention, and even customer development.

Customer identification or acquisition is the first stage, and it usually aims at identifying profitable clients and those with a high chance of joining the company. Various clustering and segmentation machine learning techniques can be utilized to explore customer historical and personal data to create similar customer subgroups or segments. The second stage is customer attraction, where the identified customer subgroups are analyzed to determine common characteristics that differentiate these segments. Several marketing techniques can be implemented to target varying customer subgroups, such as direct marketing or even targeted advertising (Rygielski et al., 2002). Customer retention is probably the primary focus of customer relationship management since retaining existing customers is more cost-effective and profitable than acquiring new ones. Customer retention is a stage that includes every action taken by a business to reduce the churn rate and enhance customer loyalty. Customer churn is the rate at which customers stopped using an organization's services or products within a specific time frame. This rate is an essential pointer that all businesses aim to reduce and vital for proactive customer retention plans. Predicting the churn rate requires predictive analytics and data mining models in forecasting the chances of a customer churning (Coussement et al., 2017). These models usually analyze behavioral and personal data allowing for customer-centered and personalized retention and marketing campaigns. The other stage in the customer relationship management life cycle is customer development, aiming to increase customer transactions amount to increase company profitability. Various machine learning and statistical techniques are employed within the customer relationship management lifecycle to enhance customers' satisfaction while increasing company profitability.

### **Machine Learning and Customer Relationship Management**

Machine learning and artificial intelligence addition to CRM systems have helped them become more robust and potent. For instance, artificial intelligence can evaluate customer behavior and expectations when a company is launching a new product. CRM systems equipped with artificial intelligence allow companies to combine all technologies and strategies to analyze, manage, and examine customer interactions. Further, machine learning can be implemented to evaluate decisions in history to establish which actions can result in better and informed decisions. CRM system can then make informed and better decisions based on current or recent customer interactions. The system can adapt and learn continuously based on varying outcomes from made decisions and updated strategies (Swift, 2001). CRM systems having machine learning can even connect and identify different data points to enhance the customer experience. Therefore, machine learning and artificial intelligence used in CRM systems help enhance customer experience.

Machine learning, at its core, is an artificial intelligence category that aims at extracting insights or knowledge from a series of data or observations. It analyzes consolidated data and provides the business user with analytics and insights based on this data while also adapting and learning from every data set. Machine learning utilizes an algorithm or technique that requires minimal time to analyze all available data. Within a customer relationship management system, machine learning techniques or algorithms usually analyze all customer information available, including unstructured and structured data, and provide a business user with a holistic view of a customer (Soltani & Navimipour, 2016). Machine learning techniques in customer relationship management systems have several advantages and allows organizations to serve their customers better. These techniques utilize both emerging trends and historical data to recognize hidden patterns within information while revealing how these insights relate. This insight into data can prove invaluable when the management is trying to formulate proactive sales strategies, identify marketing opportunities, and reduce customer churn.

CRMs have proved a vital and huge data source for companies, making it necessary to use this data for machine learning. There are several ways in which organizations can enhance their competitiveness and capitalize on

machine learning through their customer relationship management data. Through these data and machine learning techniques, an organization can make better sales predictions. Machine learning algorithms such as supervised learning are used to make these predictions. However, huge volumes of historical sales and customer data are needed in the customer relationship management system to uncover the most accurate predictions (Reid & Catterall, 2015). A business user can divide predictions basing on the most important factors to the company, such as the region, product, and even salesperson, among various other factors. Accurate sales predictions are advantageous as they ultimately result in cost savings for an organization by better financial planning and budgeting.

Additionally, an organization can also gain insights from free text fields. The free text field can prove resourceful and sometimes wasteful since comments and notes can be helpful to a person but challenging to gain meaningful insight into larger trends. Machine learning techniques can prove beneficial in helping connect various data points by searching for phrases implying certain traits. For instance, a machine learning algorithm can be set to search for language related to complaints, references to a certain salesperson, extra purchases, and even product inquiries. The patterns from free text fields can provide an organization with new information previously hidden (Xu et al., 2002). Additionally, machine learning techniques for CRM can be used to enhance customer lifetime value. By gaining knowledge on how to support customers the best, it helps an organization extend its lifetime value with the customer. Machine learning algorithms can make accurate predictions about when support is needed, notice user habits and patterns that can imply churning, and even predict when a customer is likely to purchase again. Additionally, machine learning techniques can also help optimize prospect scoring. They achieve this by reviewing available historical data, where the algorithm implemented can identify potential customers having similar characteristics to existing clients. Optimizing prospect scoring usually helps salespersons within an organization prioritize their focus towards more likely sales.

## Literature Review

### a. Customer Relationship Management

Customer relationship management definition has evolved in the recent past due to the heavy influence and impact novel technologies have on organizations' infrastructure. Customer relationship management can be defined as a set of processes and strategies utilized by an organization to manage and develop customer relationships. The main CRM objective is augmenting and enhancing customer relationships in ways that an organization is able to achieve revenue growth, customer loyalty, as well as customer lifetime value through effective customer retention efforts. There is a need to highlight the integration between the different functions or dimensions when defining customer relationship management since it separates the phrase relationship marketing from customer relationship management. Relationship management can be defined as the overall customer relationship management aiming at long-term shareholders' value. As such, customer relationship management is a branch of relationship marketing. CRM is, therefore, a relationship between management that involves computers and the integration of various functions using information technologies (Frow et al., 2009). Customer interactions usually include personalization, automation, as well as marketing campaign management.

CRM has gone through various changes from the late twentieth century to now advancing from marketing the best products to customers to marketing the best services and finally to marketing to customers with dynamic products and services that suit their needs the best. In recent years, social communities growth has allowed for increased information sharing, which has formulated a new avenue in customer relationship management integration. This recent evolution has changed CRM into a more dynamic direct where social platforms are vital in enterprise resource planning and customer relationship management solutions (Buttle, 2008). Additional



increase in social platforms and networks has also allowed for open channels to provide feedback about company products and services, making customer happiness and satisfaction vital.

### **b. Common Issues with CRM**

Data consolidated in customer relationship management is generated from various sources and channels. Since data comes from different sources, it usually leads to the collection of low-quality data. Data quality issues within customer relationship management usually lead to problems that hinder an organization from taking full advantage of benefits offered by customer relationship management (Reid & Catterall, 2015). For better customer relationship management, data management is vital as it leads to enhanced and profitable customer relationship management. According to Soltani and Navimipour (2016), Proper and effective customer data management is an indicator of customer relationship quality and, ultimately, the organization's success. Another common problem with customer relationship management is that although it generates huge amounts of data, some of these systems lack analytical capabilities. Although companies effectively interact and handle customers to gain a competitive advantage, data analytics techniques need to be implemented to allow for a holistic customer view (Xu et al., 2002). Therefore, customer relationship management systems usually generate huge amounts of data for an organization, although the utilization of this consolidated data to achieve maximum potential useful insights is a challenge and, in a way, expensive.

### **c. Machine Learning and Data Analytics**

Machine learning-based data mining techniques are a combination of machine learning, artificial intelligence, and classical statistics. Advancement in the artificial intelligence field has led to the development of machine learning techniques that have proved useful when automating tedious but crucial discovering patterns activities within databases. In the past, business analysts used general statistical techniques and Online Analytical Processing analysis to identify a pattern within organization data. However, this method had some challenges. For Online Analytical Processing, it required a user to have query objectives' subjective definition. In comparison, statistical techniques required the dataset to adhere to inflexible distribution standards, allowing statistical modeling methods. Perspective knowledge or insight is usually unexpected and hidden, and therefore, hypothesis-based methods such as Online Analytical Processing and statistical methods fail to uncover these insights (Sigurdur et al., 2008). On the other hand, machine learning-based data mining techniques, based on observation from a dataset, usually have fewer restrictions while identifying patterns easy for a user to understand.

### **d. Machine Learning Techniques**

Several sources have tried defining machine learning. Machine learning is the science of programming computers to act and learn similar to humans and automatically enhance their learning by inputting information and data in real-world interactions and observations. Machine learning can also be defined as a well-recognized and mature computer science research area that focuses mainly on discovering patterns, models, and other regularities within datasets (Sigurdur et al., 2008). It can also be broadly defined as computation models or methods that rely on data or experience to make accurate forecasts or improve performance. Mike Gualtieri defined machine learning as a computer science field that involves formulating and continuously enhancing algorithms that analyze data automatically to predict future outcomes or identify patterns (Gualtieri et al., 2015). Through combining several definitions for this research paper, machine learning will be defined to have the features of improving with experience automatically, detecting patterns in data automatically, and being used to predict future results or uncovered patterns.

Evidence gathered from various application fields suggests that data mining tools based on machine learning can outperform traditional tools such as probit and logit by far. There are several reasons why machine learning-based tools can outperform conventional ones. The first reason is machine learning techniques allow for effort reduction when selecting features. Machine learning techniques for data mining can handle several features together. At the same time, traditional tools, including statistical analysis, are mostly one-dimensional and hence do not allow for a wide array of features. The major situation is classification problems. The customer relationship management area has several input variables, mostly in the hundreds, with each of the variables having a minimal amount of information. On the other hand, the human expert feature selection has proved to be sub-optimal (Liu et al., 2005). Therefore, traditional statistical tools lack effective algorithms for feature selection, which brings a severe issue to CRM.

The second reason machine learning-based tools outperform the traditional ones is their ability to work with noisy data. Noise strength is among the most important aspects of customer relationship management systems which mostly comprise very noisy data. Conventional analysis tools such as logistic regression do not have a way to handle missing values and are affected greatly by outliers (Coussement et al., 2017). As such, conventional tools are very sensitive to input variables structures and even noisy data. Machine learning-based techniques can adequately handle noisy data, especially random forests and decision trees. They are considered resistant to overfitting and noise because of their classifier strategies, such as boosting and bagging. Machine learning-based techniques usually need minimal data intervention by the user while also allowing for better predictive or forecasting performance.

Another reason machine learning-based techniques are better is because of their flexibility when modeling nonlinear relationships between variables. Most machine learning-based techniques such as support vector machine, random forest, neural network, and generalized boosting are multi-dimensional linear models that provide significant enhancement over traditional statistical methods. Simple linear classifiers such as LDA, probit, and logit, usually have limited capacity for modeling unobserved heterogeneity and non-linearity within datasets. Conventional statistical techniques need to replace the linear model with the non-linearity form and polynomial function that must be first identified to deal with nonlinear relationships (West et al., 1997). Researchers have confirmed classification trees to be very useful non-parametric classifiers when considering non-linearly related variables. Stewart et al. (2015) suggest that newer classifiers can outperform all others and prove decisive to different assumptions and data structures.

Despite these advantages of machine learning techniques, several studies have shown the disadvantages and limitations of these techniques. A major argument for the limitations and downsides of machine learning techniques is interpretability by business users. Although some machine learning techniques such as decision trees are easy to explain, others, such as support vector machines and neural networks, are changing and somewhat impossible to decipher the behavioral influence and role of inputted variables (Jones et al., 2017). Therefore, for the business user or end-user, the logic behind the classification is not understandable. Thus, machine learning techniques are often referred to as black-box models since how these algorithms classify information is not understandable to a user. Although these new machine learning techniques can provide better predictive capabilities and outperform traditional ones, in some cases, the justifiability and comprehensibility of a particular model are usually more important to end-users than its forecasting accuracy.

### **e. Data Analysis for CRM**

In the modern business environment, the ability to gain meaningful insight into a customer from consolidated business data has proven more important to management. Data mining usually helps organizations realize better customer relationship management performance. Therefore, data mining can help an organization differentiate itself from competitors while gaining various competitive advantages. As machine learning-based data mining techniques are becoming more advanced and affordable, organizations are increasingly willing to implement these tools to achieve an enhanced way to find hidden customer insights and information, therefore, enhancing the effectiveness of CRM in the long run. According to Swift (2001), customer relationship management is a business approach to influencing and understanding customer behavior through meaningful communication to enhance customer retention, customer acquisition, customer profitability, and customer loyalty (Swift, 2001). Some studies categorize customer relationship management into four dimensions: customer identification or acquisition, customer attraction, customer retention, and customer development. Data analysis can help customer relationship management with various aspects (Parvatiyar et al., 2001). With the customer identification dimension, data analysis can help in targeting the suitable customer subgroups or even detect clients with high chances of churning. Data analysis can help establish the right and effective communication processes and channels with customers in the customer attraction dimension. On the other hand, data analysis can help improve customer retention by maintaining and enhancing customer satisfaction while fostering and keeping long-term relationships with customers. While in the customer development dimension, data analysis usually helps increase customer profitability while enhancing the lifetime value the organization offers to the customer.

### **How Machine Learning Has Changed Customer Relationship Management**

In the early twenty-first century, there was the emergence of customer relationship management. A crucial element of customer relationship management is databases comprising customer personal and contact information. All information stored in the database can refer to socio-economic characteristics such as income level, education, age, and gender. Also held within the databases are previous customer interactions and customer purchase history. This data usage has allowed for customer response to new offers prediction or even prediction of customer retention, all of which are vital aspects for marketing efforts and initiatives (Fatemi, 2019). Thus, there are several ways in which machine has transformed customer relationship management.

One of the ways machine learning has changed customer relationship management is through data ingestion and retrieval. Most scholars and people believe that with the emergence of artificial intelligence and machine learning, various professions involved in sales and marketing risk losing their job, which is not true and can be taken as short term viewpoint. According to Fatemi (2019), artificial intelligence and machine learning promise to enrich and not replace the human element within the sales processes (Fatemi, 2019). For that reason, future salespeople will utilize artificial intelligence to enhance their professional skillsets and practices. Through machine learning and artificial intelligence integration, manual data entry processes by salespeople become obsolete, resulting in saving employees valuable time of extra effort and wasteful time sending on varying activities and processes. Additionally, machine learning also assists in the centralization of different customer databases and simultaneously saves the entire customer lifecycle data where it is gained through email, chatbots, or calls.

Sentiment analysis is also another change arising from the integration of machine learning into customer relationship management. Since most interactions with customers happen online and virtually through communication channels that do not show customers' facial expressions and body language, it is challenging for salespeople to develop trust and a strong relationship. Machine learning and artificial intelligence, however, offer a solution to this issue. Through the utilization of sentiment analysis, machine learning-powered tools can now analyze conversations while also evaluating customer emotional situations (Fatemi, 2019). For instance, Cogito is a machine learning-based tool that provides analysis of in-call voice, allowing salespersons to understand the current emotional states of a customer and how best to respond to these customers.

Data reliability is also a significant way in which machine learning integration has changed customer relationship management. A machine learning integrated customer relationship management system can prove helpful in augmenting the role of decision making. Machine learning integrated customer relationship management system can help understand potential problems within the systems, report any errors for correction, do away with duplicated data, identify outliers and incomplete data within other systems, and advise on updating any obsolete data (Dilmengani, 2021). Additionally, integration machine learning techniques also allow for converting leads into customers. Machine learning and other artificial intelligence have significantly impacted organizations to moves from a hypothesis or rules-based lead scoring to more predictive lead scoring. This move is because machine learning can analyze millions of historical records and instantaneous attributes such as web activity, geographic data, and demographic data, which helps the sales team decide a customer's buying readiness.

Once combined with customer relationship management systems, machine learning can analyze the rates of lost versus won sales deals to identify patterns that can advise and influence lead scoring methods. When a more accurate model or method is determined, the machine learning algorithm makes it the default (Fatemi, 2019). Additionally, the implementation of machine learning in customer relationship management systems usually results in targeted recommendations for salespersons. Customer relationship management systems are an invaluable source of data collected and used to manipulate and train the algorithms implemented. When machine learning is integrated into customer relationship management, they hold new and more critical roles, such as trustful and truthful advisors. Customer relationship management with machine learning capabilities is effective when it provides salespeople with the why element, thus informing the sales team on the rationale employed in specific prescribed action courses. Therefore, machine learning integration has changed customer relationship management, which is not limited to those discussed in this section.

### **The Need for CRM and Its Integration with Machine Learning**

Some studies estimate that roughly sixty-five percent of an organization's business is from existing customers. Further, it costs around five times more to attract new prospects than to keep existing customers satisfied. As a result, it is crucial for organization management and employees to better understand customers and make accurate actions and decisions to maintain and foster strong relationships with customers while also improving the sales metrics. In recent years, sales have become increasingly measurable and predictable. However, this was not an important characteristic in the late twentieth century and early twenty-first century, since meetings back then were either on the phone or face to face. Data recording technology was not available back then; therefore, maintaining customer relationships majorly relied on an employee's sales skills. However, since sales in the modern business environment mainly rely on customer interaction records, databases, and emails, the customer relationship management tools or systems have proved ever more useful. The biggest challenge for an organization is sales (Buttle, 2008). Sales processes are usually made more accessible through the



implementation of customer relationship management systems. Nowadays, organizations utilize these customer relationship management tools to process consolidated data on their customers while finding ways to enhance the sales channels using the hidden insights gained. Since most companies are implementing and using customer relationship management tools, this domain can grow to be the single most significant revenue share of company software spending.

From small and medium enterprises to large companies, most organizations now use customer relationship management systems to track their sales. Integrating machine learning into customer relationship management tools can prove beneficial for several reasons. For one, the unstructured data's volume increases, making it impossible to process this data without machine learning or artificial intelligence. With an increasing number of transactions, the volume of customer data generated will also increase. This increase in customer data can prove beneficial as it can help an organization better understand its customers as they can process more information about customers (Sigurdur et al., 2008). However, organizations also require more effort to extract relevant information and insights from data since most of the consolidated is usually unstructured and can be converted to structured data through machine learning techniques. Additionally, there is the increasing complexity of relationships between data points. With increasing transactions, the volume of data increases, but business relationships and processes are becoming more complicated. This increasing complexity makes it challenging to analyze customers accurately and even to understand relationships within the organization. Additionally, machine learning-based customer relationship management tools have become increasingly popular since 2016. This increase in popularity can be linked to technological advancements in this field, and even the impact machine learning has on customer relationship management tools.

### **Societal Implications of the Research**

Undoubtedly, Machine learning has enormous and observable impacts on customer relationship management tools. In the United States and worldwide, most organizations are integrating customer relationship management with artificial intelligence techniques. The integration of CRM with machine learning techniques allows for enhanced marketing evaluation where machine learning provides better quality of analytical data and information on which marketing people can depend to achieve higher customer satisfaction rates and business growth (Buttle, 2008). It has become easier to evaluate marketing results in recent years because of increased data quantity and quality and innovative analytical techniques. The societal implications of this research are not overlooked, with the majority being in the practical domain and academic domain. A significant implication of machine learning increased capacity in marketing processes is that it is increasingly becoming more relevant from the customer's viewpoint.

Artificial intelligence and machine learning techniques have allowed for increased predictability and personalization based on the consolidated customer data. Therefore, customers now buy the services and goods they want while vendors produce the needed and high-quality products, leading to overconsumption and overproduction reduction. Further, the increased use of innovative and artificially intelligent assistants allows customers to purchase goods from the comfort of their homes. Therefore, this increased use of these assistants reduces the extra time spent when customers are shopping (Dilmegani, 2021). Additionally, there is also a need for organizations within the United States to form the ethical guidelines set for handling and safeguarding customer data. The organization should not trespass on customers' data integrity even if it makes more revenue. Not following the set ethical guidelines can lead to the deterioration of customer and organization relationships over time. Therefore, when properly implemented, machine learning techniques for customer relationship management can provide organizations with a competitive advantage and even more sales revenue.

## Conclusion

In conclusion, machine learning techniques for customer relationship management can prove a potent and robust tool for large and small organizations. The benefit of using customer relationship management and machine learning can be attributed to the idea that these two complement each other in terms of challenges and benefits. Machine learning techniques have been implemented to find hidden information and insights from consolidated data aiming at helping the customer relationship management process become more smooth and effective. Machine learning is a significant and common artificial intelligence branch that makes predictions based on historical data and past decisions. Machine learning integration in customer relationship management can prove expensive and challenging at first but has various benefits in the long run. Insights from this data can prove invaluable to an organization's management when making crucial marketing and other decisions. As such, this field can only be expected to grow and become advanced and robust with time as new technologies and techniques are being developed and improved.

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