

Machine Learning and Artificial Intelligence use in Marketing - A General Taxonomy

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Artificial intelligence and machine learning are crucial resources that can uncover enormous value that might otherwise go unused. In addition to ensuring that marketing budgets are used as effectively as possible and producing results that support business objectives, marketers can access great insight through AI and ML that leads to effective decisions. Many businesses can improve their understanding of consumers' needs, their ability to forecast future demand, their ability to provide better customer service, etc. Following a thorough PRISMA review of the academic and business literature in this field, we present in this paper a general taxonomy of machine learning and artificial intelligence applications in marketing. We identified different application areas, including segmentation and targeting, customer churn, customer lifetime value, recommendation engines, the marketing mix module, and customer attribution. This study shows that both supervised and unsupervised learning algorithms are frequently employed by marketers.



ABSTRACT

Keywords: Machine Learning; Artificial Intelligence; Marketing

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Introduction

The ability to contact customers is ubiquitous today. As people switch between devices and digital channels, they generate many touchpoints across various online and offline mediums. The possibility for marketers to modify their marketing strategy is enormous given all the information about customers' behaviours (Goworek, 2022).

Maintaining client loyalty is critical to corporate success in a world that is always changing due to technological advancements. With greater technology intrusion in our lives, consumers today want speed and hyper-personalization in everything; marketers must discover inventive methods to satisfy expectations and maximize their budgets by boosting customer interaction, customizing advertising and services, creating closer connections with customers, optimizing marketing budget, designing better-targeted campaigns, and gaining important information. Because customers are becoming more sophisticated, achieving this aim may prove challenging. Better data-driven marketing techniques with machine learning and artificial intelligence integration are possible. Companies like Amazon, Netflix, and Google have set the bar for what consumers have come to expect from technology and marketing as customer expectations have never been greater (Kushner, 2022). Big Data in marketing gives insights into which material is most successful at each point of the sales cycle, how to build client connections, and what techniques might raise conversion rates (Goworek, 2022).

Marketers may use machine learning and artificial intelligence to gather data, get consumer insights, predict the best course of action, and make automated judgments regarding marketing initiatives. According to Kushner (2022), the application of artificial intelligence in marketing may be very advantageous if the increase in revenue generation, cost savings through efficiencies, and enhancing consumer engagement and satisfaction are the objectives. According to Davenport et al. (2020 as referenced in De Mauro et al., 2022), artificial intelligence is the capacity of a computer to exhibit human qualities including thinking, learning, planning, and creativity.

John and West (2018) Artificial intelligence algorithms have the capacity to learn and adapt as they make judgments since they are created to make decisions, frequently utilizing real-time data. When talking about artificial intelligence, machine learning is significant because (McAfee & Brynjolfsson, 2017) it analyzes data to find underlying patterns. According to De Mauro et al. (2022), artificial intelligence projects frequently use machine learning and data analytics. Machine learning is reshaping how marketing jobs are carried out by gathering, analyzing, and then recycling user clicks and comments on brands as well as understanding the emotions associated with them. Data Scientists can utilize whatever information machine learning (ML) is able to extract from the data to make the analysis of specific problems if they are pertinent and valuable and the data is robust enough for algorithms to identify meaningful patterns (McAfee & Brynjolfsson, 2017). For instance, marketers may tailor their sales calls to each possible consumer by using the outcomes of data analysis via machine learning to customize their sales tools for specific persons. The methods supported by machine learning aid in improving client visits by classifying the various click-through responses to brands and engaging them on a highly personalized level (Ashley & Tuten, 2015). Deep learning is used to identify patterns in the enormous amount of data that is collected every day by categorizing it into different sectors and understanding how it relates to digital customers.

Without clearly classifying the methodologies for the use case(s) they can be applied, Verma et al. (2021) presented a thorough evaluation of AI in marketing employing bibliometric, conceptual, and intellectual network analysis of existing material published between 1982 and 2020. Following a number of evaluations, we were able to develop a taxonomy of machine learning in marketing and look into its marketing applications.

Literature Review

Contribution of Big Data

Big data's role in the successes of many significant technological companies is no longer a secret. But as more businesses use it to store, analyze, and extract value from their massive volume of data, it becomes more difficult for them to use the gathered information in the most effective manner.

The Internet and the Web have provided distinctive options for data collecting and analysis since the early 2000s. Companies like Yahoo, Amazon, and eBay began examining click rates, IP-specific location data, and search logs to study customer behaviour as online storefronts and web traffic increased. A whole new universe of opportunities was now available. The whole industry was revolutionized by big data, which also altered human culture and behaviour. The information era is to blame for it, and it is altering how individuals conduct business.

When John Graunt was researching the bubonic plague that was ravaging Europe in 1663, he had to cope with enormous volumes of information. This was the first instance of big data (Adilin, 2021). The first individual to ever employ statistical data analysis was Graunt (Belyh, 2019). But it wasn't until Roger Mougualas coined the phrase "Big Data" in 2005 that it became widely known. At the time, he was referring to a sizable quantity of data that was nearly difficult to manage and analyse using the conventional business intelligence tools available (Firican, 2022). Big Data, according to Goworek (2022), is a vast, intricate collection of data that is created from a variety of sources and expands rapidly over time. This complexity spawned new technologies that enable enhanced computer storage and high-speed data processing gadgets (Duan et al., 2019). For example, Big Data might be handled with Hadoop, which was developed in 2005. Hadoop was built on the open-source Nutch software architecture and integrated with Google's MapReduce (Bappalige, 2014).

To alter and enhance how businesses function across their many regions, services, and channels with consumers and other stakeholders, these technologies are required to manage enormous volume, high velocity, and expandable diversity of data. (Sestino et al, 2020) Big data and machine learning are terms that have consistently being used together in modern times owing to their close connection (Cheema, 2021). Owing to its capacity to leverage massive data sets and translate them into useful business insights, AI is enjoying significant attention in the field and has changed how businesses across many industries make strategic decisions (Sestino & De Mauro, 2021). Since the introduction of computers in the 1950s, the area of artificial intelligence (AI) has been enjoying a resurgence (Tan & Lim, 2018).

Advanced technologies and big data capabilities have made it possible for computer scientists to create algorithmic models that can recognize trends and adapt in real time, which helps to explain this in part. AI applications are being used in a wide range of scenarios and devices that go beyond the traditional boundaries of computing. These include customer service, recommender systems, and cell phones (Makridakis, 2017; Zhang et al., 2021; Belanche et al., 2020; Lu et al., 2020; Wirtz et al., 2018). They even assume advanced responsibilities in professions that were formerly thought to depend on human brains, such as journalism (Carlson, 2015), artistic arts like painting (Quackenbush, 2018), music creation (Marshall, 2018; Tufekci, 2015), and marketing (Sterne, 2017).

Businesses are increasingly relying on artificial intelligence to enable big data analytics in order to analyse data and give various viewpoints or perspectives (Cheema, 2021). For automation and insights, machine learning has been implemented in a number of fields. It has promoted company growth by facilitating data-based decision-making (Anisin, 2022). Machine learning applications are developed and made available by businesses as Software-as-a-Service or for the automation of internal procedures like data entry work, sales, and marketing.

Digital information, satellite images, visual information, text, and unstructured data are all examples of data.

Machine learning

The field of artificial intelligence known as machine learning is concerned with the study and predictive modelling of past data. In layman's terms, it employs complicated mathematical algorithms to extract usable, encoded information from structured data in order to forecast trends and behaviours (Anisin, 2022). Machine Learning is classified into four types based on how it learns: supervised, unsupervised, semi-supervised, and reinforcement learning.

Supervised learning: Occurs when certain goals are specified to be achieved from a specific set of data (Kotsiantis, 2007; Sarker et al., 2020). It entails creating a prediction based on a set of pre-specified input and output variables and employs labelled training data and a number of training samples to infer a function (Brnabic, & Hess, 2021). Once the system has reached an acceptable level of accuracy with reference to the instructional data, the parameter tweaking operation is discontinued (Kotsiantis, 2007). Rajbanshi (2021) This approach is divided into two categories: classification (Naive Bayes classifier, Decision Trees, Logistic Regression, K-Nearest Neighbors, and Support Vector Machine, for example) and regression (e.g., Simple linear Regression, Multiple linear Regression, polynomial Regression, Decision Tree Regression, Random Forest Regression, Ensemble Method).

Unsupervised learning: As opposed to supervised learning, unsupervised learning works with unlabelled data. Unsupervised machine learning algorithms employ this unlabelled data to find patterns in associated data and information. They are more unpredictable than other forms of machine learning since they don't need any kind of supervision while they work on their strategies to find patterns (Hiran et al., 2022). By identifying existing patterns or clusters in the input datasets, it is employed in classifiers (Das & Behera, 2017). Clustering, Dimension Reduction, and Anomaly Detection are included in Swamynathan's (2017) list of the most significant unsupervised algorithms.

Reinforcement learning: is a technique that allows intelligent programs (agents), to operate in a known or unknown environment to continuously adapt and learn depending on receiving inputs. The machine trained itself, and the input could be either positive (also known as incentives) or negative (also known as punishments). The next step is to choose an appropriate course of action based on the interaction between the agents and the environment (Nandy & Biswas, 2018; Nagar & Singh, 2019). Markov decision process, Q-learning, Temporal Difference methods, and Monte-Carlo methods are a few examples of reinforcement learning approaches.

Semi-supervised learning is a different kind of artificial intelligence. Semi-supervised machine learning, as the name implies, combines supervised and unsupervised learning techniques, with only a portion of the input data containing outcomes. Because one of the issues with Supervised learning is acquiring the needed huge amount of labelled input/output training data, this hybrid technique permits analysis and learning using a smaller collection of labelled data combined with a much larger set of unlabelled data.

Semi-supervised learning is another kind of machine learning. Semi-supervised machine learning is, as the name implies, a combination of supervised and unsupervised learning techniques, with only a portion of the input data containing results. This hybrid approach enables analysis and learning with a smaller number of labelled data, mixed with a much larger collection of unlabelled data since one of the problems with Supervised learning is obtaining the necessary huge volume of labelled input/output training data.

Marketing Applications of ML and AI

When marketing automation platforms started to gain traction in the 1990s, they did so by capitalizing on the market's crowded CRM and Email Marketing programs and their flurry of technology advancements. Automating recursive and rather easy processes was one of the core functionalities that was quickly expanded with other more complicated jobs that were driven by machine learning. The automation solutions started to fuel intelligent decision-making with automated Lead Scoring and personalized customer development along the full customer journey. This is possible by using ML to process a large amount of collected customer data. Insights gathered from recorded interaction data might be utilized to dynamically supply each person with accurate messaging at every step, converting prospects into lifelong supporters.

In the 1990s, as marketing automation platforms gained popularity, they started by using artificial intelligence (AI) and machine learning (ML) to analyze vast amounts of data from a variety of media (e.g., textual, visual, oral) and sources (web, mobile, in-person) in order to gain in-depth knowledge (Du & Xie, 2021). These insights assist marketers in developing their decision-making skills, which is essential for business success (Paschen et al., 2019). (Abubakar et al., 2019). The previous 20 years have seen significant progress in the use of AI and ML in decision-making, which will continue to affect how marketers make decisions (Davenport et al., 2020). Modern AI systems can enhance decision quality by minimizing human mistakes and enhancing human decision-making (Jarrahi, 2018; Logg et al., 2019). The question of whether to use AI and machine learning to stay ahead of the competition (Huang & Rust, 2021) has given way to the question of how much (Lilien et al., 2017). However, a study demonstrates that people frequently reject algorithms and AI, especially when errors occur (Moon, 2003; Dietvorst et al., 2015) or when people feel less accountable (Promberger & Baron, 2006; Dietvorst et al., 2015). Only under specific circumstances, such as with objective or numerical tasks, do humans typically prefer algorithmic guidance to human judgment (Castelo et al., 2019; Logg et al., 2019; Newman et al., 2020). Given their potential, it is not surprising that many marketing managers are still hesitant to fully utilize AI and ML in decision-making (such as automated decisions; Davenport & Kirby, 2016). The key areas where AI can play a significant role in marketing were able to be identified by a study by Haleem et al. (2022).

One of the applications is

- 1) Digital marketing. To understand consumer behaviour, actions, and indicators, marketers may use AI. They are able to swiftly and effectively target the right individual with the appropriate approach as a result (Shah and Shay, 2019; Paschen et al., 2021; Yang et al., 2022; Syam & Sharma, 2018).
- 2) Connect business processes. When it comes to marketing outputs in businesses, marketers who take advantage of AI's potential excel. Using the power of information systems, they can link up all aspects of business operations and provide a flawless user experience (Sadriwala & Sadriwala, 2022; Yablonsky, 2019; Grewal et al., 2020; Mer & Viridi, 2022).
- 3) Improved marketing automation software. When marketers use marketing automation tools, they can quickly identify qualified leads, improve lead nurturing strategies, and produce pertinent content. The best dynamic content emails are one-on-one emails because they use contextual emails to energize what the brand says and target what subscribers want to hear (Alyoshina, 2019; Tanase, 2018; Jarek).
- 4) Focus on the needs of the customer. AI provides organizations with valuable insights that help them better understand their customers and make decisions that are centered on their needs. With the help of the vast amounts of data generated by AI systems, marketers can quickly create consumer personas (Feng et al. Rekha et al., 2021 2015; Paschen et al., 2016, 2019).
- 5) Predictive model creation and
- 6) improved customer service.

Methodology

This article discusses the application of ML and AI technologies in marketing by developing a taxonomy of ML and AI applications used to solve marketing problems. After conducting a systematic review of the literature in this area, or rather, we were able to collect several use cases of AI classification in machine learning and marketing. Using PRISMA, we identified 309 titles from different authors on this topic. No filter is set to return documents published after a certain date or year. Topics (algorithmic marketing techniques) were researched to determine their suitability to the topic. Topics that relate to other areas have been removed. As a result, more than 209 relevant and duplicate titles were removed and 100 titles were processed for full-text analysis. They were also evaluated on merit. 90 articles were included in the detailed review. However, 12 titles were excluded because they related to other areas. Finally, 78 articles from the most prominent journals and conferences in the field were reviewed.

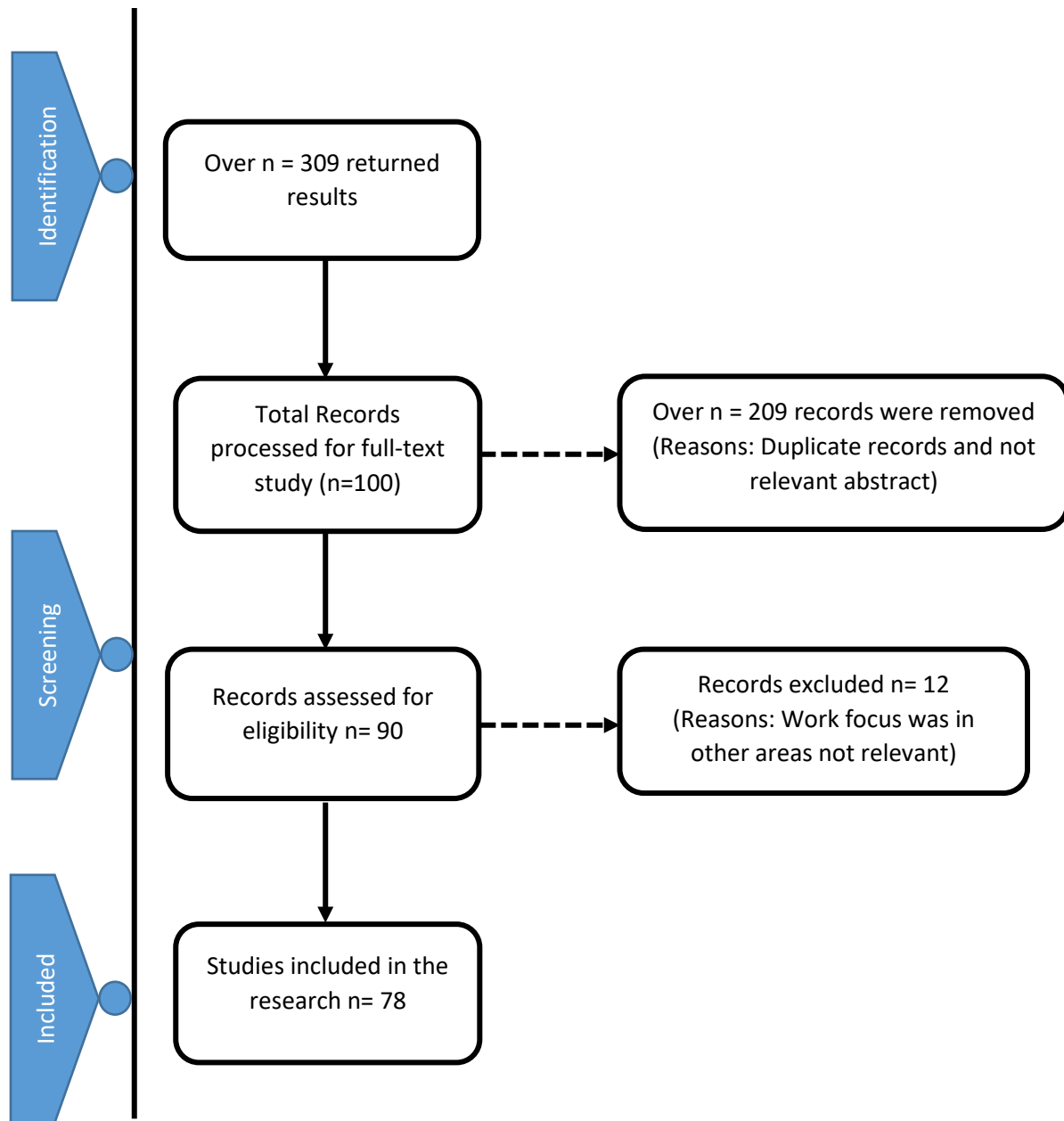


Fig. 1 PRISMA Technique for Article Selection

Results and Discussion

We identified different application areas including Segmentation and targeting, customer churn, customer lifetime value, recommendation engines, marketing mix modules, and customer attribution.

Segmentation and Targeting

The processes of identifying a business's potential consumers, selecting the consumers to target, and producing value for the prospective consumers are referred to as market segmentation and targeting and it's accomplished by using Segmentation, targeting, and positioning (STP) (CFI Team, 2022). Increasingly more realistic micro-segments are being captured through more fine-grained segmentation. This ongoing improvement may eventually result in

each customer being a distinct section that can be targeted with offers and promotions that are unique to him or her (Ma & Sun, 2020).

Client Churn

One of the major issues that businesses encounter is customer churn. However, the scope of the problem isn't often fully understood. In reality, it is believed that churn costs the economy \$2 trillion or more per year (Dorrell, 2018). That is equivalent to one of the top ten economies in the world. Churning out customers is a real issue. It has significant, tangible effects on your company's operations and bottom line. Churn can indicate issues with a variety of aspects of a business, including revenue loss, excessive costs associated with acquiring new customers, issues with customer experience (CX), the influence of rivals, and the potential for Churn customers to spread the poor word of mouth (Goodey, 2022). The Random Forest prediction model can be used by marketers to predict customer turnover and stop it as soon as possible.

Customer Lifetime Value

Selling to an established customer is cheaper than acquiring a new one. As a result, you want to ensure that your consumers are content with your product or service so that you can keep them long enough to recoup the investment required to gain their business in the first place (Fontanella, 2022). Customers leaving would be the last thing any company wants. One of the most effective ways to prevent this is to assess client lifetime value (CLTV). According to Caldwell (2022), customer lifetime value is a measure of the overall money a firm may expect to pull in from an average consumer for as long as that individual or account stays a client.

Recommendation Engine

To increase the chances of a sale, businesses need to recommend additional items that customers may not be aware of or may find attractive. The recommender engine (RE) is considered the preferred solution in these cases because it provides relevant items, increases cart value, and increases customer retention (Behera et al., 2020). With the aid of a recommendation engine, marketers may offer timely, pertinent product recommendations to their clients. To propose appropriate product catalogues to people, make use of modern algorithms like machine learning (ML) and artificial intelligence (AI) and data analytics techniques. Products may also be displayed on websites, applications, and emails based on user choices, previous browsing behaviour, attributes, and contextual context. These days, it is frequently employed in business-to-consumer (B2C) e-commerce sectors like entertainment, mobile apps, and education that call for a personalized strategy. The global market for recommendation engines was estimated to be worth US\$ 2.7 billion in 2021, according to a report from The Business Research Company (2022). According to forecasts, the market will grow at a CAGR of 35.61% from 2022 to 2027, reaching US\$ 16.3 billion.

Marketing Mix Module

The marketing mix model is a well-liked technique for choosing how to allocate the marketing budget and calculating return on investment (ROI). Economics and econometrics are the foundation of the procedure (Cain, 2010). According to Pandey et al. (2021), the marketing mix model has been around for many years. While some have yet to realize its full potential, several businesses have already done so with great success. It has become even more difficult to get marketing strategy right for any sector and product due to the rapidly changing marketing environment, consumer dynamics, and multiple touch points. According to Martin (2021), it is a marketing evaluation technique that will become increasingly significant, possibly even the next "gold rush" tactic, for organizations to get the most out of their marketing efforts. The most difficult aspect of the marketing mix optimization process is determining the real-time cross-channel effects on companies.

Customer Attribution

Marketers use customer attribution models whenever they want to enhance personalization, understand their customers better, and save money. The process of "customer attribution" or "marketing attribution" involves

assigning credit for success to specific marketing platforms (channels) and contacts a customer has with a brand (touchpoints). This involves assessing your current marketing touchpoints to identify the most effective platform for attracting new clients and turning the contacts into meaningful actions that grow your business. According to a study by Moffett et al. (2014), attribution modelling involves using advanced analytics to give each marketing channel's showcasing touchpoint the proper credit for a sale or conversion. Numerous platforms are used by advertisers to connect with customers. Throughout their "customer journey," these customers frequently engage with a variety of channels. It is still challenging to determine how each channel influences marketing success and how channels interact with one another. We still lack a thorough understanding of how channels interact and how effective they are in multichannel environments, even though both academia and industry have adopted sophisticated attribution models (Anderl et al., 2016).

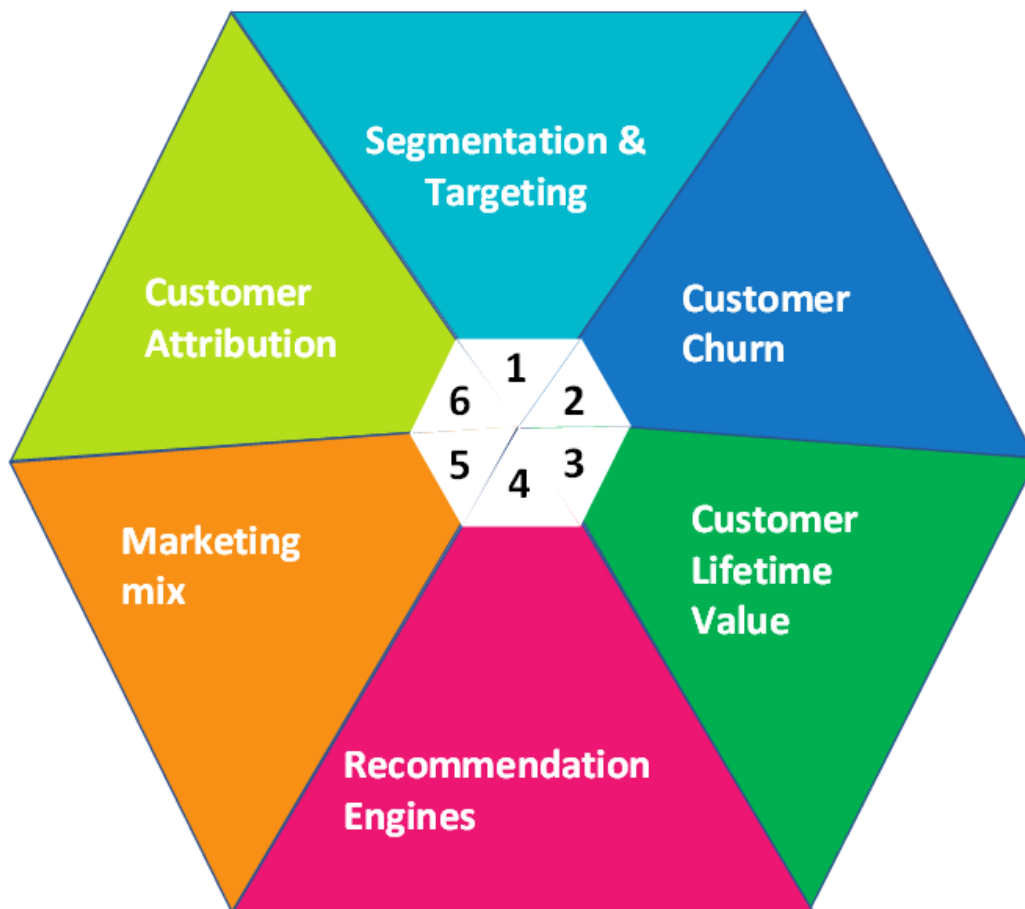


Fig. 2: Taxonomy of Machine Learning use in Marketing

Conclusion

Artificial intelligence (AI) describes methods that let machines engage in cognitive tasks like learning, reasoning, and interacting with their environment, which typically requires human intellect. Machine learning algorithms can learn from their experiences and enhance their performance. Its primary goal is to enable users to access, utilize, and gain knowledge from current data. Their marketing use today is crucial to the expansion of businesses. The following areas identified as Segmentation and targeting, customer churn, customer lifetime value, recommendation engines, the marketing mix module, and customer attribution are just a few examples of application fields. This paper

presents the taxonomy of machine learning methods used in marketing. This study demonstrated that only two of the techniques—supervised learning and unsupervised learning—are frequently employed by marketers. Our work would aid future research in determining the optimal approach for their unique interests.

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