# Research on Marketing Methods based on Machine Learning Model

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**Abstract.** Machine learning is an interdisciplinary discipline, involving many fields, from probability theory to algorithms, to statistics, and other things, all of which enable computers to simulate human learning methods. Machine learning can also greatly enhance the efficiency of learning by dividing the original content into knowledge structures. Turing proposed to build a learning machine and promoted the progress of practical application, which is a great progress in machine learning. Although banks have a large amount of information data, the traditional marketing methods can not fully mine the value of these large amounts of data. Through the use of machine learning technology to establish a precision marketing system, use the machine learning model on the big data platform to conduct in-depth analysis of user behavior, needs, preferences, etc., and then carry out the implementation of the marketing plan for the mined potential customers. This paper analyzes the relevant content and application of machine learning, and gives a more comprehensive analysis of the system.

**Keywords:** Machine learning, Business, Marketing.

## 1. Introduction

In the early stage of the development of mobile internet, e-commerce platforms rely on the digitization of commodity information, provide rich data information as the basis for consumers to make decisions, and change the traditional shopping experience of consumers with convenient and fast good shopping experience; In the medium term of the development of the Internet, the investment focus of e-commerce platform is to recommend the products with high sales volume and high popularity in the required categories for users from the perspective of platform management, so as to improve the transaction of the platform [1]; However, the rapid development of Internet technology and the improvement of residents' living standards have led to the increasingly complex and diverse attributes of goods. The number of information in e-commerce platforms has increased exponentially, causing information overload for users, and on the contrary, increasing the decision-making cost of users. At the same time, users' personalized consumption preferences are increasingly prominent, and the recommendation strategy of unilateral products is insufficient to meet users' demands [2].

In general, the user transaction marketing strategy is marketing activities to certain groups within a certain cost range to achieve business performance. Strategy formulation can rely on hands-on experience and data analysis to define the process. It can also rely on machine learning to build models for multiple links and build models manually to complete the entire strategy formulation . At this stage of strategy formulation, the advantages of machine learning can be played, because strategy formulation is based on maximizing the effect of strategy targets, and machine learning models are also based on maximizing specific targets. Therefore, if the mathematical model can be made correctly in combination with business goals, the effect of business goals can be maximized [3].

## 2. Theoretical Background

The hierarchical types of AI can be divided into mechanical type, analytical type, intuitive type and empathy type. Mechanical AI involves the execution of routine and task-based marketing activities, including intelligent customer service and automated sales. Analytical AI supports marketing decision and implementation through logical reasoning and data operation in processing

and solving marketing problems. At present, most machine learning algorithm applications in AI marketing focus on mechanical and analytical AI, which is still in the stage of weak AI, and mainly focus on transactional, task-based and analytical applications. Crossing the stage of weak AI, intuitive AI has the ability of creativity and innovation, and carries out "human-machine" interaction and feedback according to early experience and knowledge map to achieve product recommendation, marketing interactive voice, etc. Empathic AI is the highest level of AI, with certain emotional interaction and empathy capabilities, and can realize "human-machine" independent learning and interaction. This level of AI is still in the exploration stage in the marketing field. From the perspective of various AI levels and development stages, AI marketing is in the weak AI stage have a relatively wide range of practice, and have obtained certain experience and model reference. They are gradually turning to the stage of strong artificial intelligence (intuitive type and empathic type). There have been some practical exploration in some specific fields, but there is still room for improvement. The development level and stage of AI in marketing field. AI marketing research mainly focuses on machine learning methods. Mitchell gave a widely used definition of machine learning: "According to computer programs, specific tasks t and performance measurement p can be learned from experience, so as to build prediction models and improve the models through parameter optimization [4]." Based on AI's ability in image recognition, voice processing, data mining and other tasks, The existing practice has fully demonstrated machine learning in various marketing activities such as user classification, market prediction, industry insight, brand monitoring, etc [5].

Application in Various algorithms and technologies in machine learning are directly embedded in various daily marketing activities and become an important driving force to promote marketing. For example, Tiktok and YouTube achieve accurate push through recommendation algorithm in terms of content and advertising, and improve the information matching between content and users; Ctrip builds a group algorithm model based on consumer characteristics to carry out precision marketing and promote consumer consumption. The possibility of participation and purchase by the consumer; Based on consumer data, the German HSE e-commerce platform classifies users with the help of classification algorithms to achieve differentiated marketing and category optimization of the platform; With the help of user evaluation on social media platform, cosmetics company Sephora uses natural language processing (NLP) and subject model algorithm (LDA) to realize the mining of unstructured data, and uses social listening to understand consumer needs and attitudes, improve the quality of products and services, and promote user satisfaction; Donatos Pizza Use decision tree algorithm to predict and judge customer churn, and then provide targeted marketing promotion. Behind all kinds of algorithm-driven marketing cases, the application of specific algorithms can not be separated, which has changed the traditional marketing model and strategy, and has largely met the diversified needs of enterprises, markets and consumers. The application of machine learning in marketing activities has its own implementation process and mechanism, which can be summed up in the three key processes of "input - analysis/mining - application" [6]. First, the input stage. Marketing activities start from data acquisition, including structured data of consumer shopping behavior characteristics, as well as unstructured data such as pictures, texts, videos, etc. Multimodal data sets provide a data source basis for the subsequent application of machine learning algorithms; Secondly, the analysis/mining stage. All kinds of algorithms have different applicability to marketing activities; finally, in the application stage, combine specific algorithm technology, and carry out technical application and deployment for specific marketing objectives and function realization. Types of Machine Learning. As shown in Figure 1.

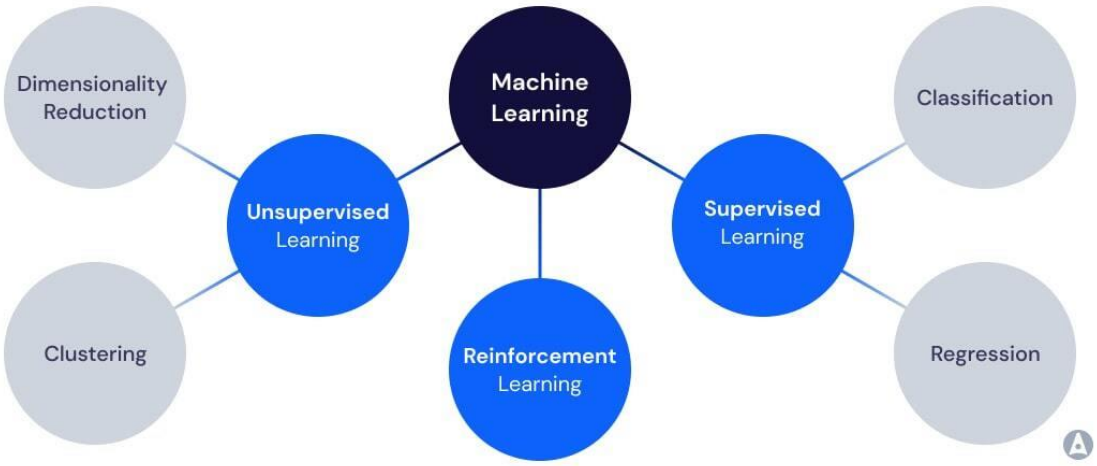


**Figure 1.** Types of Machine Learning

Supervised Learning: The supervised learning algorithm provides a training set with labels. In marketing activities, user types, consumption levels, attribute characteristics, etc. are artificially labeled. The input of various possible influential elements is usually expressed as a set of variables, while the label is defined as the target variable of Y. Then train the learning function of the data set to predict the output results after input. If y is a number/classification variable, the task is called regression/classification, and the prediction and classification judgment realized are the key points of supervised learning. The supervised learning algorithm can maximize the accuracy of using input variables to predict output results. Usually, the data set is divided into training subset and verification subset. The training subset is used to train the model, and the verification subset is used to adjust or select. Then, the test data set will be used to evaluate the final model and applied to marketing activities such as market forecast and user classification [7].

Unsupervised Learning: In unsupervised learning tasks, the dataset contains only input variables, while the output variables are undefined or unlabeled. The typical goal is to find hidden patterns in the data or extract information from the data. In cluster analysis, input instances are divided into multiple groups to maximize intra-group similarity and cross-group differences. In the dimensionality reduction task, high-dimensional data is converted into lower-dimensional variables while preserving the information in the original data. The extracted function contains the key information, features and variables of the original data, which can be interpreted or used as input for subsequent analysis [8].

Reinforcement Learning: These tasks are often called Markov Decision Process (MDP) and are used to predict market trends and consumer behavior choices. The reinforcement learning algorithm needs to clarify the action taken and formulate the best action policy, including five aspects: agent, environment, state, action and reward. Intensive learning is an important transitional stage from weak AI to strong AI, which is gradually applied in the marketing field, involving Marketing activities related to interaction, interaction, recognition and cognition [9,10].

## 3. The connotation of AI marketing

The foundation of AI marketing: big data and AI：Technology. This kind of technology converts the insights obtained from machine learning and analysis into words, images, sounds and other forms that can be understood by human beings as the output results. These outputs can provide information for marketers' decisions, or be directly used for intelligent tasks in marketing activities, such as intelligent customer service response and interaction [11,12].

Characteristics of AI marketing: intelligence：AI marketing is more intelligent in task execution [13,14]. At present, AI has made great progress in mechanical intelligence, analytical intelligence and emotional intelligence, which can replace the routine and repetitive tasks of marketing personnel to a certain extent and provide marketing services for users [15]. For example, the intelligent online customer service embedded with machine learning, natural language understanding and other

technologies can not only quickly understand the simple questions raised by users and respond in time, but also identify the user's anger, happiness, disappointment and other emotions, and contain corresponding emotions in the response, making the interaction with users more warm [16,17].

## 4. Conclusion

These information contents appear in the marketing big data system in the form of numbers, text, pictures and videos, with the characteristics of diversification and mass, and this part of data is concentrated in shopping websites. Brand attitude mainly includes user sharing, user social activity, user evaluation, etc. It is the basis for enterprises and marketing personnel to predict consumer behavior. AI is the core of AI marketing, including machine learning and algorithms, involving three stages of information input, analysis and output. The input stage mainly involves speech recognition technology, computer vision technology, etc., in order to express the external information with computer language structure. The analysis stage mainly involves machine learning, that is, extracting hidden knowledge from big data, or expanding knowledge reserves by using experience, new concepts, new things, etc., to make intelligent and reasonable decisions and predictions. The output stage includes image generation technology and language generation technology, and converts the analyzed content into text, image or audio and other information forms that can be understood by human beings. AI marketing is characterized by intelligence, including data analysis and processing Intelligent management and intelligent decision-making. In terms of data analysis and processing, traditional marketing uses artificial data analysis method, which lags behind in prediction.

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