Customer Service System Design Based on Big Data Machine Learning

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Abstract. In recent years, with the rapid development of big data, traditional offline transactions have been moved to online in large numbers driven by the Internet. The virtual nature of online transactions has caused it to have problems such as difficulty in guaranteeing product quality and difficulty in user consultation. In addition, consumers are paying more and more attention to the quality of services, and the participation of customer service in the process of online transactions is very important. However, the current e-commerce market in our country is large and the number of online shopping users is extremely large. Customer service personnel are facing great work pressure. In addition, customer service has the characteristics of difficulty in recruiting, high labor costs, and high turnover rate. Such a dilemma is not conducive to our country. The sound development of e-commerce needs to be solved urgently. In order to solve these problems, it is a good method to apply related technologies to realize the automatic response of customer service. The purpose of this article is to design and research a customer service system based on big data machine learning. This article first through the understanding of the basic concepts of big data, and then extend the core technology of big data. Combining with the design ideas and concepts of contemporary customer service systems in our country, we will discuss the design and research of customer service systems based on big data machine learning. Research shows that traditional customer service in the era of big data can no longer meet people's growing needs, and customer service systems based on big data machine learning are more efficient and convenient.

Keywords: Big Data Technology, Machine Learning, Customer Service System, Research Design

1. Introduction

Customer service is a bridge between companies and users, playing the role of alleviating conflicts, enhancing feelings, and deepening understanding. Fast response capabilities and good service levels play a decisive role in improving corporate products, building a good reputation, and increasing user
stickiness [1-2]. The rapid development of the Internet has changed the operating models of traditional industries such as sales, catering, and banking, and has also brought new difficulties to the operation of traditional call centers. From traditional phones, TVs, computers to new smart phones, tablet devices, and wearable devices, a wide variety of terminal devices emerge in an endless stream, bringing explosive information growth. Traditional call centers and customer service centers are facing a large amount of real-time repeated data, which brings great challenges to the guarantee of service quality, information management and storage [3-4]. Especially during the Double Eleven event, most shops are facing consulting difficulties. The limited number of customer services cannot meet the sudden increase in customer flow, and it is difficult to provide satisfactory services to users. In addition, the labor cost of customer service continues to rise, the attrition rate is high, and the recruitment of professional customer service is difficult. Traditional manual agents can no longer meet the needs of users and the market. A new service model is urgently needed to solve the rapidly growing and changing needs and labor. Solve the problem of speed mismatch [5-6].

Since the development of machine learning is relatively early, many core technologies are relatively mature, but the recommendation method based on rules or group physics is adopted in the content-based recommendation system [7-8]. There are many researches and applications on intelligent response systems at home and abroad, and there have been good research results in intelligent assistants, such as Apple Siri, Microsoft Xiaoice, Xiao Ai, etc., providing queries, operations, chats, etc. Function, but also constantly learning new skills, is the assistant of life, but also the companion of emotion [9-10]. However, the application of intelligent response systems in customer service is different from that of intelligent assistants. Intelligent customer service has strong domain relevance and requires expertise in specific fields to accurately solve user questions and requires high accuracy of answers. In addition, intelligent customer service needs to continuously learn during the service process, continuously optimize the quality of service in various scenarios based on user feedback, and provide users with customized and personalized services based on user behaviors [11-12].

This paper studies and analyzes the core technologies and implementation methods required for the design of a customer service system based on big data machine learning, and further optimizes it in combination with our country’s current customer service system to discuss the design and implementation of a customer service system based on big data machine learning.

2. Research on the design and application of customer service system based on big data machine learning

2.1. Principles of big data related technologies
(1) Introduction to the principle of Yarn.
YARN is essentially a system used to manage distributed applications. It is also an important part of Hadoop 2.0-the resource management system. It is composed of ResourceManager and NodeManager. ResourceManager supervises all available cluster resources and NodeManager supervises the status of each node. NodeManager accepts ResourceManager scheduling and is responsible for managing the resources available on a single node. ResourceManager is a pure scheduler, which is mainly responsible for the balanced scheduling of available resources in the application, and optimizes the cluster utilization for various capacity restrictions, SLAs, etc., so that all resources can maintain normal working conditions.

(2) Principle of MapReduce.
MapReduce is an algorithm model that can process big data quickly and efficiently. It is also a programming model. It can realize parallel computing and processing data on a computer with a common configuration. The MapReduce program consists of a mapping process (or method). composition. This process performs filtering and sorting, as well as a reduce method that performs summary operations. It turned out to be an important computing model framework of Google. It can summarize those complex, large-scale running cluster calculations into two functions: one is the Map
function and the other is the Reducce function. The essence of MapReduce is to divide the unprocessed data set into N data sets, and each machine runs a task. Finally, the results of each machine must be integrated. The Map function accepts a key-value pair and generates a set of intermediate keys. Value pair, the MapReduce framework will pass the same key value in the intermediate key-value pair generated by the map function to a reduce function.

2.2. Customer service question answering system design

Question answering systems have been around for a long time and have been widely used due to the effectiveness of their results. The purpose of all these systems is to provide users with direct and accurate answers to their questions while allowing users to use natural language. Question answering system is a combination of various fields, such as natural language processing, information retrieval and information extraction. In the overall architecture of all typical question answering systems, question processing, information retrieval and answer processing are the three main modules that constitute the question answering system.

(1) Problem handling module.

The purpose of this module is to process and analyze natural language problems to better understand the information requested by the problem. The task of this module can be defined as "the task of analyzing and processing problems by creating a mapping of the problem request information". The entire query processing and analysis can be divided into two small subtasks. The QA step helps to understand the focus of the question. The focus of the question can be defined as "a phrase in the question that can disambiguate and emphasize the type of expected answer."

(2) Document processing.

The second module is document processing and information retrieval. Its function is to retrieve related information based on the data of the problem processing unit. The process of information retrieval depends on the type of knowledge base or corpus used by the system. Generally, most systems use document corpus or the World Wide Web as their knowledge resource base. The three main modules of this module are fetch, filter and command. The information retrieval system can retrieve related documents or paragraphs based on the information sent by the question. The system uses various technologies to retrieve a set of documents or paragraphs. Among them, keyword matching or keyword frequency are some commonly used technologies.

(3) Answer processing.

The task of answer processing can be further subdivided. This module can obtain the type and focus of the problem in the problem processing module and the candidate paragraphs in the document processing module. First, the module needs to determine the paragraph with the answer. It is important that the type and focus of the question have been determined, because it indicates the nature of the answer. At the same time, the parser plays an important role in identifying the named entities and part-of-speech tags of words. With this information, the system can identify the paragraph that contains the answer. The next step is to extract precise answers from the selected paragraphs and use a set of simple rules combined with heuristics to extract the final answers from the paragraphs.

2.3. The realization of the system

The realization of the intelligent customer service system depends on the association of various subsystems. This section tests the effect of the intelligent customer service system on the basis of the realization of the system. The intelligent customer service system must first have an appropriate entrance, considering which scenarios users need to consult, and provide users with an interface to enter the system. In the consultation interface, the intelligent customer service system needs to obtain information such as the user's order status, and then identify the type of problem according to the content input by the user, so as to determine the interface to be called subsequently, identify the problem through the word segmentation module and the matching module, and perform relevant after identification Information retrieval, and then return the corresponding information. Part of the code is as follows:
2.4. The mathematical basis of bayesian algorithm

Bayes' theorem is a theorem about the conditional probability of random events A and B (assuming that event A and event B are not related), and its expression is as shown in the formula:

\[ P(A|B) = \frac{P(B|A)P(A)}{P(B)} \]  \hspace{1cm} (1)

For the Bayes theorem of two variables, the expression is as follows:

\[ P(A|B, C) = \frac{P(A|B)P(B|A)P(C|A, B)}{P(B)P(C|B)} \]  \hspace{1cm} (2)

3. Customer service system design based on big data machine learning

3.1. Subjects

(1) In order to ensure the scientific validity of the experimental data, this experiment investigates the customer service system design of a certain company. This time compares the traditional customer service system with the customer service system based on big data machine learning designed this time. Research on customer service system design based on big data machine learning.

(2) In order to further study the optimized machine learning customer service system, this article visited a number of experts and scholars to conduct face-to-face interviews, and launched an investigation on the development environment of the system.

3.2. Research methods

(1) Document method.

This article reads a large number of predecessors' research materials and the scientific research results of related experts and scholars. And collect the most cutting-edge data in the industry, these data provide a solid reference basis for the research results of this article.

(2) Field research method.

This article conducts face-to-face interviews with relevant experts and scholars through field research. The data obtained from the interview was sorted and recorded. This survey collected the most authentic and credible data for the research of this article.

(3) Mathematical Statistics.

Use relevant software to sort out the data obtained and make the results more organized.
4. Experimental analysis of customer service system design based on big data machine learning

4.1. Comparative analysis of system optimization

In order to make the experiment more intuitive, this experiment compares the customer service system based on big data machine learning with the traditional customer service system, and compares the time efficiency of completing the work before and after, so as to judge whether the machine learning customer service system under big data is competent for traditional customer service. The data obtained is shown in Table 1:

| Problem handling | Document processing | Answer processing |
|------------------|---------------------|-------------------|
| Machine learning | 94                  | 109               | 88                |
| Traditional      | 134                 | 152               | 132               |

![Figure 1. System optimization comparative analysis](image)

Table 1. System optimization comparative analysis

It can be seen from Figure 1 that compared with the traditional customer service system, the customer service system based on big data machine learning has shorter service time and higher efficiency. In particular, the document processing module is nearly 50% more efficient than traditional customer service. It can be seen that in the era of big data, traditional customer service can no longer meet people's growing needs.

4.2. Experts and scholars analysis of customer service system design based on big data machine learning

Based on the architecture design and functional module design of the entire system, the functions of the online customer service system were initially realized. Finally, the entire system was debugged and interviewed with relevant experts and scholars to investigate their recognition of the system. This time, a ten-point scoring system was adopted. To ensure the reliability of the experimental data, the results obtained are shown in Table 2:

| Architecture | Development Framework | database | Development language |
|--------------|-----------------------|----------|----------------------|
| Man          | 7                     | 8        | 7                    | 6                    |
| Woman        | 6                     | 9        | 7                    | 8                    |
Figure 2. Experts’ recognition of system design

It can be seen from Figure 2 that most experts agree with the design of the customer service system for big data machine learning, especially the development framework Hadoop, which expresses the good compatibility and stability of Hadoop.

5. Conclusion

The increasing number of online shopping users, the rapid increase in the number of online transactions, and the increasing requirements of consumers for service quality have brought great challenges to the guarantors of online transaction service quality-customer service personnel. They are under tremendous pressure, and the resulting slow response speed and high customer churn rate have brought companies such problems as high labor costs, insufficient professionalism, and difficulty in guaranteeing service quality, which is not conducive to the sound development of e-commerce platforms. With the increasing maturity of artificial intelligence technology in recent years, it is an effective means to use technology to alleviate and solve the predicament faced by e-commerce companies. The design and development of the intelligent customer service system is of great significance to society, enterprises, customer service and users. It can effectively allocate resources and improve service quality.

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