

The Application of Artificial Intelligence Technology in Public Library Information Retrieval

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Abstract. With the continuous innovation and development of social science and technology, artificial intelligence technology has been the focus of attention and research in more and more industries. Public library, as an important place in the society to provide mass education for the masses, should fully seize the development opportunity with artificial intelligence technology as the core idea in the operation and development, carry out intelligent, automatic and digital reform and innovation of the library, and optimize the links of information retrieval, book borrowing, information service and access to the library. Through Internet technology, artificial intelligence technology and other advanced technologies, the whole science and technology content of public libraries and public service quality is improved so as to meet the specific needs of the public for the use of public education resources. Based on this, this paper first briefly describes the basic concepts of human intelligence technology and information retrieval technology, and then studies the specific application of artificial intelligence technology in public library information retrieval link and related service applications, hoping to provide some reference for professionals.

Keywords: Information Retrieval; Public Library Artificial Intelligence Technology; Information Filtering Technology; Natural Language Processing Technology.

1. Introduction

In the background of the era of big data, public libraries not only need to store a large amount of public educational resources to guarantee the public masses to carry out public pedagogy, but also need to provide the masses with information resources, public education, social culture and other services. As a result, public libraries need to store, collect and manage more and more data resources. Thus, information retrieval needs to face certain difficulties. Therefore, intelligent reform and optimization of information retrieval can provide more convenient help for users to carry out information retrieval. However, the practical application value of most disordered information retrieval is relatively small, and it is difficult to meet the needs of users to carry out information query efficiently and quickly. Therefore, relevant departments need to focus on the specific application of artificial intelligence in real life.

2. Artificial Intelligence Technology

Artificial intelligence technology is a new technology based on Internet technology, which can be widely used in most industries. The research and development of artificial intelligence technology is challenging and innovative to a certain extent, which requires relevant researchers to have a certain cognitive understanding of computer technology, psychology, linguistics, imaging, philosophy, and other fields of knowledge. Therefore, artificial intelligence technology is a relatively extensive science, including different kinds of professional knowledge such as computer vision and machine learning. In general, the main purpose of artificial intelligence research is to enable machine systems to handle a series of complex tasks based on human thinking. However, in different stages of research and development, people's definition of "complex task" is not the same, but its essence is always the same, that is, through advanced technology to enable machines to process related affairs in accordance with human normal thinking and logic methods. Hence computer and Internet technology is the core technology that artificial intelligence technology can realize. The development of artificial

intelligence technology will be directly affected by the development history of computer technology. At the same time, due to the diversity and change of the expression methods of knowledge content, artificial intelligence technology has a variety of different reasoning methods. Usually, people divide the logical reasoning process into two types, namely deductive reasoning, and non-deductive reasoning.

3. Information Retrieval Technique

Computer technology can help people quickly find the document information they need from the massive data resources, which greatly improves the convenience and efficiency of information retrieval. From the substantive point of view, the use of computer technology for information data processing can provide effective guarantee for information technology to carry out more complicated and in-depth management innovation. In the public library, the information of books or related documents input into the information retrieval system can help readers quickly find the books they want to consult, so as to improve the efficiency of readers' consulting. With the advent of the information age, people pay more attention to lifelong learning and use public libraries to carry out relevant knowledge learning to improve their own comprehensive ability and quality. Therefore, people pay more and more attention to the storage of information resources and information retrieval in public libraries.

4. The Application of Artificial Intelligence Technology in Public Library Information Retrieval

4.1. Natural Language Processing Technology

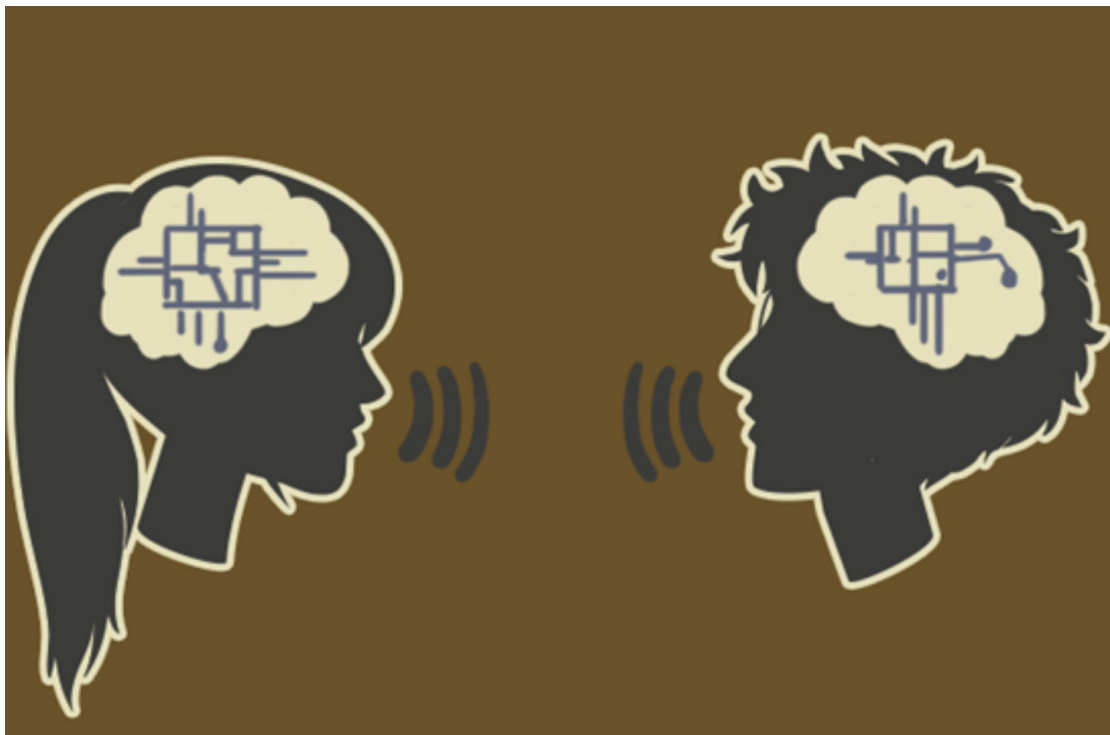


Fig 1. Natural language processing technology simulation diagram

Natural language processing technology is a very important basic system in artificial intelligence technology. Its main research content is the universal language features of human, the language habits and grammar commonly used by human, and the language features are effectively converted into computer language, so as to achieve effective communication and interaction between human and computer. The main function of natural language processing technology is to process the junk

information. By comprehensively monitoring the information data, it can judge whether the content of the information data is useless garbage resources. Add specific language rules to the information data filtering system and embed them into the information retrieval system. When the system receives suspicious information, it will be sent to a specific management area. After comprehensive retrieval of the information content, it will analyze whether it belongs to junk information, so as to perform filtering operations. People can look at information quickly to see if it meets their expectations. Natural language rules can prevent sentences from understanding the meaning of other sentences, and with specific complex processing optimization, it is possible to achieve comprehensive analysis of a single word, multiple keywords or long paragraphs, so as to achieve effective analysis and judgment under the grammar rules of pronunciation.

4.2. Video Image Retrieval Technology

At present, there is a new video image retrieval method in the field of artificial intelligence. In this method, artificial intelligence technology can be effectively applied in the integration and collection of video image resources, classification relations and retrieval. The feature selection of video image information mainly includes texture analysis, influence color histogram calculation and dynamic tracking algorithm for local video information, and the feature selection information finally forms the feature vector. The artificial intelligence system includes adaptive matching algorithm and feedback artificial intelligence neural network, which can classify and retrieve the image and video information according to the feature vector. The working area of the whole system is a complete two-dimensional plane area. The artificial intelligence system will classify the information of different video clips according to the feature vectors, so as to achieve effective integration and classification of video resources. In the process of query, the user only needs to refine the rules in a specific area, which can limit the video resources in a small range, so as to achieve the purpose of fast retrieval of video image resources. The specific process can be divided into five stages, which are system training, video image resource aggregation, video image retrieval, feature vector extraction algorithm and artificial intelligence algorithm.

4.2.1. System Training Stage

At this stage, the system will initialize the artificial nervous system and conduct repeated training during the interaction between the system and users, so as to enable the system to adapt to the feature vector of video image resources, so as to carry out more precise and detailed integration and classification of related impact resources.

4.2.2. Video Image Resource Aggregation

In the training stage, the artificial intelligence system will be formally applied in the integration and classification of video image resources. Data resources with similar feature vectors will be integrated into similar areas by the system, while different types of video image resources will be divided according to their correlation [1].

4.2.3. Video Image Retrieval

After the integration and classification of video image resources, users only need to conduct detailed search in a specific area to quickly query specific video image resources. There are two core operations in the integration and classification of video images by artificial intelligence system. First, feature vector extraction is carried out on video image resources, that is, the specific expression method of video resource features is determined. Secondly, the corresponding artificial intelligence algorithm is used to ensure that users can quickly access video image resources according to the algorithm.

4.2.4. Feature Vector Extraction Algorithm

The feature vector extraction algorithm used in this technology mainly includes color histogram extraction, that is, to effectively analyze the color information of video image resources, so as to obtain all the color information of video image resources. Texture analysis algorithm to effectively

analyze video image patterns; The motion tracking algorithm for local information can further improve the classification accuracy of video image resources.

4.2.5. Artificial Intelligence Algorithm

This video image retrieval technique uses two relatively mature artificial intelligence algorithms, namely adaptive matching algorithm and feedback artificial neural network. The adaptive matching algorithm has the characteristics of high efficiency and precision in practical application. It can quickly find the system vector with the most similar characteristics by analyzing the input vector. The feedback artificial neural network can feed back the internal parameters of the system by analyzing the accuracy of the classification results and adjust them according to the actual situation.

4.3. Network Information Retrieval Technology



Fig 2. Network Information Retrieval Technology

When artificial intelligence technology is applied to the network information retrieval system, its main functions are as follows: effective imitation, innovation and expansion of human intelligence based on computer technology, so as to enrich the technology, methods and relevant theoretical knowledge of artificial intelligence. At present, the specific application of artificial intelligence in network information retrieval system is mainly manifested in intelligent agent and intelligent knowledge service system. Intelligent agent technology was first born in the 1980s. It is a very important research content in the field of artificial intelligence. It can effectively alleviate and solve the problems existing in network information retrieval.

Intelligent agent technology is a software program that enables users to exchange information resources with the help of agent communication protocol, so as to effectively solve the problem of information retrieval. Intelligent agent technology has the following characteristics: automation, intelligence, dynamic, collaborative, agent and active [2]. The specific application of intelligent agent technology in information retrieval is intelligent search agent, which can take the specific needs of users as the core oriented content, carry out the integration and collection of information resources and classification processing, and filter information according to the specific needs of users and recent preferences and habits as the measurement criteria. In the user interface can provide users with good natural language query function. When the user's specific query needs are not clear enough, the intelligent agent will start the reasoning mechanism in the system, judge the content in the database that meets the user's potential needs according to this, and conduct approximate retrieval according to the user's habits.

The main purpose of intelligent knowledge service system in practical application is to help people solve the problem that the volume of data resources is huge, but the acquisition of resources has a certain difficulty. Intelligent knowledge service system mainly includes data resource acquisition

system, intelligent processing system, intelligent service system and resource database system. The data resource acquisition system is mainly responsible for processing the collected data resources, so as to effectively transform them into professional knowledge information. The intelligent processing system is mainly responsible for associating and classifying the collected knowledge information with the existing knowledge information in the resource database and accurately uploading the qualified knowledge information to the resource database. Intelligent service system and resource database system can also become intelligent knowledge storage system, which is the most important part of the whole intelligent knowledge service system, which directly affects the overall quality and effect of intelligent knowledge service.

4.4. Information Filtering Technique

Information filtering technology mainly includes two aspects, namely information filtering and security filtering. Information filtering mainly includes data mining and search engine filtering, which is the filtering of information resources. Security filtering mainly refers to the filtering of information resource security. The traditional filtering methods mainly include text filtering, packet filtering and application filtering, etc., which have the disadvantages of convenient operation, low flexibility, and unable to effectively analyze the semantics of the article. Compared with the traditional technology, the new information filtering technology based on human intelligence technology can effectively realize the intelligent filtering of text content, which not only improves the security of information, but also effectively reduces the filtering burden required by the network management system.

4.5. Speech Recognition Technology

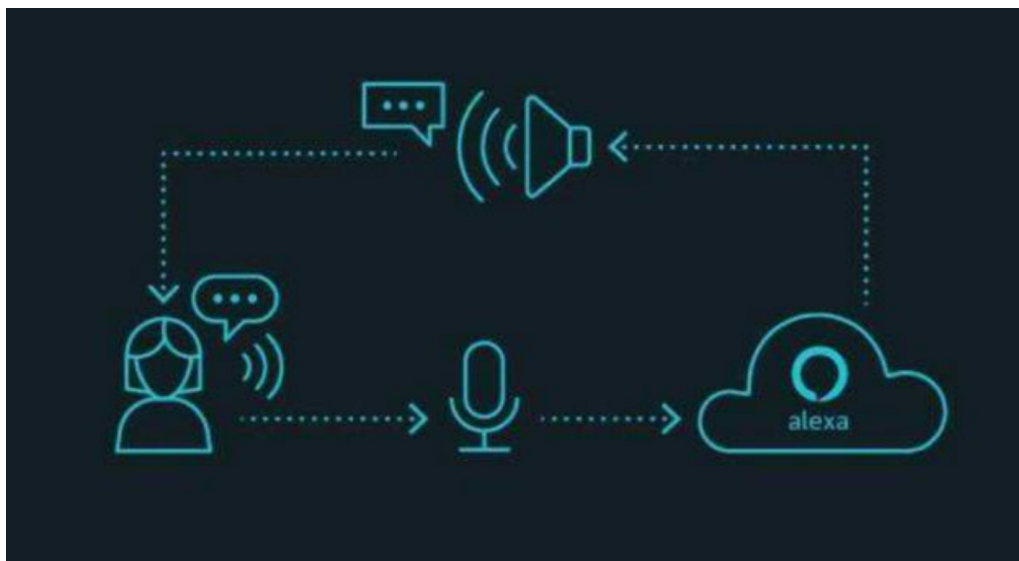


Fig 3. Speech recognition technology

Speech recognition technology mainly includes pattern recognition, signal processing, artificial intelligence, sound and hearing mechanism, introduction theory and information theory, etc. It has a very wide range of applications in artificial intelligence technology, and can play a good role in information retrieval system. Its main function is to effectively recognize the complex and diverse natural languages of human beings, so as to properly filter the language information, extract the key speech information, and conduct information recognition based on this [3]. In the recognition process, the information that is difficult to be effectively recognized will be processed separately. After the overall analysis and processing of the speech content, the key content will be recombined to retrieve the effective information.

4.6. Heterogeneous Information Integration and Holographic Retrieval Technology

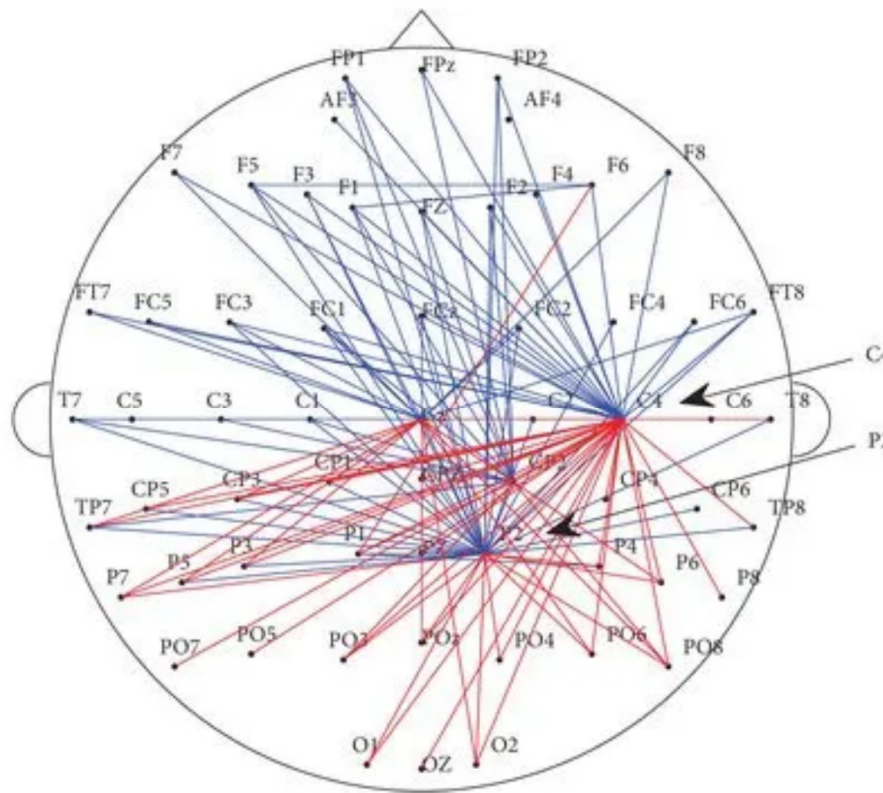


Fig 4. Heterogeneous Information Integration and Holographic Retrieval Technology

Heterogeneous information technology can help users effectively retrieve file information in different formats in practical application, including XML, HTML, PDF, RTF, TBXT and other common file formats. Heterogeneous information retrieval technology also supports the effective query and retrieval of various non-Chinese language information, the overall management of structured information data, unstructured information data and semi-structured information data, and the seamless integration with relational databases and the effective integration of open retrieval interface. Holographic retrieval mainly refers to information retrieval that supports all methods and formats. According to the current application situation analysis, heterogeneous information retrieval and whole-system retrieval have a large space for development and progress, which requires further research on natural language understanding, human-computer interaction and multimedia information retrieval.

5. Problems in the Quality of Information Retrieval

In the traditional information retrieval mode, although users have different needs for information retrieval due to certain differences in age, occupation, hobbies, personal habits, and other factors, but experts in various fields can effectively solve the problem. For computer systems, it is also a relatively complex task to accurately locate user categories. The high professionalism of various industries leads to the difficulty of efficient integration of information sources in computer systems. At the same time, computer systems lack the rich experience of experts and the correct understanding of professional knowledge systems. In the case of huge information volume, information retrieval technology usually uses two common retrieval technologies, namely classification technology and overall retrieval technology. Classification technology refers to the classification of search contents according to disciplines, concepts, etc., and planning them into corresponding categories. Overall retrieval technology refers to the search of the whole document or content, but in order to search accuracy, it still needs to simply divide the search content into categories. However, with the advent

of the era of big data, public libraries need to deal with massive information data in the process of daily operation, which makes it difficult for traditional information retrieval technology to effectively guarantee the quality and efficiency of retrieval. As a result, the understanding of newly developed information concepts is not clear enough, and the problem of classification errors will occur in the process of data classification. Thus, the quality of data information retrieval is relatively low [4]. Information retrieval is relatively simple, the analysis of information stays on the surface of the text, and it is difficult to effectively understand the internal meaning of the sentence. In the case of a large amount of information, the accuracy of information retrieval will be reduced to a certain extent.

6. Service Application of Artificial Intelligence Technology in Public Library Information Retrieval

6.1. Carrying Out Personalized Services

Personalized service mainly refers to the information retrieval service based on the actual search needs of users, user behavior habits, browsing preferences and individual characteristics of users. In the process of personalized service, it always adheres to the service idea of “taking user needs as the core”. The public library has a certain universality, and the user group structure is very complex. In the current network information service environment, user information must be deepened, detailed and personalized, which directly determines the trend of the whole information retrieval service, that is, in real life, users need to ensure that they can quickly and accurately find the effective information they need in the retrieval process.

6.2. Knowledge Service

Due to the changes of users' information search behavior, search content and information service environment, public libraries should provide good knowledge services and innovate and optimize the existing knowledge system and content. In the process of the application of artificial intelligence technology, it is also necessary to provide users with the corresponding public services provided by non-intelligent and non-specialized libraries, including the traditional mode of information retrieval and the transfer of related resource information and other services. With the further promotion and application of artificial intelligence technology, users are more and more accepting of modern information retrieval services. Meanwhile, the public is more inclined to learn professional knowledge in the process of public knowledge learning. In the process of information retrieval, technical emphasis should be placed on the methods of obtaining information resources and solving knowledge problems, rather than the access to information resources [5]. In the process of digitization and intelligent development of information resources, the methods of information retrieval and collection and integration of related resources should be simplified and optimized, so as to ensure that the library can integrate public education resources efficiently, and ensure that users can retrieve desired information resources more conveniently and accurately, so as to realize the purpose of information retrieval and non-information retrieval.

6.3. Subdividing the User Structure of Information

Compared with university libraries, research libraries and other kinds of libraries, public libraries have obvious characteristics, that is, the use of public libraries is relatively large, and the demand for the types and quantities of public resources are stricter. In the process of dividing user types, public service methods are mainly divided according to the specific structure of user groups. After structural division, public libraries can carry out targeted public services according to different user needs, so as to ensure that the public can effectively carry out public education and learning and enjoy personalized and professional public services. Thus, the social value and educational value of public resources can be effectively brought into play.

6.4. Intelligent Agent Service

The intelligent agent service will make appropriate adjustments with the changes of the information environment, and carry out relevant information consulting, screening and classification management according to the developed and perfect strategy scheme and user retrieval requirements in advance, so as to effectively make up for the shortcoming of waiting for user input instructions in the traditional mode. The intelligent agent service can set up the index at the same time of the automatic collection of information resources, and present the final query result to the user through the retrieval and user query input index library. At the same time, the intelligent agent service can also effectively predict and reason the content and purpose of the user's query according to the current environment, and adjust the predicted results according to the changes of the operating environment, so as to clarify the user's search results. The intelligent agent service has a complete intelligent system in the running process, and has a certain degree of problem-solving ability and target analysis ability.

After introducing intelligent agent thinking logic, the server will make use of the user feedback mechanism to improve and optimize information retrieval, so as to ensure the quality and effect of information retrieval and provide users with more complex retrieval services [6]. The user needs to log in a specific personal account, and the account needs to record the query and retrieval records of the user. When the user logs in again, the retrieval system can provide intelligent and humanized retrieval services for the user according to the recorded information, extract the information resources frequently queried and retrieved by the user, and prevent the phenomenon of multiple reviews.

In addition, tracking and analyzing user feedback can obtain users' satisfaction with the retrieval structure and further improve the quality of information retrieval. Thus, intelligent agent service can effectively ensure that the computer system quickly and accurately understand the specific needs of users, so as to ensure man-machine integration, to achieve the ultimate goal of intelligent service.

6.5. Understanding and Application of Natural Language

Natural language is a branch subject in the field of artificial intelligence, which includes logic, computer, linguistics and other contents, with linguistics as the main content. Part of the data search, information compilation and literature extract work can be replaced by using computer simulation of human language. The workflow of natural language in practical application is as follows: input certain grammar, words, reasoning rules and semantic rules into the computer system. After the user enters the search content, the computer system can scan and analyze the search content sentence by sentence, identify all the words and grammar in combination with the information base, conduct combination analysis of the words, deduce the general meaning and content of the search content, so as to consult the relevant information of the knowledge base, and show the results of approximate semantics to the user according to the degree of correlation [7].

Natural language processing technology can effectively segment and label sentence paragraphs, conduct grammar and semantic analysis of the search content, identify and label the related content in the search database, extract the key information and search features, and then effectively identify and analyze the grammatical meaning, and form it into a dictionary and knowledge database. In practical application, natural language technology needs artificial intelligence technology and computer technology to carry out auxiliary implementation, and does not need too much user participation, so it has a very wide application in public library information retrieval.

7. Conclusion

Public library is an important place to ensure that our citizens can effectively carry out social learning. In the development of the new era, in order to optimize its service quality and improve users' public reading experience, public libraries should actively apply artificial intelligence technology to optimize and reform information retrieval, so as to improve the quality and efficiency of information retrieval, and further promote the healthy development of public libraries in the direction of intelligence and science.

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