

Research on Personalized English Learning System Based on Big Data and Cloud Computing

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Abstract: With the development of globalization, the importance of English as an international language has become increasingly prominent. However, traditional English learning methods often face many challenges, such as limited learning resources and insufficient personalization of teaching content. In order to solve these problems, researchers began to explore personalized English learning system based on big data and cloud computing. This paper aims to summarize the research in this field, summarize the existing research results and put forward the future research direction.

Keywords: Big Data, Cloud Computing, Personalized English Learning System,

1. Introduction

The core of personalized English learning system is to provide customized learning experience according to individual differences of learners. Big data analysis can recommend suitable learning content and learning path for learners through their learning history, hobbies, learning styles and other information. At the same time, the system can adjust teaching strategies in real time according to learners' learning progress and performance, and provide personalized counseling and feedback. The goal of personalized English learning system is to help learners improve their learning effect and motivation, and make them participate in learning more actively[1].

The development of big data and cloud computing technology provides strong support for the construction of personalized English learning system. Big data technology can collect and analyze a large amount of learning data, thus providing learners with personalized learning resources and suggestions. Cloud computing technology can provide efficient computing and storage capabilities to ensure the stability and scalability of the system. The combination of these two technologies lays the foundation for the realization of personalized English learning system[2].

Personalized English learning system based on big data and cloud computing is an important direction of English education development in the future. By using big data analysis and cloud computing technology, personalized English learning system can provide personalized learning resources and guidance for learners, and improve learning effect and learning motivation. Future research should further deepen the

study of personalized English learning system to provide better learning experience and results for English learners[3].

2. The basic Characteristics and Research Significance of Personalized English Learning System Structure.

2.1 The Basic Characteristics of Personalized English Learning System Structure

Personalized English learning system is a customized English learning platform for learners' individual differences and needs. It provides personalized learning content, learning path and learning support for learners based on their language proficiency, learning style, learning goals and hobbies. The basic characteristics of personalized English learning system include adaptability, personalized content, personalized feedback and personalized support[4].

(1) Self-adaptability: It can automatically adjust learning content and difficulty according to learners' language level and learning progress. By analyzing learners' answers and learning behaviors, the system can judge learners' mastery and learning ability, and provide suitable learning materials and tasks for learners according to this information. For example, for learners with low English level, the system will provide simpler courses and exercises to help them gradually improve their English ability; For learners with high English level, the system will provide more complex and challenging content to further improve their language ability.

(2) Personalized content: It can customize the learning content for learners according to their learning goals and hobbies. Learners can choose their own topics or fields of interest to study, and the system will provide relevant learning materials and tasks according to the learners' choices. For example, if learners are interested in spoken English, the system will provide oral training courses and exercises; If learners are interested in business English, the system will provide business English learning materials and case studies. By providing personalized learning content, the system can stimulate learners' interest in learning and improve the enthusiasm and effect of learning[5].

(3) Personalized feedback: It can give timely feedback and evaluation to learners according to their learning performance and answering questions. The system will analyze learners' answers, find out learners' mistakes and weaknesses, and give corresponding explanations and guidance. For example, if learners have problems in grammar, the system will give corresponding grammar explanations and exercises; If learners have difficulty in listening comprehension, the system will provide more listening materials and exercises. Through personalized feedback, the system can help learners find and correct mistakes in time, and improve the effectiveness and efficiency of learning[6].

(4) Personalized support: It can provide learners with corresponding learning support and help according to their learning needs and difficulties. Learners can communicate and interact with teachers or other learners through the system and get personalized learning guidance and suggestions. The system can also provide learning resources and learning tools to help learners with learning planning and time

management. For example, the system can provide the function of making and tracking the study plan, and help learners to arrange their study time and tasks reasonably. Through personalized support, the system can meet the specific needs of learners and improve the learning effect and satisfaction[7].

Personalized English learning system has the basic characteristics of adaptability, personalized content, personalized feedback and personalized support. Through these characteristics, personalized English learning system can meet learners' individual differences and needs, provide personalized learning experience and learning support, and thus effectively promote learners' English learning and improvement.

2.2 Research Significance of Personalized English Learning System Structure

Personalized English learning system refers to a system that provides tailor-made English learning content and learning support for learners according to their individual differences and learning needs. The research significance of this system is various, which will be elaborated in detail from three levels: learners, educational institutions and society (Table 1)[8].

Table 1. Research Significance of Personalized English Learning System Structure

Research level	main content
learner	Every learner has his own characteristics and needs in the process of learning English, but traditional teaching methods often cannot meet the individual needs of all learners. Personalized English learning system can tailor the learning content and learning path for learners according to their learning styles, hobbies, learning goals and other factors. In this way, learners can learn English more efficiently and improve their learning motivation and learning effectiveness. At the same time, the personalized English learning system can also adjust the learning content and difficulty in time according to the learners' learning progress and understanding, so as to ensure that learners can gradually improve in the learning process and achieve considerable learning results[9].
educational services	Traditional English teaching is often carried out in accordance with the unified syllabus and teaching methods, which cannot meet the individualized learning needs of students. Personalized English learning system can provide an innovative teaching model for educational institutions and help them better adapt to the development trend of modern education. Through personalized English learning system, educational institutions can provide students with more personalized learning services, improve teaching quality and student satisfaction. At the same time, personalized English learning system can also provide educational institutions with a large number of learning data and learning analysis to help them improve their teaching and research. By analyzing the learning data, educational institutions can understand students' learning situation and learning characteristics, and provide more targeted teaching services for students[10].
society	With the development of globalization and the increase of international communication, English has become a universal language. Mastering English well is of great significance to personal development and national competitiveness. However, due to the differences of learners and the diversity of learning needs, traditional English teaching methods can not meet the needs of all learners, which leads to many learners unable to learn English effectively. Personalized English learning system can provide learners with more personalized learning services and help them learn English better. In this way, the English level of the whole society can be improved and the international competitiveness of the country can be enhanced. At the same time, personalized English learning system can also provide a large number of learning data and learning resources for the society, and provide reference and support for

The research significance of personalized English learning system is various. For learners, it can provide more personalized learning services and improve learning effect and motivation; For educational institutions, innovative teaching models can be provided to improve teaching quality and student satisfaction; For the society, it can improve the English level of the whole society and enhance the international competitiveness of the country. Therefore, the research and development of personalized English learning system has important practical significance and social value[12].

3. Research and Development of Big Data and Cloud Computing

3.1 Research and Development of Big Data

Big data refers to the technologies, methods and theories involved in processing and analyzing large-scale, complex and changeable data sets. With the rapid development of Internet, Internet of Things, social media and other information technologies, people can collect and store a large amount of data, which usually contains important information and value. The main meaning of big data is to extract useful information and insight from these large-scale data sets through analysis and processing, and provide support for decision-making, innovation and improvement.

The research content of big data is very extensive, involving data collection, storage, processing, analysis, mining and visualization. The following are the main contents of big data research:

(1) Data collection and storage: The primary task of big data research is how to efficiently collect and store large-scale data. Data collection can be carried out by means of sensors, network crawlers, log records, etc., while data storage needs to consider factors such as data security, scalability and reliability. Commonly used data storage technologies include distributed file system, NoSQL database and cloud storage[13].

(2) Data processing and management: Big data processing mainly includes data cleaning, data integration and data conversion. Because big data often contains noise, missing values and redundant information, it is necessary to preprocess the data before data analysis. In addition, for the large data set of distributed storage, management work such as data partition, load balancing and fault-tolerant processing is needed[14].

(3) Data analysis and mining: Data analysis is one of the core contents of big data research, and its main purpose is to discover hidden patterns, associations and trends from big data sets. Data analysis techniques include statistical analysis, machine learning, data mining and artificial intelligence. Through these technologies, big data can be classified, clustered, predicted and recommended, thus providing strong support for decision-making and business.

(4) Data visualization: Big data usually has high dimensions and complexity, so how to display data in a visual way is an important content of big data research. Data visualization can help users understand the data more intuitively and find the rules and anomalies in the data. Common data visualization technologies include charts, maps, heat maps and network diagrams[15].

(5) Data privacy and security: Because big data usually involves sensitive information such as personal privacy and trade secrets, data privacy and security has become an important direction of big data research. Researchers need to explore how to protect users' privacy and data security during data processing and analysis, while ensuring data availability and credibility.

(6) Data ethics and law: The application of big data involves not only the technical level, but also the ethical and legal level. Researchers need to think about the legality, fairness and morality of data use, and formulate corresponding policies and norms to protect personal rights and social interests.

With the continuous development and innovation of science and technology, the research content of big data is also expanding and deepening, which brings great opportunities and challenges for decision-making and development in various fields(Figure 1)[16].



Fig.1 Big Data Concept Analysis Diagram

3.2 Research and Development of Cloud Computing

Cloud computing is a technology that provides computing resources and services through the network, and it has become an important research and development direction in the field of information technology. The development of cloud computing has gone through many stages, from the initial concept to now it has been widely used in various fields.

The research and development of cloud computing can be traced back to the 1960s, when computers were mainly mainframes and minicomputers, using centralized computing mode. With the development of the Internet, people began to realize that computing resources and services can be provided through the network, thus giving birth to the concept of distributed computing. The goal of distributed computing is to

distribute computing tasks to different computing nodes for parallel processing and improve computing efficiency. However, distributed computing faces many challenges, including resource management, task scheduling, communication protocols and other issues, which have become the focus of cloud computing research.

The research and development of cloud computing mainly focuses on the following aspects:

(1) Resource management and scheduling: Cloud computing platforms usually include a large number of computing nodes and storage nodes. How to manage and schedule these resources efficiently is a key issue. Researchers have proposed many algorithms and strategies for resource management and scheduling, such as scheduling algorithm based on load balancing and virtual machine migration algorithm, to improve the performance and resource utilization of cloud computing platform.

Data security and privacy protection: Cloud computing platforms usually store a large amount of user data. How to protect the security and privacy of these data is an important issue. Researchers have proposed many methods of data encryption and access control to ensure the security and privacy of user data.

(2) High availability and fault tolerance: Cloud computing platforms usually need to ensure high availability and fault tolerance, that is, they can ensure the continuity of services in the face of hardware failure or network failure. Researchers have proposed many fault-tolerant and recovery methods, such as backup and replication, fault detection and recovery, to improve the reliability of the cloud computing platform.

Virtualization technology: Virtualization is one of the core technologies of cloud computing, which can virtualize physical resources into multiple virtual resources, thus realizing resource sharing and flexible allocation. Researchers have proposed many virtualization technologies, such as virtual machine technology and container technology, to improve the resource utilization and flexibility of cloud computing platform[17].

(3) Edge computing: With the development of Internet of Things, more and more devices and sensors need real-time computing and data processing. Edge computing is a technology that pushes computing tasks and data processing to the edge of the network, which can reduce data transmission delay and network load. Researchers have proposed many methods and models of edge computing to meet the needs of real-time computing and data processing.

The research and development of cloud computing still faces some challenges and problems. First of all, cloud computing platforms usually need a lot of computing and storage resources, and how to effectively use these resources is a key issue. Secondly, cloud computing involves a lot of data transmission and storage, so how to ensure the security and privacy of data is an important issue. In addition, cloud computing also involves large-scale distributed systems and networks, and how to ensure the reliability and performance of the system is a challenge. In the future, with the development of emerging technologies such as artificial intelligence, Internet of Things and big data, cloud computing will continue to play an important role, and there will be more research space and development potential in resource management, data security and edge computing (Figure 2).

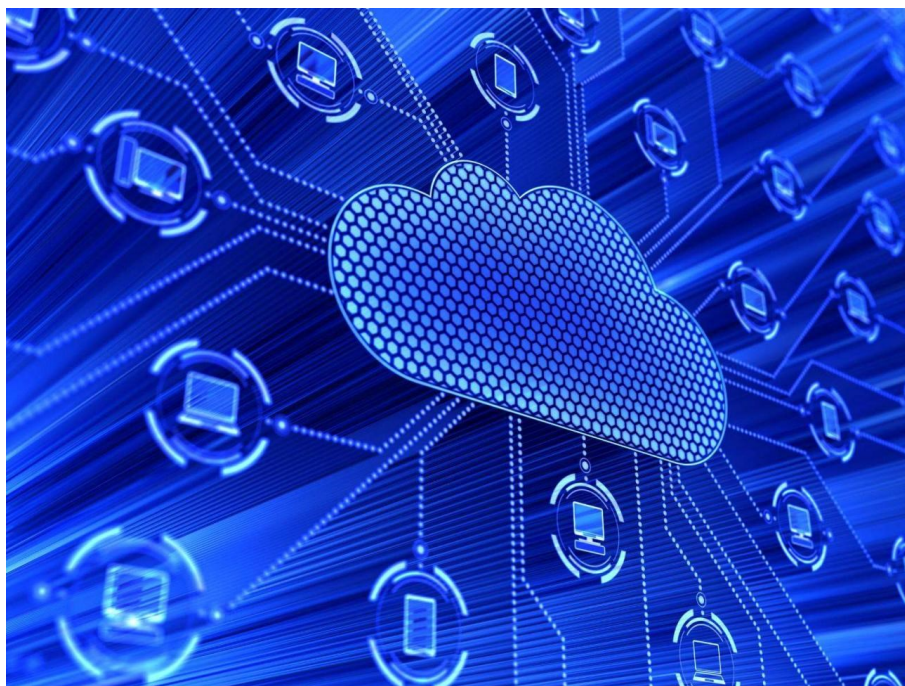


Fig.2 Conceptual diagram of cloud computing

4. Research on Personalized English Learning System Based on Big Data and Cloud Computing.

4.1. Application of Big Data and Cloud Computing in Personalized English Learning

Big data and cloud computing can help personalized English learning platforms collect and analyze learners' data. By collecting data such as learners' learning records, test scores and classroom performance, personalized English learning platform can comprehensively understand learners' learning situation. At the same time, cloud computing can provide powerful computing power and storage space, so that the platform can efficiently process and store a large number of learning data. These data can be used to analyze learners' learning characteristics, weaknesses and advantages, so as to tailor learning plans and teaching resources for learners.

Big data and cloud computing can provide personalized learning content and resources for personalized English learning. By analyzing learners' learning data, personalized English learning platform can provide learners with suitable learning materials, teaching videos, exercises and so on according to their needs and levels. At the same time, the powerful computing power of cloud computing can help the platform to generate and update learning resources in real time, so that learners can get the latest learning content anytime and anywhere. In this way, learners can choose

suitable learning content according to their own interests and needs, and improve their learning effect and interest.

Big data and cloud computing can also provide intelligent learning AIDS for personalized English learning. By analyzing learners' learning data, personalized English learning platform can understand learners' learning progress and difficulties. Based on these data, the platform can develop intelligent learning AIDS, such as intelligent question bank and intelligent error correction system, to help learners better master English knowledge and skills. At the same time, the high-performance computing power of cloud computing can ensure the efficient operation of these intelligent tools, so that learners can get feedback and help in time.

Big data and cloud computing can also provide personalized learning evaluation and feedback for personalized English learning. By analyzing learners' learning data, personalized English learning platform can evaluate learners' learning achievements and progress. The platform can provide personalized learning evaluation reports and feedback according to learners' learning data to guide learners' learning direction and methods. At the same time, the high-performance computing ability of cloud computing can ensure that learners can get accurate learning evaluation and feedback information in time, and help them better adjust their learning strategies and improve their learning effects.

In a word, the application of big data and cloud computing in personalized English learning can provide learners with a more personalized and efficient learning experience. By collecting and analyzing learners' learning data, personalized English learning platform can tailor learning plans and teaching resources for learners. At the same time, the platform can provide personalized learning content and resources according to learners' needs and levels. In addition, big data and cloud computing can also help the platform to develop intelligent learning AIDS and provide personalized learning evaluation and feedback. These applications will greatly improve learners' learning effect and interest, and promote the development of personalized English learning.

4.2. The Framework of Personalized English Learning System under the Background of Big Data and Cloud Computing

With the development of big data and cloud computing, the architecture of personalized English learning system is also evolving. The goal of personalized English learning system is to provide customized learning content and learning methods according to students' individual needs and learning characteristics. The architecture of personalized English learning system can be divided into the following levels: user interface layer, application layer, service layer and data layer. The user interface layer provides an interface for students to learn, the application layer is responsible for handling students' learning requests, the service layer provides various services needed for learning, and the data layer stores students' personalized learning data and related learning resources (Table 2).

Table 2. Architecture of Learning System

Architecture of learning system	Specific content
Overview of system	The architecture of personalized English learning system can be divided into the following levels: user interface layer, application layer, service layer and data layer.

architecture	The user interface layer provides an interface for students to learn, the application layer is responsible for handling students' learning requests, the service layer provides various services needed for learning, and the data layer stores students' personalized learning data and related learning resources.
User interface layer	User interface layer is the interface for students to interact with personalized English learning system. The user interface can be a web page, a mobile application or a desktop application. The user interface layer needs to provide functions such as user login, registration, personal information management, learning plan setting and learning progress viewing. In addition, the user interface layer also needs to provide the display of learning resources, such as words, sentences, listening materials, reading materials and so on.
application layer	Application layer is the core layer of personalized English learning system, which is responsible for handling students' learning requests. The application layer includes learning recommendation, learning plan generation, learning progress management and other functions. Learning recommendation is to recommend learning content and learning methods suitable for students according to their learning data and learning goals. Learning plan generation is to generate students' learning plans according to their learning goals and time schedule. Learning progress management is to track students' learning progress and remind students to study in time.

4.3. Application Characteristics of Personalized English Learning System under the Background of Big Data and Cloud Computing

The architecture of personalized English learning system has the following characteristics:

Table 3. Structural Features of Sexualized English Learning System

characteristic	main content
Elastic expansion	Because the number of students and learning needs are dynamic, the system needs to have the ability to expand flexibly to meet the needs of different scales and loads. Distributed processing: the system needs to support distributed processing to improve the concurrent processing ability and response speed of the system.
real time computation	The system needs to be able to process students' learning requests in real time and feed back the learning results in time to provide a good learning experience.
Data security	Students' personal information and study data are sensitive, and the system needs to have high security to ensure that students' data is not leaked or abused.
algorithm optimization	Personalized English learning system needs to use big data and cloud computing technology to analyze and mine students' learning data, extract students' learning characteristics, and make learning recommendations and generate learning plans according to learning characteristics. To sum up, the architecture of personalized English learning system needs to include user interface layer, application layer, service layer and data layer, which can provide students with personalized learning content and learning methods. The system needs to have the characteristics of flexible expansion, distributed processing, real-time calculation, data security and algorithm optimization. Such a framework can provide students with an efficient and personalized English learning experience.

5. Conclusion

With the rapid development of Internet and the popularity of smart devices, personalized learning has become a trend. Based on big data and cloud computing technology, this paper studies the design and implementation of personalized English learning system. Based on big data and cloud computing technology, this paper studies

the design and implementation of personalized English learning system. By analyzing learners' learning data and behavior, we can provide them with personalized learning suggestions and resources to improve learners' learning effect and motivation. The experimental results show that the system has good learning effect and motivation, and has high practical value and popularization value.

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