The Integration Path of Computer and Big Data in the Software Development of Higher Education Courses

Hao Sun

Communication University of China, Nanjing, Nanjing 211199, Jiangsu, China

Abstract: This paper discusses the integration path and application status of computer and big data in the software research and development of higher education courses. This paper analyzes the application advantages and challenges of current computer technology and big data in education, and then expounds the technical requirements and functional requirements of course software development. Through the integration of data collection and processing technology, big data analysis technology and personalized teaching design, this paper puts forward the integration path of computer and big data. At the same time, this paper also discusses the challenges faced in the process of integration, including data privacy, security issues, technical resources and costs, and provides corresponding solutions.

Keywords: higher education; course software; computer; big data

1. Introduction

With the rapid development of information technology, computer and big data technology are increasingly widely used in various fields, especially in the field of education, which is gradually changing the traditional teaching mode and curriculum research and development mode. As a key stage of cultivating professionals, higher education, facing the challenges of globalization and informatization, urgently needs more efficient and intelligent teaching tools and means to meet the development needs of The Times. In recent years, the combination of computer technology and big data has provided new opportunities for higher education. Through the analysis of students learning behavior, the evaluation of teaching effect and the dynamic adjustment of course content, a more personalized and interactive teaching mode can be realized. This not only improves the teaching efficiency, but also promotes the fairness and popularization of education [1].

However, how to effectively integrate computer and big data technology into the development of curriculum software in higher education. Most of the existing course software focuses on static content, which lacks the ability to effectively process and analyze real-time data, and cannot make full use of the information value brought by big data. Moreover, issues such as data security, privacy protection, and technology costs also challenge the implementation of this integration path. Therefore, a deep discussion of the integration path of computer and big data in higher education course software can not only help to improve the teaching quality and students learning effect, but also can promote the further innovation and development of educational technology.

2. The application status of computer and big data in higher education

2.1 Application of computer technology in higher education course software

The application of computer technology in higher education course software has penetrated into many levels, from the digital management of teaching resources to the whole digital support of the teaching process. The powerful computing ability of computer technology provides the foundation for the diversification and interactivity of teaching content. For example, the development of online courses, virtual laboratory and multimedia courseware cannot be separated from the support of computer technology. At the same time, the learning management system (LMS) and the intelligent education platform, relying on computer technology, can provide students and teachers with convenient learning and teaching tools for [2]. These tools can not only help teachers easily design courses and publish teaching content, but also track students learning progress and performance in real time, so as to realize personalized teaching. However, despite the great progress in the application of computer technology in higher education, the traditional curriculum software development still faces problems such as single function and lack of interactivity, which limits the further improvement of the teaching effect.

2.2 Application advantages and challenges of big data in higher education

The application of big data in higher education provides unprecedented opportunities for personalized learning. Through

a comprehensive analysis of students learning data, educators can have a deep understanding of students learning habits, interests and needs, thus optimizing the teaching content and strategies. The application of big data can also help universities improve their teaching results through predictive analysis, such as monitoring students academic progress and predicting their academic performance, so as to provide timely guidance and support for students. In addition, big data also promotes the precise allocation of educational resources and makes education more equitable [3]. However, the application of big data also faces many challenges. Data collection and analysis need strong technical support, and the infrastructure of many universities in this area is not perfect. Data privacy is always a sensitive point in the application of big data, which needs to ensure the security of students personal information while avoiding data abuse.

2.3 The potential of combining computers with big data in education

The combination of computer and big data has brought great development potential for higher education. In the development of course software, computer technology can provide efficient algorithm and powerful computing power support for the processing and analysis of big data, so as to realize the real-time processing of massive educational data. Through this combination, educators can dynamically adjust their teaching strategies and contents according to the results of big data analysis, so as to realize more efficient and personalized teaching. In addition, the combination of computer and big data can also improve the intelligent level of course software, promote the further development of intelligent education platform, and provide students with more interactive and deeply immersive learning experience. However, how to give full play to this potential, we still need to overcome the practical problems such as high technology cost and data security. Exploring the deep integration of the two will become an important direction for the development of educational technology in the future.

3. Current situation and demand of higher education course software research and development

3.1 Development mode of the existing course software

At present, the development mode of higher education course software is mainly based on the traditional software engineering development process, which usually includes several stages of requirement analysis, design, coding, testing and maintenance. In the demand analysis phase, developers will communicate with educational institutions to clarify the objectives and needs of the course. Next, the technical team designs the software architecture according to the requirements, and develops the corresponding teaching function modules. The coding stage is implemented by the programmer and integrated into the software system. The test phase is to ensure that the software functions properly and eliminates errors, and finally, regular maintenance and updates. However, the development mode of the existing course software is often relatively solidified, and it is difficult to quickly adapt to the changing teaching needs and technological innovation, leading to the limited flexibility and efficiency of the development. In addition, in the traditional development model, the feedback of teachers and students is often not timely integrated into the software update, which also affects the user experience to a certain extent.

3.2 Technical requirements analysis of course software in higher education

Higher education curriculum software needs to meet multiple levels of technical needs. The software needs to support the online access of large-scale concurrent users to cope with the large number of college students. Therefore, the stability, scalability and response speed of the system become the core requirements in the technology development. As teaching methods constantly change, course software needs to be cross-platform compatibility and able to operate stably in different devices and operating systems. In addition, modern education increasingly emphasizes interactivity and practicality, so the software also needs to integrate multimedia, virtual lab, online discussion and other functions to provide a more participatory learning experience. At the same time, the need for personalized learning also requires the software to analyze students learning habits through intelligent algorithms, and provide customized learning paths and content push to improve the teaching effect.

3.3 Functional requirements of course software in the era of big data

In the era of big data, the functional requirements of higher education course software have been improved. Software needs to have strong data processing ability, able to analyze and utilize learning data from students to generate targeted teaching strategies. Through the in-depth analysis of students behavior data, the course software can realize the accurate tracking of the learning process, and help teachers to understand the learning progress, weak links and interest points of all the students. Course software needs to have predictive functions, using big data models to predict students possible academic

performance, identify problems in advance and provide intervention suggestions. In addition, the data visualization function is also an important requirement of the course software in the era of big data. With intuitive charts and statistical analysis, both teachers and students are able to better understand the data to optimize teaching and learning strategies.

4. The integration path of computer and big data

4.1 Application of data collection and processing technology

The integration of computer and big data is first reflected in the data collection and processing technology. Curriculum software in higher education needs to continuously collect a large amount of learning data through various channels, such as online learning platforms, electronic textbooks, classroom interaction, etc. These data can include information about students course selection, study length, classroom engagement, and test scores. In order to effectively manage and process these data, computer systems need to integrate advanced database technologies and distributed computing platforms such as Hadoop, Spark to ensure to quickly store, classify, retrieve, and process massive amounts of learning data. At the same time, data processing also needs to include data cleaning, weight removal and standardization steps to ensure the accuracy and availability of data. With efficient processing techniques, course software can analyze these data in real time to provide strong support for teaching decision making.

4.2 Application of big data analysis technology in course content optimization

Big data analysis technology plays a vital role in optimizing the course content. Through the analysis of students learning data, the software system can identify which content is difficult for students and which content is better grasp, and then make targeted adjustment to the teaching content. For example, through data analysis, we can find that the error rate of some knowledge points is high, and the course software can prompt teachers to give in-depth explanation or redesign of these contents. In addition, the big data analysis technology can also identify the common problems existing in the learning process of students, and optimize the allocation of teaching resources according to these information, such as adding auxiliary materials, video explanation or interactive experiments, so as to improve the teaching effect of the course. Through this continuous data-based optimization, the course content can better adapt to the learning needs of students, thus improving the overall learning efficiency.

4.3 The integration of computer and big data in the personalized teaching design

The combination of computer and big data makes personalized instructional design possible. Based on the personalized recommendation system of big data, the course software can customize a personalized learning path for each student according to the students learning behavior data, such as learning progress, knowledge mastery and interest preference. This process relies on the intelligent analysis of students data by computer algorithms, such as using machine learning algorithms to predict students future learning needs, and make personalized adjustments in course content, difficulty, learning pace and other aspects. In addition, the computer can also combine big data real-time feedback, automatically adjust the teaching program, provide adaptive learning suggestions, so as to meet the learning characteristics of different students. Through this integration path, education can not only impart knowledge more efficiently, but also stimulate students independent learning ability and promote personalized growth.

5. Technical framework for the integration of computer and big data

5.1 Application of data mining and machine learning

Data mining and machine learning are the core technologies in the integration of computer and big data, which can provide powerful analysis and prediction capabilities for higher education course software. In the field of education, data mining technology can extract useful patterns and information from massive learning data, such as the relationship between students learning habits, learning behavior and academic performance and course difficulty. Combined with machine learning algorithms, the course software can make more accurate prediction and personalized recommendations. By training the model, machine learning can identify weak points in the learning process, predict possible learning disabilities in the future, and actively provide adaptive learning resources and guidance. This use of intelligence makes the teaching process more targeted and efficient.

5.2 Cloud computing platform construction of education data

Cloud computing technology provides strong support for the development and operation of course software in higher education. Building an efficient cloud computing platform for educational data can greatly improve the storage

and processing capacity of data, especially in the face of the growing demand for learning data, the cloud platform can be dynamically adjusted through elastic computing resources. The course software can quickly access and process massive data through the cloud computing platform. Both the teaching resources uploaded by teachers and the learning data generated by students can be stored and analyzed in real time. In addition, cloud computing can also support a distributed computing architecture, enabling multiple nodes to process data at the same time, greatly improving the parallel processing capacity of the system. Through cloud computing, educational institutions can reduce hardware investment, optimize data management and maintenance costs, and improve the overall efficiency of educational data management.

5.3 Development and application of real-time data feedback system

The development of real-time data feedback system is an important part of realizing efficient teaching and learning. By integrating computer and big data technology, the course software enables real-time monitoring of the learning process and provides timely feedback to teachers and students. The behavioral data generated by students in the learning process, such as answers, learning progress, and course participation, can be transmitted to teachers through the real-time data feedback system, so that teachers can quickly understand the learning status of each student and make corresponding teaching adjustments. At the same time, students can also adjust their learning strategies and pace based on real-time feedback. Such a system can not only improve the flexibility of learning, but also help to realize refined teaching management, enhance the interaction between teachers and students, so as to improve the quality of teaching and learning effect.

6. Challenges and solutions faced in the integration process

6.1 Data privacy and security issues

In the process of integrating computer and big data, data privacy and security issues are important challenges that need to be solved urgently. As a large number of students learning behavior and personal data are collected and stored, it is crucial to ensure the security of these data. Unauthorized data access, data leakage or abuse may violate personal privacy and even negatively affect the reputation of educational institutions. Therefore, strict security measures must be established, such as data encryption, authentication, and multi-level access control. In addition, compliance with relevant data privacy regulations such as the Personal Information Protection Act will be required to ensure that all operations comply with regulatory requirements. Regular security audits and vulnerability patching can reduce security risks and enhance the overall security of the data.

6.2 Technical resources and cost issues

Large-scale integration of computer and big data technology involves complex hardware, software and infrastructure construction, which inevitably brings high technical resource demand and cost burden. Educational institutions, especially universities with limited resources, may not afford the high costs of equipment upgrading and technical support. To solve this problem, consider reducing the investment of technology resources by cooperating with technology companies, seeking government funding, or using open source technology. In addition, cloud computing technology can also provide flexible pay-for-pay on-demand services to help educational institutions control their budgets properly while ensuring the efficiency of the system.

6.3 Adaptability of the technical ability of teachers and students

The wide application of computer and big data technology puts forward high requirements for the technical adaptability of teachers and students. Teachers need to master new technologies, to be skilled in operating data analysis tools and teaching software, and to use them effectively in instructional design and classroom interaction. At the same time, students also need to have a certain technical literacy, in order to make full use of the course software for independent learning. However, some teachers and students may face the problem of low technology acceptance and a steep learning curve. In view of this situation, schools should provide systematic technical training, establish a continuous learning and support mechanism, and help teachers and students to gradually improve their technical ability, so as to smoothly adapt to the changes of the new technological environment.

7. Summary

The integration of computer and big data provides great potential for the software research and development of higher education courses, and promotes the innovation and personalized development of teaching methods. However, in the process of integration, the challenges, such as data privacy and security issues, technical resources and costs issues, as well as the adaptability of the technical capabilities of teachers and students, cannot be ignored. In order to ensure the smooth

implementation of the integration, educational institutions need to adopt diversified solutions, including strengthening data security, reasonable allocation of technical resources, and improving the technical literacy of teachers and students. In the future, with the continuous progress of technology and the diversified development of teaching needs, the deep integration of computer and big data will play a more important role in the field of higher education, and provide new solutions for the improvement of teaching quality and the fairness of education.

References

[1]   Zhuangzi Yao. Study on curriculum design and teaching methods for higher education software development [J]. Journal of Social Sciences, Jiamusi University, 2023,41 (06): 170-172.

[2]   Zhang LAN. Research on the Curriculum System Construction of Computer Software Development in Higher Vocational Education under the Background of Emerging Industry [J]. Science and Technology Innovation Guide, 2020,17(08):154+156.DOI:10.16660/j.cnki.1674-098X. 2020.08. 154.

[3]   Zhu Changqing. Exploration and research on the reform program of mathematics curriculum in independent colleges [J]. Modern Vocational Education, 2019 (27): 174-175.

Author Bio

Hao Sun (1989-), Born in Yancheng, Jiangsu. Title: senior engineer. Research Direction: big data, cloud computing.