Exploration on the Construction of Big Data Major in Local Colleges and Universities under the Background of New Engineering

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Abstract

In the context of the information age, all walks of life generate massive amounts of data. Data information mining has driven the rapid development of related industries, and there is a huge gap in big data professionals. Therefore, local colleges and universities have opened big data major. According to the requirements of the construction of new engineering majors, from the perspective of cultivating applied professionals, this paper analyzes the characteristics of professional training, and then constructs big data major from four aspects: professional training objective, curriculum system, practice system, and teaching team, with the purpose of providing useful reference for the construction of this major.

Keywords

Information age; Data information mining; Big data major; Construction of new engineering.

1. Introduction

At present, the global competition for comprehensive national strength led by technological revolution and industrial transformation is becoming increasingly fierce. Following the development trend of the times, China is implementing major development strategies such as innovation-driven development, "Made in China 2025", "Internet +", and the Belt and Road Initiative [1,2]. New economic forms characterized by new technologies, new business forms, and new industries are prosperous and developed. This requires engineering and scientific and technological professionals have higher innovation and cross-border integration capabilities to accelerate the construction of new engineering and help economic transformation and upgrading. The new engineering is based on the new economy and new industry, and its construction should not only set up and develop a number of new engineering majors, but also promote the reform and innovation of the existing traditional engineering majors [3]. In order to realize China's development goal of transforming from a big country in engineering education to a strong country in engineering education, colleges and universities should establish a "new concept" of innovative, comprehensive and full-cycle engineering education, focus on building a "new structure" of disciplines combining new engineering and traditional engineering, innovating a "new model" for professional training in engineering education, creating a "new quality" of engineering education with international competitiveness, and finally establishing a "new system" of engineering education with Chinese characteristics [4].

With the advent of the era of big data, the application of big data has gradually expanded from the Internet and finance to education, government affairs, medical health, transportation and logistics, and other social and economic fields, which are profoundly affecting the development process and transformation of China's society and economy [5]. According to the educational concept of the new engineering reform, we should establish a demand-oriented big data professional training mechanism. Therefore, how to cultivate big data professionals who meet

the requirements of the new engineering era requires the joint practice and exploration of education and industry [6]. Many colleges and universities in China have opened the major related to big data. In 2013, Xi'an Jiaotong University, Hong Kong Chinese University, Zhejiang University, and Xiamen University set up data science research centers or big data centers to cultivate compound professionals with big data thinking and innovation ability [7]. In 2014, Peking University and Tsinghua University began to recruit the first batch of masters in big data. Among them, the first batch of masters in big data trained by Tsinghua were divided into five fields: data science and engineering, business analysis, big data and national governance, social data, and the Internet finance [8]. In 2015, Yuanpei College of Peking University set up a data science experiment class for undergraduates, and Central South University recruited the first batch of undergraduates in the direction of big data [9]. However, until 2022, the professional construction of big data and professional training were still in a weak stage, and there are still the following problems, especially in local colleges and universities:

1) Insufficient teaching team. Big data major involves a wide range of subject knowledge and engineering skills. Due to insufficient investment in teacher training, there is a shortage of full-time teachers with comprehensive big data knowledge and skills. At the same time, existing teachers urgently need to improve their theoretical level, practical operation skills and engineering practice ability.

2) Lack of experimental resources. The basic experimental environments of local colleges and universities is weak, including the lack of distributed systems for big data, which cannot meet the needs of student's multi-computer cluster experimental environments. Moreover, the shortage of experimental data, experimental teaching plan, and project practical experience leads to the difficulty of carrying out big data experiments.

3) Disconnection between professional training and industry needs. The direction of big data professional services is not clear, the orientation of professional training is ambiguous, and the training objective are not prominent, resulting in the skills of professionals is out of touch with the needs of the industry, and the function of colleges and universities to serve the society is not well reflected.

It can be seen from the above that the traditional exam-oriented education and physical classroom teaching mode cannot solve these problems. Therefore, it is urgent to explore and reform the construction of big data major in local colleges and universities.

2. Characteristics of Professional Training

The big data major is a new discipline created by the cross-integration of different disciplines and is a typical new engineering major. Therefore, the professional training of big data major has three typical characteristics. The first is multi- disciplinary cross-integration. On the one hand, in addition to professional knowledge of computer science and technology, big data major also need to have mathematical knowledge such as statistical analysis. On the other hand, big data major uses big data technology to solve problems in various industries, so it is necessary to master the knowledge of the application field except the relevant technologies and knowledge of the big data discipline. The second is strong practical ability. The big data major is an application-oriented major, which needs to propose solutions according to actual problems and solve problems through technical means. Therefore, practical experience and ability are important contents of professional training. The last is strong logical thinking ability. Big data major need to discover knowledge and create value from massive data, so they need rigorous logical thinking ability to model problems and solve problems through technical means such as programming.

3. Construction of Big Data Major

This paper explores and plans the construction of big data major from the aspects of training objective setting, curriculum system construction, practice system construction and teacher team construction.

1) Training Objective Setting

On the basis of the teaching conditions of local colleges and universities and the situation of students, this paper puts forward the training objective of big data professionals, that is, to cultivate application-oriented and compound senior engineering and technical professionals in the fields of data science and big data technology. The students are required to be of sound character, with scientific and humanistic spirit, innovative and entrepreneurial spirit and good professional ethics, as well as the independent learning ability, critical thinking ability and international communication ability. The students need to master the basic knowledge and basic skills of information science, management science and data science; and master the basic theory and basic knowledge of computer, network, data coding, data processing and other related disciplines required by data science and big data technology. The students need to be proficient in the technologies and tools of big data acquisition, storage, processing and analysis, transmission and application, and have the system integration ability and application software design and development ability for big data engineering projects.

2) Curriculum System Construction

This paper constructs a big data professional curriculum system suitable for local colleges and universities from three aspects: subject basic courses, professional compulsory courses and professional elective courses. The subject basic courses mainly involve advanced mathematics, probability theory and mathematical statistics, discrete mathematics and computer science and technology related courses, such as: C/C++ programming, data structure, computer composition principle, operating system principle, etc. The professional compulsory courses focus on cultivating students' engineering practice ability in data acquisition, data organization and storage, data cleaning, data preprocessing, data analysis and data visualization, including Java programming, Python programming, database principles, big data platforms and programming practice, distributed computing and parallel computing, data warehousing, machine learning, data visualization, etc. The professional elective courses provide students with a variety of development directions of interest. Courses that can be offered include social network analysis, data privacy and security, recommendation algorithms and applications, information fusion, and virtual reality technology.

3) Practice System Construction

Practical teaching of big data major is one of the important links in the teaching process. It is oriented to the goal of cultivating applied professionals, based on theory, and improve students' data analysis ability and engineering practice ability by strengthening practical links. The practical teaching system should be closely integrated with production, education and research. It can introduce the big data education and related practical resources of the enterprise in the form of school-enterprise cooperation, and build a training center in the school or a practice training center jointly built by the school and the enterprise. At the same time, it is necessary to establish innovation center inside and outside the school, set up scientific research and innovation projects for college students, and improve students' innovative ability in many ways. The in-school training center mainly completes basic experiments, including in-class experiments and curriculum design, so that students can deepen their understanding of basic knowledge. The practice training center mainly conducts comprehensive practice training to cultivate students' practical ability to analyze and solve problems. The innovation center inside and outside the school mainly complete college students' innovation projects, big data

application competitions and graduation projects, etc., to cultivate students' innovation ability and self-employment ability.

4) Teaching Team Construction

In order to improve the level of the teaching team of big data major, this paper mainly starts from the following aspects: First, integrate the teaching resources in the school, and select outstanding teachers with relevant disciplines from relevant colleges to form a full-time teaching team. Second, select several young and middle-aged teachers every year for long-term or short-term big data-related training courses, or go deep into big data companies to study and work, or send young teachers to improve their academic qualifications in big data-related majors, so as to improve teachers' engineering practice and research capabilities. Finally, selecte big data engineers from the cooperative enterprises as part-time teachers, who are responsible for professional experiments, internships, practical training and graduation design and other practical courses, so as to improve students' engineering practice ability. At the same time, a specific plan for the construction of the teaching team shoud beformulated from the aspects of system, organization and funding.

4. Conclusion

Today, China is in the transition to the era of big data and intelligence. Big data technology is more and more important to the development of society. By analyzing and mining big data, it can reduce costs, make accurate decisions, and promote product innovation. The society's demand for big data-related professionals is increasing. Under the background of new engineering, this paper explores the construction of big data major in local colleges and universities from the aspects of professional training objective, curriculum system, practice system and teaching team. It is of great practical significance to cultivate big data professionals who meet the needs of the times. The teaching and research results of this paper can be experimented and promoted step by step in the relevant majors of the colleges and universities.

Acknowledgments

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