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Construction of Curriculum System of Data Science and Big Data Technology under the Background of New Engineering

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Abstract: With the rapid development of science and technology, the construction of new engineering has become a hot topic in today's society. The new engineering Department aims to cultivate composite engineering talents with innovative spirit and practical ability to adapt to and promote the rapid economic development and industrial upgrading. Under the background of new engineering, data science and big data technology, as an important discipline direction, have a wide range of application fields and market prospects. Therefore, it is of great significance to build a scientific, reasonable and perfect data science and big data technology curriculum system for training high-quality talents to meet the needs of society. This paper will discuss how to build a reasonable curriculum system from the perspective of the job demands of data science and big data technology.
Keywords: New engineering; Data science; Big data technology; Curriculum system

1. Introduction to the background of "New Engineering"

The concept of "new engineering" originated in 2017, in response to a series of major strategies such as innovation-driven development, Made in China 2025, Internet +, mass entrepreneurship and innovation, and "The Belt and Road", the concept of "new engineering" was put forward and attracted wide attention in society. In terms of educational objectives, "New engineering" aims to cultivate high-quality engineering talents who can adapt to future technological changes and social development [1]. In the field of technology, the new engineering is not only reflected in the emerging information technology fields such as computer science, artificial intelligence, big data, and the Internet of Things, but also reflected in the upgrading and transformation of traditional engineering fields such as mechanical engineering, chemical engineering, materials science, and biological engineering. Under the new scientific and technological revolution and industrial transformation, these traditional engineering fields need to be continuously upgraded and transformed to adapt to new market demands and social changes.

At the present stage, the new engineering is characterized by innovation, cross-border and practicality. The new engineering needs to train talents with innovative ability to promote scientific and technological innovation and industrial upgrading. At the same time, the new engineering needs to train talents with cross-border thinking to adapt to the cross-integration between different fields; Finally, the new engineering needs to train talents with practical ability to deal with complex and changeable practical problems.

2. Position situation of data science and big Data technology courses

Combined with the construction of the major, the author conducted a survey on Internet recruitment information and found that the jobs of the major are mainly concentrated in the following four categories:

2.1 Big Data engineer

Big data engineers are professionals responsible for big data processing, analysis, storage and management. They need to have a solid foundation in computer science and mathematics, be familiar with various big data processing technologies and tools, such as Hadoop, Zookeeper, Spark streaming, etc., and be able to efficiently process and analyze massive data. At the same time, it is also necessary to master data visualization, data mining and other technologies to be able to convert raw data into valuable decision-making basis.

2.2 Data analysts

Data analysts are mainly responsible for the analysis, mining and visualization of data to support the decision-making and management of enterprises or organizations. They need to master the knowledge of statistics, machine learning, data visualization, etc., and be able to use data processing and analysis tools, such as SPSS and SQL, for data mining and prediction. In addition, they also need to understand the basic principles and methods of business operation, and be able to provide strong data support for corporate decision-making.

2.3 Data mining engineer

Data mining engineers are professionals specializing in data mining and pattern recognition. They need to have a solid mathematical foundation and computer science background, be familiar with various data mining algorithms and tools, such as decision trees and neural networks, and be able to extract useful information and knowledge from a large amount of data [2]. In addition, they need knowledge of databases, statistics and other fields, as well as good innovation and teamwork skills.

2.4 Big data development engineer

Big data development engineers are professionals responsible for the development and maintenance of big data platforms and tools. They must be familiar with distributed data processing and storage technologies, such as Hadoop and HBase, and be able to develop, deploy, and maintain large-scale data processing and analysis applications. In addition, they need to understand the basic knowledge of database design and management to be able to guarantee the stability and security of big data platforms.

3. Data science and big data technology curriculum system construction strategy

In view of the above job needs, the construction of data science and big data technology curriculum system should start from the following aspects:

3.1 Professional basic course design

Professional basic courses should cover mathematics, statistics, computer science and other aspects of knowledge, to lay a solid knowledge foundation for students. Specific courses should include advanced mathematics, linear algebra, probability theory and mathematical statistics, discrete mathematics, data structures and algorithms, principles of computer composition, C language programming, Linux operating system, etc. These courses are designed to cultivate students' mathematical literacy and basic computer ability, laying a foundation for the study of subsequent professional courses.

In this stage, students will be exposed to the basic concepts and tools of data science and big data technology, such as the Python programming language and SQL database language. In addition, schools should arrange some experiments and project practices to help students better understand and apply what they have learned. For example, students can be arranged to complete some basic programming and database operation tasks to exercise their programming and database operation skills.

3.2 Design of major main courses

The main courses should be designed around the core areas of data science and big data technology to cultivate students' ability to engage in related work. Specific courses should include database principle, computer network, basis of cloud computing, big data processing technology, and basis of data visualization, etc. These courses aim to let students understand and master the basic concepts, technologies and methods related to big data, and train students' ability to process, analyze and utilize big data [3].

In this stage, students will gain an in-depth understanding of big data storage and processing technologies, such as distributed storage systems and real-time data processing. At the same time, they will learn how to use data analysis tools and machine learning algorithms to solve real-world problems such as data mining and predictive models. In addition, in terms of project practice, teachers can arrange students to complete some big data processing and analysis tasks, so as to exercise their data processing and analysis skills.

3.3 Design of professional elective courses

Professional electives can be set up according to different students' interests and career development direction to further expand the field of professional knowledge of students. Specific courses can include machine learning, deep learning, natural language processing, recommendation systems, data analysis and mining, Java language programming, digital image processing, applied time series analysis, etc. These courses are designed to enable students to deeply understand and master the relevant fields and application skills of data science and big data technology, and cultivate students' professional abilities in specific fields.

At this stage, students can choose courses according to their interests and career development direction. For example, if students are interested in machine learning and deep learning, they can choose courses to further their knowledge in these areas; Similarly, if students are interested in natural language processing or recommendation systems, they can also choose courses to expand their areas

of expertise; If students want to further enhance their abilities in the field of statistics, they can take elective courses such as Applied multivariate statistical Analysis, applied time series analysis, and applied stochastic processes.

3.4 Design of professional practice courses

Professional practice course is the key link for students to apply the knowledge they have learned to solve practical problems. Specific practical content can include data analysis projects, big data application development projects, etc. Through practice, students can better understand and master the knowledge and skills they have learned. In addition, some team projects can be set up to allow students to cooperate in groups, and cultivate students' teamwork and problem solving ability.

In this stage, students will consolidate and deepen their acquired knowledge and skills through practical projects. For example, students can be arranged to participate in some school-enterprise cooperation big data processing and analysis projects, such as financial risk control data analysis, e-commerce user behavior analysis, etc., so that students can understand and master how to apply the knowledge to solve practical problems. At the same time, through the form of team projects, students can also develop the ability of teamwork and communication and coordination. In practical courses, colleges and universities can invite project engineers from enterprises to give guidance to students and help students consolidate their professional skills.

In order to improve the teaching quality of practical courses, colleges and universities should strengthen the construction of practical training bases, including on-campus big data laboratories and off-campus practical training bases, so as to provide a strong material foundation for the growth of students' practical skills.

Peroration

This paper discusses and analyzes the course system construction of data science and big data technology under the background of new engineering, and discusses the course system construction strategy from four aspects: professional basic course design, major main course design, professional elective course design and professional practice course design. Although there are still many problems in the construction of data science and big data technology curriculum system in concrete practice, which need further research and discussion, some basic ideas and suggestions put forward in this paper can provide certain references for "teaching" and "learning" in related fields. At the same time, we hope that in the future research, we can have more in-depth research in this field, so as to better promote the development and progress of higher education.

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