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## Research on the Construction of Robot Curriculum Module under the Background of New Engineering

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ABSTRACT

Under the background of the construction of new engineering and the strategy of “making China 2025”, the society has also put forward new requirements for the personnel training of mechanical specialties. Therefore, combining the training goal of mechanical design, manufacturing and automation in Beijing (Beijing), it is necessary to cultivate new direction and cultivate new growth point for “old” mechanical specialty. And social and economic development has a very important significance.

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## 1. Introduction

Students' knowledge acquisition ability can be trained through machine learning, statistical reasoning, data mining and other courses. Through machine learning and statistical reasoning courses, students can master a series of knowledge acquisition probability models, such as linear regression model, logistic regression model and so on<sup>[2]</sup>. Machine learning is the key technology of big data analysis. It is the major professional course of data science and big data technology. Therefore, the importance of curriculum construction can largely guarantee the quality of data talents training.

## 2. "New Engineering" Construction and the Training of Data Talents

A new round of technological and industrial revolution in the world is driving the formation and development of new economy.<sup>[1]</sup> At present, China's economic development has entered a period of structural adjustment, transformation and upgrading, and the new and old growth kinetic energy is changing. A new round of technology and industrial revolution, with the core of the Internet, is developing, and new technologies, new formats, and new models have flourished.<sup>[3]</sup> The new economic development urgently needs the support of new engineering talents, and requires the training of engineering talents with innovative entrepreneurship and cross-border integration ability. The corresponding higher engineering education reform has received unprecedented attention and universal attention to.<sup>[3-4]</sup> In 2016, the concept of "new engineering" provided a new perspective for the theory and practice of engineering education, and the reform of the international engineering education was carried out in China's localization of<sup>[3-5]</sup>. The connotation of the new engineering education is: Taking "Strengthen Moral Education and Cultivate People" as the guide, taking the change and shaping the future as the construction idea, taking inheritance and innovation, cross and integration, coordination and sharing as the main way to cultivate the future pluralistic and innovative outstanding engineering talents.<sup>[6]</sup> In February 2017, the Ministry of Education held a seminar on the development strategy of higher engineering education at the Fudan University. The universities and colleges discussed the problems of the training of engineering talents, the construction of new engineering and the choice of the path of development in the new period. In April 2017, the Ministry of Education held a workshop on the construction of new engineering in Tianjin University. The representatives of more than 60 colleges and universities agreed that the construction

and education of the "new engineering" should focus on industrial demand, focus on cross boundary integration, explore new paradigm of engineering development, and update the knowledge system of engineering talents in time. Students are chosen as the center to design teaching methods and means according to their interest and interest. Data show that in 2016, the global market for big data has reached 45 billion 300 million U.S. Dollars.<sup>[7]</sup> Sai think tank predicted that in 2017, China's big data industry scale is expected to reach 418 billion 500 million Yuan, and the market growth rate in the next 2-3 years will remain at around 35%.<sup>[7]</sup> Big data industry has gradually become an important part of the new economy and driving force.<sup>[8]</sup> Therefore, to train qualified data talents for the new economic development is the key to the occupation of high and new technology commanding points in the new economic development and the important content of the new engineering construction.

## 3. The Goal of the Course Construction

Under the background of "new engineering", the major of data science and big data technology is oriented by social needs and enterprise needs, and it is the main way to cultivate diversified and innovative data talents with the main way of cross integration, sharing and innovation. Specifically, the computer science and technology, statistics, intelligent science and other related specialties are intersecting and integrated to cultivate good personal quality, professional quality, scientific literacy, master the basic theory of large data analysis, master large data collection, processing and analysis skills, and be able to engage in finance and business, advanced engineering and technological innovative talents in Data Science in telecommunications and other fields.

Machine learning is a major professional course in data science and big data technology. The construction of machine learning curriculum should focus on the training target of the data science and the major data technology specialty, facing the construction of "new engineering", increasing the content of the project application case content in the teaching content, introducing the latest knowledge and technology in the related fields, following the direction of the development of the subject, and actively exploring a set of effective teaching and learning methods for this course.

## 4. The Construction of Teaching Content

Machine learning is a multi-disciplinary field of computer science, statistics, and intelligent science. It has developed together with data mining and artificial intelligence.

There are intersections and overlaps in the content, but they have their own characteristics, and new theories and methods have been developed. Therefore, the teaching content of the machine learning course should be selected and optimized, and the students can understand the basic concept of machine learning, the common machine learning model and the common learning algorithm, and can use the key technology of machine learning to analyze the actual problems and understand the development of the machine learning.

The leading course of machine learning is calculus, higher mathematics, linear algebra, probability and statistics, high level language program design, data structure and algorithm. The following courses are parallel computing, Hadoop, computer vision, video large data comprehensive experiment, social network and information communication analysis comprehensive experiment. The teaching content of this course will follow the principle of “sufficient knowledge, emphasis on application, advanced content and overall optimization”. Machine learning is a strong practical course. The undergraduate teaching of this course should focus on knowledge application and practical skills, and introduce the latest technology of machine learning to ensure the advanced content of the course.

The contents of this course are divided into theoretical teaching content and practical teaching content. On the basis of the above principles, the content of the theory teaching is divided into 3 parts:

(1) the basis of machine learning, and through a case study of what machine learning are, related concepts and experimental tools to introduce;<sup>[6]</sup>

(2) The key technology of machine learning, the introduction of data preprocessing technology, the common model and algorithm of machine learning through specific case applications, including the decision tree and the decision tree. Support vector machine, linear regression, logic regression, Bayesian method, k-mean algorithm, k-nearest neighbor algorithm, error inverse propagation (BP) algorithm, Boosting algorithm, etc.

(3) Introduction of machine learning advanced technology, such as convolution neural network, recurrent neural network, generating antagonism network, dual learning and so on.

The content of practical teaching will be designed according to the second parts of the theory teaching content, machine learning key technology, based on machine learning technology and different application scenarios. In practice teaching, students can improve the understanding of the understanding of machine learning technology and the characteristics of the related applica-

tion scene, exercise students' ability to analyze and solve problems, and cultivate their innovative consciousness and ability. The concrete implementation is divided into 5 stages: “Learning—Imitation—Analysis—Application—development”, which embodies the process of gradual teaching, gradually guides undergraduate students to participate in the project of teachers' scientific research, and further strengthens the practical experience of the student project.

## **5. Teaching Methods and the Construction of Teaching Means**

Facing the construction of “new engineering”, the students are the main body, the teaching links are designed according to the interests and characteristics of the students, and the students' subjective initiative and creativity are mobilized, and the students' ability to cooperate, analyze and solve problems is trained. The theory teaching takes case application as the carrier to explain the knowledge principle, pays attention to the problem analysis process and the application of knowledge technology; the experiment teaching designs the practical application scene, guides the students to analyze the problem scene, encourages the students to try and contrast the different techniques, and inspires the students to think.

### **5.1 The Construction of Teaching Methods**

#### **5.1.1 Case Driven Teaching**

The development of machine learning theory and method is ultimately aimed at solving practical problems, serving production and life. The course theory teaching uses case application as a problem scene, for example, during the 2012 United States election, Obama has a machine learning team led by the semi supervised learning research expert R.Ghani, which is based on the machine learning model analysis to show how Obama carries out the ticket. Through case analysis, teachers draw out related technologies, extract problems and lead to relevant concepts, analyze, verify, evaluate the techniques in cases, and summarize the methods of use. Taking case as a carrier to drive teaching, practical combat is strong, students' enthusiasm is high, and students' interest in learning can be greatly stimulated. Through the case solving process, students' knowledge structure will grow and gain confidence and sense of accomplishment.

#### **5.1.2 Promote Teaching with Problems**

According to the content and purpose of teaching, it

is reasonable to design the problem of application scene and theoretical knowledge, provide reference materials, enlighten students to think, analyze, organize student discussions, promote students to understand machine learning related techniques, and cultivate students' ability to learn and think. In addition, a variety of machine learning techniques can be used to solve a problem. What kind of technology is the best? What kind of technical efficiency is the highest? What are the features of each technology application scenario? For this kind of problem, teachers first encourage students to find literature and do experiments, and then listen to students' experimental reports and give answers. Through experimental analysis and comparison, students deepen their understanding of the nature of the problem and enhance their understanding of technology and methods.

### 5.1.3 Promote Teaching with "Encouragement"

The experiment teaching improves the students' understanding and application of machine learning model and machine learning algorithm in practice, and exercises students' ability to analyze and solve practical problems. Experimental teaching should choose and design corresponding practical application scenarios according to theoretical teaching knowledge points. In the course of teaching, it inspires students to analyze the problem scene, encourages the students to try to solve the problem according to their own thinking, encourages and inspires the students in the process of solving the problems, and guides the students to analyze and summarize the experiment.

### 5.2 The Construction of Teaching Methods

This course can integrate various teaching methods, combine traditional teaching methods with modern multimedia and mobile phone teaching methods, combine network teaching with traditional teaching, combine courseware making with the latest computer technology, enhance the interest of knowledge content, guide students to think about problems and experience solving problems. In order to improve teaching effect and students' autonomous learning ability, we should strengthen the construction of teaching means in two aspects:

(1) Effective use of network teaching. Through the network, students recommend course courseware, course video, e-book, conference paper resources, data set, open source toolbox, academic forum website and so on. Online knowledge question and answer and submission work are carried out to facilitate students' self-study and help students to improve.

(2) Make the courseware carefully. According to the syllabus, scientific selection of teaching content, meticulous production of PPT, reasonable organization of demonstration content, text, and formula combined with pictures, animation, sound, to increase the content of vivid and interesting.<sup>[9]</sup>

## 6. Conclusion

Data resource is an important modern strategic resource. Finding valuable information in big data is the core work of data scientists. Training qualified data talents will play an important role in the development of China's new economy. Under the background of the construction of the new engineering science, this paper discusses the goal of the training of the undergraduate course of the major data science and the big data technology, discusses the goal of the construction of the machine learning course, analyzes the construction of the teaching content of the machine learning, puts forward the principles of the selection of teaching content, and gives the main frame of the teaching content, and discusses the teaching methods and means of the machine learning. 3 teaching methods are put forward: case driven teaching, problem enhancing teaching, and "encouraging" to improve the quality of experimental teaching. The above research results will effectively guarantee the implementation of the machine learning curriculum teaching plan, improve the quality of teaching and data quality training.

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