

# Teaching Reform of Computer Science in Combination with Artificial Intelligence

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**Abstract:** In recent years, with the rapid landing application of artificial intelligence in various industries and the strong demand for artificial intelligence professionals, many colleges and universities nowadays respond to national policies and compete to open courses and majors related to artificial intelligence. In order to build first-class application-oriented undergraduate institutions and cultivate first-class talents, higher education institutions should actively cultivate application-oriented and compound skilled talents for the development of the whole society and local economy and industrial transformation and upgrading. In order to promote the intelligence and development of computer majors, this teaching reform proposes the teaching concept of AI + software, project-based teaching reform for courses and independent practical links, introduction of AI, reflecting engineering quality and job competence training, and strengthening the mastery, application and innovation of professional knowledge.

**Keywords:** Artificial intelligence, Composite talents, Teaching reform.

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## 1. Introduction

According to the actual needs of the current society and future development, based on the basic situation of AI development in colleges and universities, the Ministry of Education has issued the Action Plan for AI Innovation in Higher Education[1], with the following 3 stage goals: first, by 2020, the layout of optimizing the scientific and technological innovation system and discipline system in colleges and universities will be basically completed to adapt to the high-speed development of the new generation of AI; second, by 2025, significantly improve independent innovation ability and talent cultivation quality[2], based on the new generation of AI field, to obtain original achievements with international influence and contribute to the intelligent society, economic transformation and industrial upgrading; third, by 2030, to rank the top of innovative countries for China[3], the core power of universities in AI, and also the cradle of AI talents. Especially local colleges and universities should focus on action plans, based on local advantages and social needs, combining artificial intelligence with mature computer professions to promote the development of local colleges and universities and the training of talents to adapt to society.

In response to the call of national policy, in order to build first-class applied undergraduate institutions and cultivate first-class talents[4], colleges and universities should actively cultivate applied and technically skilled talents for the whole society and local economic development and industrial transformation and upgrading, which also requires colleges and universities to focus on cultivating students' problem-solving ability[5], especially complex engineering problems in the current society, and promote and realize school-enterprise in different forms, different channels and other methods. The two sides cooperate with each other and educate people in collaboration.

## 2. Current Status

The 21st century is the era of information technology. The basic, pillar and pioneer industries of the national economy are inseparable from the information industry. An important symbol of its development level is the measurement of a country's modernization level and comprehensive national power[6], and the development of the national economy and the gradual improvement of people's living standards are also directly influenced by the national informatization construction.

One of the most promising emerging industries in the 21st century is the software industry, the level of development of the information industry of each country and the comprehensive competitiveness in the international market is determined by the level of development of the software industry. By 2021, although the number of domestic computer science graduates has skyrocketed, but the software technology senior personnel is still very short, in response to this problem[7], the domestic software industry. The primary task is how to train high-quality computer talents in line with international standards, and overall improve the overall level of the domestic software industry.

In the economic and social needs, new technologies and new ideas in all walks of life are inseparable from intelligent identification, Internet of Things, cloud computing, big data, etc. Based on this background, high-tech companies at home and abroad have laid out artificial intelligence, and the development of artificial intelligence has ushered in a new development opportunity.

From the employment situation of computer science graduates, there are many students in the process of employment, have intersected with artificial intelligence, or want to go to the direction of artificial intelligence[8]. At the same time, by looking up the relevant literature, China's artificial intelligence talent gap is growing, the ratio of talent supply and demand 1:10, can be described as a huge gap. However, the current curriculum does not contribute enough

to the cultivation of core competencies of AI, so it is necessary to explore the teaching design of computer science majors with AI from the teaching aspect.

### 3. Implementation Program

#### 3.1. Reform content

In order to ensure the feasibility of online teaching content for computer professionals, a resource library for professional teaching content needs to be constructed before designing the system software[9]. The purpose of building a teaching resource library is to provide an effective storage space for data information and teaching resources, and store the data in the designated space of the computer. The database has certain requirements and standards for data storage, and disorganized data cannot be directly imported into the database, so this way can effectively guarantee the security and standardization of data.

In the process of constructing the database, considering that computer professional teaching involves more professional knowledge, it is necessary to classify the resources in the

process of importing learning resources[10]. Firstly, a learning sample is constructed in the front end of the system, a sample training set is input against the sample template, and the data reverse transfer algorithm is invoked to iteratively train the weights of online teaching resources to ensure that the output resource classification results are closer to the desired classification results[11]; secondly, the error sum of squares of the output layer of the resource database is calculated, and it is trained with the specified error for several times, and when the network weights are lower than the deviation value, the training of Finally, we use Convolutional Neural Networks (CNN) to evaluate the timeliness and quality of teaching resources, and import the results into the front-end after completing the evaluation to ensure that the learning resources provided can meet the teaching requirements and students' needs. After the classification of the teaching resources, the corresponding information tables are constructed in the database according to the classification results. Taking the course information table as an example, the description of the information table content in the database is shown in Table 1.

**Table 1.** Contents of information table of teaching resource library

Fields	Name	Type	Is empty	Whether primary key
Course Id	Course Number	Int (20)	No	Yes
Course Num	Course Sections	Varchar (50)	No	No
Teaching case	Teaching Case	Varchar (50)	No	No
content validity	Content Introduction	Varchar (50)	No	No
unit testing	Unit Testing	Varchar (50)	No	No
Expand content	Expanded Content	Varchar (50)	No	No

According to the contents in Table 1, the planning of other table contents in the database is carried out. After ensuring that all the contents can meet the standardized format requirements, the design of the online teaching resource library for computer majors is completed.

#### 3.2. Objectives of the reform

After the construction of teaching resource library is completed, deep learning theory is introduced to recommend personalized teaching contents for students. Assuming that the data set of the clustered samples is denoted as X, the different teaching cases or teaching resources in the data set can be denoted as X1,X2,...,Xn. In this process, each sample can be denoted as Xi, where Xi corresponds to the dimension of the data set as m[13]. The dimension normalization process of the data set, i.e. max-min processing, is also called data clustering. This process is also known as data clustering.

$$r_s = 1 - \frac{\gamma \times \sum d_i}{n(n^2 - 1)} \quad (1)$$

where rs denotes online student learning behavior,  $\gamma$  denotes the coupling degree between students and personalized recommended content, d denotes learning behavior characteristics, and n denotes the number of iterations. According to equation (1), the CNN network is used to directly map students' personalized learning behaviors to the Euclidean space, and the spatial distance obtained from the mapping is used to grasp students' personalized learning

tendency, which is used as the basis for students' participation in online learning, and the terminal recommends online learning resources to students. In the recommendation process, the convolutional layer will continuously increase the RoI layer data to obtain the mapping distance, and then calculate the absolute value of the mapping distance. When the absolute value converges to 0 in the iterative process, it means that the learning contents recommended by the system for students meet the personalized online learning needs of students, and the personalized teaching content recommendation based on deep learning is realized in this way.

#### 3.3. Implementation method

In order to cultivate "high-quality applied talents", combine the application of artificial intelligence with computer science, and realize the training goal of artificial intelligence in computer science, we adopt the following 6 talents training strategies.

(1) Curriculum modularization. In order to ensure the learning effect of students, according to the composition of students' vocational job abilities, special ability teaching modules are constructed, and then the specific courses corresponding to each teaching module are determined. In the elective or compulsory modules of computer science, a part of AI courses are offered to improve students' learning of AI knowledge so that they can quickly apply AI knowledge to computer expertise in their future working life.

(2) Set up practical courses based on job requirements. Based on the existing vocational job requirements set curriculum, in order to highlight the cultivation of vocational

core competencies, adapt to the actual practical work, adhere to the "employment-oriented, competence-based, industry-academia combination", appropriate for students to participate in the company's actual project development and other work. For the cultivation of vocational core competencies, in order to refer the development of actual projects to teaching, the company's technical staff can be directly involved in the teaching activities of the practical classes, and AI-related experiments can be incorporated into the course requirements of the practical classes.

(3) Faculty team integration. In order to conform to the teacher team construction of computer science, it can be composed of enterprise technical engineers and full-time teachers in the school. Under the teaching reform of "engineering integration", students can go to enterprises to work on practical projects during winter and summer vacations, so as to link the theoretical knowledge of the course with the existing technology and check the gaps. The full-time teachers can be responsible for teaching the theory of AI and computer science, and the technical personnel of enterprises can be responsible for the instruction of these two types of development techniques.

(4) Focus on practical teaching and strengthen the cultivation of ability. Computer professionals have strong hands-on ability, so the proportion of practical teaching in the curriculum system is also increasing, and can implement a hierarchical and phased technical skills training program, integrating practical teaching into the classroom and outside the curriculum. There are four levels as follows: First, about four small experiments can be set up in classroom teaching, and the experimental operation methods and steps can be written into the experimental report, which not only can highlight the training of basic skills, but also can exercise the ability of writing documents. Secondly, after each course, we can ask the enterprise technicians to do a small practical development project for the content of this course to highlight the training of professional and comprehensive ability of the course. Third, open the corresponding apprenticeship, practical training, so that students go to the enterprise comprehensive integration of learning. Fourth, contact some companies and units, so that students top internship, focusing on the cultivation of individual ability. Fifth, the graduation internship/design link, comprehensive vocational skills training, not only to adapt to the requirements of the position, but also good communication, handling problems. In these five sessions, a certain amount of practical teaching of artificial intelligence skills development is added.

(5) Vigorously implement the teaching reform. In order to realize the cultivation of computer talents, in the teaching reform, in addition to combining with the knowledge of artificial intelligence, we should also integrate computer with other courses and highlight the "engineering practicality" of the course system.

(6) Encourage the acquisition of appropriate certificates. According to the existing recruitment requirements, students can be encouraged to take relevant vocational and technical examinations, such as the Computer Technology and Software Professional Technical Qualification (Level) Examination, the Computer Grade Examination, and the Artificial Intelligence Technology and Application Practice.

## 4. Effect

When teachers teach students online, they perform online student learning behavior acquisition through Fast CNN in the deep learning module. The terminal automatically sends web crawlers to multiple applications. The crawlers can acquire learning features based on students' learning history and currently performing learning behaviors, and the acquired information will be mapped to candidate regions, which will automatically iterate pooling based on the content of the convolutional layer of the data to obtain a fully connected communication channel with individual students.

Faculty team building: A team of instructors with research and development and innovation capabilities has been formed in the areas of programming applications, Web site design, data analysis and modeling optimization, and cloud computing skills.

Project Incubation and Competition Project Enhancement: Combine students' technical and business areas of interest and research to select appropriate topics to apply for science and innovation projects. Lead students to explore cutting-edge technologies outside the classroom together around real-world problems and facilitate their learning to apply new technologies to complete their projects.

Building an online teaching resource library based on SuperStar Learning Connect

## 5. Summary

In order to promote the intelligence and development of computer profession, combined with the development status of computer profession and the rapid development of artificial intelligence, this teaching reform project proposes new talent training strategy from the aspects of modularization of curriculum, setting up practical courses with job requirements, integration of faculty team, focusing on practical teaching to strengthen ability cultivation, vigorously implementing teaching reform, encouraging the acquisition of corresponding certificates, etc., proposes: artificial intelligence + software The teaching concept, taking the industry ability demand as the guidance of students' training effectiveness, taking the application-oriented ability characteristics as the target, carrying out project-based teaching reform on the curriculum and independent practice links, introducing artificial intelligence, reflecting engineering quality and job ability cultivation, and strengthening the mastery, application and innovation of professional knowledge.

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