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Teaching Reform and Practice of Integrating Artificial Intelligence Courses into Talent Cultivation for Computer Majors in Higher Education

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Abstract: The rapid development of artificial intelligence (AI) technology has put forward new requirements for the training of computer professionals. This paper focuses on the teaching reform and practice of integrating AI courses into the training of computer professionals in colleges and universities. It analyzes the construction of curriculum systems, teaching quality evaluation, and teaching cases, and proposes a reform path covering curriculum module design, teaching method innovation, and evaluation system optimization. The aim is to provide reference for the training of AI talents in computer majors of colleges and universities, and help cultivate compound AI talents who meet industrial needs.

Keywords: Artificial intelligence courses; Computer major; Talent training; Teaching reform

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1. Introduction

As a strategic technology leading the future development trend, the demand for AI talents has shown an explosive and rapid growth. Colleges and universities' computer majors, as the main positions for AI talent training, need to deeply embed AI courses into the talent training system. At present, some AI courses offered by computer majors in colleges and universities have problems such as fragmented curriculum systems, outdated teaching methods, and imperfect evaluation mechanisms, resulting in a gap between the trained talents and the actual needs of the industry. Exploring the teaching reform path of integrating AI courses into the training of computer professionals is of great significance for improving the quality of talent training and promoting the development of the AI industry. It is also an inevitable choice for computer majors in colleges and universities to adapt to the era.

2. Construction of a curriculum system for integrating artificial intelligence courses into the training of computer professionals in colleges and universities

2.1. Basic theoretical courses of artificial intelligence

With the goal of "constructing knowledge frameworks and connecting interdisciplinary links," this course serves as an introductory course for computer majors, systematically sorting out the theoretical foundation of AI. In terms of content design, first, the development history of AI is connected through a timeline, from the Turing Test to the outbreak of deep learning, helping students build industry cognition. Then, starting from the three major schools of symbolism, connectionism, and behaviorism, it analyzes basic theories such as knowledge representation, reasoning rules, and the essence of learning. Through cases such as "why AlphaGo can win chess," students can understand the theoretical logic behind the technology. At the same time, it focuses on connecting the prerequisite courses of the computer major. For example, it analyzes the connection between AI algorithms and "trees" and "graphs" in data structures, and compares the similarities and differences between "greedy algorithms" in algorithm design and "heuristic search" in AI. This helps students build an inter-course knowledge network and lay a solid theoretical foundation for subsequent learning [1].

2.2. AI algorithms and technology courses

Focusing on the "theoretical derivation + programming implementation" model, this course is designed to meet the technical needs of computer majors and deepen the teaching of core algorithms. The machine learning module elaborates on the splitting criteria of decision trees and the specific process of solving the optimal hyperplane of support vector machines. Combined with Python code, it demonstrates to students how to implement relevant algorithms using the Scikit-learn library. The deep learning module carefully disassembles the principles of convolution and pooling operations in convolutional neural networks, and analyzes the logic of time-series information processing in recurrent neural networks. Practical operations are carried out through the TensorFlow framework, enabling students to master the skills of model construction and parameter tuning. The course emphasizes the "integration of algorithms and professional skills." For example, students are arranged to implement a simplified version of support vector machines using C++ and handle data preprocessing in machine learning using Java. This not only effectively strengthens the understanding of algorithms but also practically exercises the application ability of programming languages, helping students build a technical closed loop of "algorithm principle → code implementation → problem solving."

2.3. AI application and practice courses

Guided by "from theory to industry," this course enhances students' engineering practice capabilities through case analysis and project development. In the case teaching stage, it disassembles intelligent risk control systems in the financial field, medical image diagnosis, and environmental perception components of autonomous driving, analyzing the internal logic of technical selection and implementation difficulties. In the project development stage, the "team collaboration + full-process practical operation" model is adopted. It requires 3–5 students to form a group to develop small intelligent systems, simulating the enterprise development process from demand analysis, algorithm selection, system design, to coding, testing, and deployment. At the same time, it exercises students' abilities in demand decomposition, technical implementation, and team communication.

3. Construction of teaching quality evaluation system for integrating artificial intelligence courses into the training of computer professionals in colleges and universities

3.1. Teaching objectives and achievement evaluation system

AI courses should establish a teaching objective and achievement evaluation system integrating knowledge, ability, and literacy to ensure that the evaluation fully aligns with the course's training orientation. In the knowledge dimension, the focus is on the core foundational content of AI, including the mastery of basic theories such as machine learning and neural networks, as well as the understanding of core technologies like convolution algorithms and natural language processing. For example, short-answer questions are used to assess students' understanding of the principle of gradient descent, and programming written tests are conducted to examine their grasp of algorithm logic. The ability dimension emphasizes practical operation and application, with assessments carried out through tasks such as algorithm code implementation and intelligent system module development. For instance, students may be required to independently build a simple image recognition model or develop an intelligent Q&A mini-program in teams to comprehensively evaluate their abilities in problem decomposition and technical implementation. The literacy dimension goes beyond technical aspects, focusing on students' innovative thinking during project development, such as whether they can propose new ideas to improve algorithm efficiency. Their collaborative ability is assessed by observing their division of labor and cooperation in team projects. Meanwhile, case questions related to AI ethics, such as scenarios involving data privacy protection and algorithmic fairness, are designed to examine students' ethical judgment and sense of responsibility [2].

3.2. Teaching process and method evaluation system

For AI courses, multi-dimensional evaluation of the teaching process and methods is a key link in ensuring course quality. In evaluating teaching content, on the one hand, it is necessary to verify whether the content includes cutting-edge fields such as deep learning and reinforcement learning; on the other hand, it is necessary to judge whether the cases used are consistent with actual industry situations, for example, whether real-world application scenarios such as autonomous driving and intelligent recommendation are introduced, to ensure that the teaching content matches the job requirements of computer professionals. In evaluating teaching methods, the focus is on effectiveness. For case teaching, it is necessary to assess whether the selected cases can connect theoretical knowledge with practical operations; for project-based teaching, whether it can drive students' independent inquiry; and for seminar teaching, whether it can stimulate ideological collisions among students. For example, the role of teaching methods in promoting students' ability improvement can be judged by analyzing the specific paths students take to solve problems in projects. The evaluation of teaching resources covers multiple aspects, including the authority of textbooks, the timeliness of online courses and industry databases, and whether the computing power of experimental platforms can support model training. This evaluation is carried out through a tripartite cooperation model: students fill out anonymous questionnaires to provide feedback on their learning experiences; peers evaluate the adaptability of teaching logic and methods through class observations; supervisors randomly inspect teaching materials and attend classes on-site.

3.3. Student participation and satisfaction evaluation system

Focusing on the real feedback from the learning subject, the student participation and satisfaction evaluation system can promote precise optimization of the course. In evaluating participation, in addition to counting in-class questioning and frequency of participation in group discussions, special attention is paid to tracking practical engagement in experimental sessions, such as the number of code submissions and the revision of experimental reports. In project-based learning, the depth of students' participation in tasks such as demand analysis and technical development is quantitatively presented through task assignment records and team contribution score sheets. Satisfaction surveys are conducted by combining questionnaires and interviews. Questionnaires are designed around core aspects such as course difficulty, content practicality, and assessment rationality. Group interviews are organized for students at different learning levels to explore their specific needs for teaching methods and resource support. For example, for students with weak foundations, the thoroughness of experimental guidance is investigated; for students with strong abilities, whether extended content can meet their improvement needs is understood. By integrating statistical data and interview results, if students show low interest in the teaching of a certain algorithm, teaching strategies are adjusted immediately to enhance course attractiveness and stimulate students' learning enthusiasm [3].

3.4. Continuous improvement and feedback mechanism

As a core element ensuring the steady improvement of AI course teaching quality, the continuous improvement and feedback mechanism needs to establish a closed-loop operation system. In this system, first, regular reviews of evaluation results should be conducted, specifically, various evaluation data are summarized monthly, and comprehensive reviews are carried out each semester. Through such reviews, specific problems can be identified, such as the lagging teaching progress of some cutting-edge technologies and the insufficient computing power of experimental platforms. Targeted improvement measures are formulated for the identified problems. If the course content is outdated, joint efforts with industry enterprises are needed to update the case library and introduce teaching content related to generative AI; if teaching methods are single and boring, teachers are organized to learn new teaching models such as flipped classrooms and apply them in practical teaching; if experimental platforms are limited, various resources are coordinated to upgrade servers or introduce cloud experimental platforms. After the implementation of relevant measures, a 3-4 week tracking phase is set up to collect effect data through in-class observations and student feedback. For example, after optimizing the experimental platform, changes in the actual efficiency of students' model training and the quality of experimental completion are counted. Finally, a complete and coherent cycle system is constructed, including "evaluation data collection, in-depth problem analysis, scientific measure formulation, effective implementation, timely effect feedback, and comprehensive re-evaluation," to promote the continuous improvement and updating of AI course teaching, so as to better adapt to industry development trends and students' growth needs. As shown in **Table 1**.

Table 1. Construction of teaching quality evaluation system for professional talent training

Evaluation dimension	Evaluation content	Evaluation methods
Teaching Objectives and Achievements	Knowledge mastery, ability achievement, literacy development	Course exams, project acceptance, report defense
Teaching Process and Methods	Cutting-edge content, method effectiveness, resource richness	Student evaluation, peer review, supervisor inspection
Student Participation and Satisfaction	Participation enthusiasm, learning satisfaction	Questionnaires, interviews, data statistics
Continuous Improvement and Feedback	Problem identification, measure formulation, effect tracking	Data analysis, measure imple

4. Teaching case analysis of integrating artificial intelligence courses into the training of computer professionals in colleges and universities

4.1. Teaching case 1: Teaching of AI algorithms and technology courses

In the AI Algorithms and Technology course, the "theoretical explanation - algorithm implementation - case analysis" teaching model is adopted. First, the principles and derivation processes of machine learning algorithms are comprehensively and systematically explained to help students understand the mathematical foundation of the algorithms. Then, students are guided to implement the algorithms using the Python programming language, for example, building linear regression and logistic regression models from the basic level, to temper their programming skills and algorithm implementation capabilities. Finally, combined with practical cases such as customer classification and disease prediction using machine learning algorithms, students are encouraged to apply the algorithms to real scenarios and understand their application value. Through this teaching case, students not only master the theoretical knowledge of AI algorithms but also acquire the ability to implement and apply the algorithms, achieving synchronous improvement in both knowledge and ability [4].

4.2. Teaching case 2: Teaching of AI application and practice courses

In the AI Application and Practice course, teaching is carried out around the project of developing an intelligent image recognition system. Working in teams, students start with detailed demand analysis to clarify the system's required functions, such as image classification and target detection. Then they select appropriate deep learning frameworks and algorithm models, for example, building a convolutional neural network model using the TensorFlow framework.

Subsequently, they conduct data collection, preprocessing, as well as model training and optimization, and finally complete the system integration and testing tasks. During the project development process, teachers provide continuous guidance to help students solve technical problems and cultivate their abilities in system development, team collaboration, and problem-solving. This teaching case enables students to deeply experience the complete process of AI application development and enhances their engineering practice capabilities and comprehensive literacy.

5. Conclusion

Integrating AI courses into the training of computer professionals in colleges and universities is an important measure to adapt to the development trend of the AI industry. By building a scientific and reasonable curriculum system, improving the teaching quality evaluation system, and supporting with a large number of diverse teaching cases, the AI literacy and capabilities of computer professionals can be effectively improved. We should always pay close attention to the development trends in the AI field, continuously optimize the course content and teaching methods, strengthen the construction of the teaching staff and experimental platforms, promote the in-depth advancement of the teaching reform of AI courses, and contribute to cultivating a large number of high-quality AI talents and promoting the innovative development of the AI industry.

Disclosure statement

The author declares no conflict of interest.

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