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Exploration of Teaching Practice of Computer Courses Based on Artificial Intelligence

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Abstract: The rapid development of artificial intelligence (AI) technology has put forward new requirements for the cultivation of computer professionals. This paper aims to explore the innovative practical paths of computer course teaching in the era of AI. First, it analyzes the prominent problems existing in current computer course teaching, such as outdated curriculum content that lags behind technological development, traditional and single teaching methods, weak practical platforms, and aging knowledge structure of teachers. Furthermore, it systematically proposes teaching practice strategies, aiming to provide systematic theoretical reference and practical guidance for the teaching reform of computer courses in colleges and universities, and cultivate innovative and compound talents that meet the needs of the intelligent era.

Keywords: Artificial intelligence; Computer courses; Teaching reform; Practical strategies

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1. Introduction

With the breakthrough progress of AI technology and its in-depth integration and wide application in various fields of society, there is an increasingly urgent demand for computer professionals with AI literacy and capabilities. As the main position for talent cultivation, higher education's computer course teaching is facing unprecedented opportunities and challenges. The traditional computer curriculum system, teaching model, and training goals can no longer meet the new requirements for talents' knowledge structure, skill level, and innovative thinking posed by the new technological revolution characterized by intelligence [1]. Therefore, how to organically integrate the latest achievements, thinking methods, and ethical considerations of AI into the entire process of computer course teaching, reconstruct teaching content and models, and strengthen the cultivation of practical and innovative capabilities has become an urgent issue in current computer education reform.

2. Existing problems in computer course teaching

2.1. Outdated curriculum content and insufficient integration of cutting-edge knowledge

Currently, the curriculum system of computer courses in many colleges and universities is updated slowly, and the disconnection between teaching content and technological development is relatively prominent. Core courses still focus on traditional computer science theories, basic programming languages, and classic algorithms, while the systematic introduction of core AI fields such as machine learning, deep learning, and natural language processing is obviously insufficient. Even if involved, it often stays at the level of conceptual introduction, lacking in-depth analysis and practical training on paradigm principles such as supervised learning, unsupervised learning, and reinforcement learning, as well as mainstream model architectures such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs) [2-4]. At the same time, key discussions on AI ethics, security, privacy, and social impacts are generally absent from the courses, resulting in students mastering tool skills but lacking rational cognition of the boundaries of technological application and social responsibility. This lag and one-sidedness in content make it difficult for graduates to quickly adapt to the actual needs of the industry for AI technology application and innovation [5].

2.2. Traditional teaching methods and lack of student initiative

The teaching model still mostly follows the traditional paradigm centered on teachers and dominated by classroom lectures. This "cramming" teaching makes it difficult to mobilize the learning enthusiasm and exploration desire of digital native students. Especially for the abstract and complex mathematical models and algorithm principles in AI, pure theoretical explanations are likely to make students feel bored and find it difficult to understand. In the teaching process, there is a lack of vivid cases closely combined with cutting-edge technology application scenarios and challenging practical projects. Students passively accept knowledge rather than actively construct it. Although some courses are equipped with experimental links, they are often verification-based experiments, lacking design-oriented, comprehensive, and innovative experimental projects. Students' abilities to analyze problems, solve problems, and collaborate in teams are not effectively trained. The singleness of teaching methods inhibits the cultivation of students' innovative thinking and lifelong learning abilities [6].

2.3. Weak practical platforms and inadequate connection between production and teaching

The cultivation of students' practical abilities highly depends on high-quality practical platforms. However, many institutions currently have problems such as outdated experimental facilities and a lack of computing resources, which make it difficult to support AI model training and experiments that require substantial computing power. The design of experimental content is often disconnected from real application scenarios, failing to form a stepped practical system from basic verification, comprehensive design, to innovative research. More importantly, the cooperation between schools and enterprises is not in-depth enough, and off-campus practice bases are mere formalities. Students have difficulty obtaining opportunities to participate in real AI project research and development, access industrial-grade data and platforms, and understand the latest industry trends [7]. The weakness of practical links leads to the failure of students' learned theories to be effectively transformed into the ability to solve complex engineering problems, resulting in a gap between "learning" and "application" and affecting the training effect of applied and innovative talents.

2.4. Slow transformation of the teachers' team and need for improved compound capabilities

Teachers are the key implementers of teaching reform. Faced with the rapid development of AI, some computer professional teachers have not kept up with the pace of change, have a shallow understanding of cutting-edge technologies and limited practical experience, and thus are unable to deliver high-quality teaching of AI-related content. The teacher training system and incentive mechanism are imperfect, lacking systematic opportunities for teachers to conduct research in enterprises or participate in high-end technical training, leading to a certain degree of separation between teaching and scientific research from industrial reality [8–10]. At the same time, compound teachers with interdisciplinary backgrounds who can integrate AI with specific fields for teaching are even more scarce. The insufficient preparation of teachers' teams in terms of knowledge, skills, and teaching methods has become an important bottleneck hindering the in-depth integration of AI elements into computer course instruction and improving overall teaching quality.

3. Practical paths of computer course teaching in the AI era

3.1. Reconstruct the curriculum system and integrate cutting-edge teaching content

In the AI era, to enable students to better adapt to the development needs of the new period, it is necessary to integrate cutting-edge AI-related content into the curriculum system.

First, accelerate the update of the theoretical knowledge system. For example, in computer course teaching, systematically explain basic concepts and types of machine learning, including supervised learning, unsupervised learning, and reinforcement learning, and let students understand the working principles and application scenarios of common machine learning methods such as linear regression, decision trees, and support vector machines; integrate neural network structures of deep learning, such as the working principles of CNNs, RNNs, and their derivative model long short-term memory (LSTM) networks, as well as their practical application cases such as face recognition and intelligent voice assistants. At the same time, core knowledge of ethics and security should also be introduced, and relevant sections should be set up to guide students to think about the moral and social responsibility issues related to the development of AI technology, thereby cultivating students' social responsibility and correct values based on AI technology. Students should not only learn AI technology but also learn to objectively view the practical application and development of AI technology [11].

Second, expand the capability training module and increase the proportion of skill training in computer courses. In the teaching process, in addition to inculcating basic language specifications (Python), emphasis should also be placed on cultivating programming ability and programming design. A series of challenging programming tasks should be set to guide students to learn programming practice in practical applications and improve their problem analysis and program design abilities. At the same time, integrate algorithm design ideas, introduce ranking algorithms, search algorithms, and AI algorithms to students, helping them purposefully think about design schemes when solving problems, and exercising their logical thinking ability and creativity. It is also necessary to strengthen the training of interdisciplinary integration practice capabilities. Interdisciplinary project activities can be carried out, such as medical + AI or art + AI. Thus, students can achieve mastery through a comprehensive study of the subject, innovate and excel in practice, improve their collaborative spirit in solving complex problems, and further enhance their integrated problem-solving capabilities in complex situations [12].

3.2. Innovate teaching methods and stimulate students' learning interest

The traditional teaching model cannot meet the teaching needs of basic university computer education in the AI era. We must change our teaching methods and build a student-centered teaching framework to stimulate students' learning initiative.

First, adopt a blended teaching model that combines online and offline teaching. Use online teaching software such as Chaoxing Xuexitong and China University MOOC to provide students with various teaching resources, including teaching videos, e-books, and question banks. Students can preview relevant basic knowledge and complete online tests and assignments before class, and teachers can check students' learning situation on the platform to arrange pre-class content more effectively.

Second, adopt the case teaching method and the project-based teaching method. Design relevant teaching cases and projects according to different AI application scenarios. For example, when teaching AI technology, take face recognition access control systems and intelligent security monitoring systems as examples in the part of image recognition technology, explain the technical principles and working processes of image recognition, and set up simple practical tasks of image classifiers in the training part. Students complete data collection, data preprocessing, model establishment, and model evaluation links by themselves, allowing them to master and apply knowledge and skills in the actual hands-on process and improve their ability to solve practical problems [13].

Actively encourage students to participate in relevant competitions such as the "Internet +" National College Student Innovation and Entrepreneurship Competition and the "National College Student Computer Design Competition" to promote teaching and learning. Immersive teaching can also be carried out with the help of VR/AR technology. For complex and difficult-to-understand computer technologies and AI knowledge, such as computer hardware composition and neural network structures, VR/AR technology can be used to construct a simulated scene for students to learn immersively, enhancing their visual experience and fun, and improving learning effect and satisfaction.

3.3. Build practical platforms and improve students' practical abilities

To improve students' practical abilities and cultivate their creativity, we must build multi-level practical platforms to provide students with various practical opportunities and resources.

First, build on-campus experimental and internship bases. Colleges and universities should vigorously increase the hardware construction of computer disciplines, equip high-performance computers, servers, storage devices, etc., and introduce various tools and platforms required for AI development, such as Anaconda, TensorFlow, and PyTorch, to meet students' various learning tasks, such as programming practice, algorithm testing, and model training. At the same time, according to the special needs and teaching content of each major, establish corresponding experimental tasks in different forms, such as basic verification experiments, comprehensive design experiments, and innovative research experiments. Basic verification experiments are mainly to help students consolidate and understand basic theoretical knowledge and proficiently use basic operation methods; comprehensive design experiments can exercise students' ability to solve basic problems through comprehensive application; innovative research experiments are to encourage students to think independently, conduct research, and expand the application of the latest technologies [14].

Second, deepen school-enterprise cooperation to establish off-campus practice bases. Actively seek cooperation with enterprises with certain technical strength in AI to jointly build off-campus practice bases. Enterprises provide students with practical positions, allowing them to participate in enterprise AI R&D projects, product testing, and application promotion tasks, and understand the most advanced science and technology in

the AI field and the specific needs of industry development for enterprises. At the same time, enterprise technical personnel can enter the school to give lectures and training courses for students, sharing their practical experience and industry insights; school teachers also have the opportunity to conduct practical training in enterprises to improve their practical teaching abilities. Through school-enterprise cooperation, the connection between school teaching and enterprise needs is well realized, and applied talents who meet the needs of enterprises and society are cultivated. In addition, open-source communities gather a large number of AI open-source projects and coding resources. Students can participate in these open-source projects, master high-quality design and programming experience, and interact and cooperate with technicians around the world.

3.4. Strengthen teachers' team construction and ensure the improvement of teaching quality

Teachers are the main implementers and organizers of teaching activities, and their professional abilities directly affect teaching quality. In the intelligent era, the importance of strengthening the construction of basic computer discipline teaching for teachers in colleges and universities has become increasingly prominent.

First, regularly organize basic computer discipline teachers to study and further their studies in AI-related fields, such as participating in industry seminars, professional training courses, and internships in enterprises, to ensure that they can keep abreast of the most cutting-edge AI technologies and use advanced teaching methods and information technology to teach this course.

Second, provide them with special funds to encourage them to research how to reconstruct the content of basic university computer courses in the new AI era, explore new teaching methods, and find more efficient experimental teaching methods. At the same time, educational and teaching experience exchange activities and competitions can be organized to encourage teachers to learn from each other, complement each other's strengths, stimulate teaching enthusiasm and creativity, and improve teaching abilities and levels.

In addition, a teacher exchange system between schools and enterprises can be organized. We hire core technical experts from enterprises as part-time professors or enterprise mentors to assist in classroom teaching, practical training, and graduation project guidance. These enterprise experts have rich work experience and a profound understanding of the industry, and can provide more realistic and targeted educational materials and cases, making up for the lack of practical experience of university teachers [15]. In addition, university teachers are also encouraged to work as technical consultants or part-time engineers in enterprises, participate in enterprise R&D work, achieve mutual assistance between college and enterprise resources, and form a teachers' team with a solid theoretical foundation and strong practical abilities.

4. Conclusion

In summary, the AI wave is reshaping the structure of social productive forces and talent demand. As the foundation for cultivating core forces in information technology, computer education reform is imperative. This paper systematically analyzes the challenges faced by current computer courses in teaching content, methods, practice, and teachers, and puts forward targeted practical strategies oriented to the in-depth integration of AI. By reconstructing the curriculum system, emphasizing both cutting-edge technological theories and ethical security, and broadening the dimensions of capability cultivation; by innovating teaching methods, focusing on students, and using blended teaching, project cases, and immersive technology to improve learning efficiency; by building diverse practical platforms, connecting on-campus bases, school-enterprise cooperation, and open-

source ecosystems to strengthen practical and innovative abilities; by strengthening teachers' team construction, promoting teachers' knowledge update and two-way flow between schools and enterprises, and ensuring the implementation quality of teaching reform. In this way, through multiple measures, we can cultivate a new generation of computer talents who are proficient in technology, understand ethics, are good at innovation, and have the courage to take responsibility, contributing wisdom and strength to the healthy development of the AI era.

Disclosure statement

The author declares no conflict of interest.

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