Education Reform and Development, 2025, Volume 7, Issue 12
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Research on the Application of Artificial Intelligence in Network Engineering Course Teaching

Xunli Liu*

Neusoft Institute Guangdong, Foshan 528225, Guangdong, China

**Author to whom correspondence should be addressed.*

Abstract: This study explores the effective application of artificial intelligence (AI) in network engineering course teaching to address the limitations of traditional teaching methods, meet students' personalized learning needs, and promote the teaching reform of network engineering courses. The research sorts out relevant theories and progress of AI in the field of education, combines the actual teaching situation of network engineering majors, and explores specific methods of integrating AI into teaching. The study finds that AI plays an important role in optimizing teaching model innovation and improving teaching effects, providing new ideas and directions for network engineering course teaching.

Keywords: Artificial intelligence; Network engineering; Teaching application; Teaching model; Teaching effect

Online publication: December 31, 2025

1. Introduction

The main problems currently faced in network engineering course teaching focus on three aspects: teaching content, teaching methods, and students' personalized learning needs. First, due to the rapid update and iteration of network technology, existing textbooks and course content often lag behind industrial development, resulting in students' professional knowledge being outdated [1-3]. Second, the traditional classroom teaching model is too single, making it difficult to fully mobilize students' learning enthusiasm and initiative, especially in practical operations, where students lack sufficient guidance and support. Finally, there are significant differences in knowledge foundation, learning interests, and learning abilities among different students, but traditional teaching methods struggle to provide targeted teaching services based on these differences [4]. The application of AI technology is expected to solve the above problems.

This study aims to explore the effective application model of AI technology in network engineering course teaching, with the goal of improving teaching quality and students' practical abilities, and providing new ideas and methods for the teaching reform of network engineering courses [5]. Specifically, the research will focus on the following aspects: first, constructing an AI-based intelligent teaching resource recommendation mechanism

to provide students with personalized learning resources by analyzing their learning behaviors and interest preferences; second, developing an intelligent tutoring and Q&A system to provide students with real-time and efficient learning support using technologies such as natural language processing; third, designing an intelligent teaching evaluation system to help teachers adjust teaching strategies in a timely manner and improve teaching effects through automated evaluation indicators and real-time feedback mechanisms. Ultimately, this study expects to promote the innovation of the teaching model of network engineering courses through the application of AI technology, cultivate more high-quality talents with innovative capabilities and practical skills, and provide strong talent support for the development of the network engineering field.

2. Theoretical basis of artificial intelligence in the field of education

As a comprehensive discipline, the core theories of AI include machine learning, knowledge representation, natural language processing, etc., which provide a solid technical support for its application in the field of education. Machine learning analyzes and predicts data through algorithm models, generating personalized learning paths based on students' learning behaviors. Knowledge representation abstracts educational content into a structured knowledge system, facilitating the understanding and application of intelligent systems. Natural language processing technology is particularly widely used in education; for example, the design of virtual teaching assistants relies on semantic analysis technology to achieve accurate Q&A services. In the field of education, AI not only optimizes the allocation of teaching resources but also improves the intelligence level of the teaching process, laying a theoretical foundation for the innovation of the teaching model of network engineering courses.

In recent years, with the rapid development of AI technology, its application in the field of education has gradually deepened. Machine learning algorithms can extract effective information from a large amount of teaching data, helping teachers better understand students' learning needs and behavioral patterns. At the same time, knowledge representation technology provides the necessary knowledge reserve for the development of intelligent tutoring systems by constructing domain knowledge bases. The combination of these technologies enables the education system to provide customized learning support according to students' personalized characteristics, thereby significantly improving teaching effects [6]. However, although AI has shown great potential in the field of education, its theoretical framework still needs further improvement, especially in terms of adaptability and robustness in complex educational scenarios [7].

3. Current application status of artificial intelligence in network engineering course teaching

Currently, the application of AI in network engineering course teaching is mainly reflected in intelligent tutoring, teaching resource recommendation, and teaching evaluation. Intelligent tutoring systems, by combining natural language processing and machine learning technologies, can provide students with real-time Q&A services and personalized learning suggestions. For example, an intelligent tutoring system based on knowledge graphs can quickly locate relevant knowledge points according to students' questions and generate detailed solutions. In addition, teaching resource recommendation systems use big data analysis technology to model students' learning behaviors and interest preferences, thereby pushing suitable learning resources for network engineering courses, such as video tutorials, case studies, and experimental guidelines.

However, the application of AI in network engineering course teaching also faces many challenges. First, technical issues such as data security and algorithm accuracy directly affect the reliability and user experience of the system. In intelligent tutoring systems, if the accuracy of natural language processing algorithms is insufficient, it may lead to incorrect answers or failure to meet students' actual needs. Second, teachers face difficulties in applying AI technology and changing their teaching concepts, which limits the promotion and effect of AI technology. In addition, students' adaptability to new teaching methods is also an important issue; some students may feel pressured due to the high technical threshold for use, thereby affecting their learning enthusiasm. Therefore, while promoting the application of AI technology, it is necessary to comprehensively consider factors related to AI technology, teachers, and students to maximize its benefits in network engineering course teaching.

4. Application models of artificial intelligence in the network engineering course teaching

4.1. Intelligent teaching resource recommendation

With the rapid development of AI technology, the application of big data technology in the field of education has provided new possibilities for the recommendation of teaching resources in network engineering courses. By conducting multi-dimensional analysis of students' learning behaviors, interest preferences, and knowledge mastery, an accurate student profile can be constructed, providing a scientific basis for teaching resource recommendation [8,9]. Specifically, big data technology can collect students' operation records on online learning platforms, including data such as video watching duration, after-class exercise completion, and forum interaction frequency, and conduct in-depth processing of this information through data mining algorithms. Combined with the characteristics of network engineering courses, data analysis can also be carried out for specific links, such as experimental operations and project practice, to optimize the pertinence and effectiveness of resource allocation.

4.2. Intelligent tutoring and Q&A

As an important application of AI technology in the field of education, virtual teaching assistants provide students with real-time Q&A services using technologies such as natural language processing and knowledge graphs. In network engineering course teaching, virtual teaching assistants can quickly retrieve the knowledge base and generate accurate answers by parsing students' questions. When students ask about the working principle of routing protocols, the virtual teaching assistant can extract relevant information based on the built-in knowledge graph and explain it in clear and understandable language. In addition, virtual teaching assistants also have learning capabilities; they can gradually improve their own knowledge system by continuously accumulating common questions from students and their answers, thereby improving the accuracy and efficiency of Q&A. This intelligent Q&A method not only reduces the workload of teachers but also provides more convenient learning support for students [10].

4.3. Intelligent teaching evaluation

In network engineering course teaching, constructing a scientific and reasonable automated evaluation indicator system is a key step in realizing intelligent teaching evaluation. This system includes multiple dimensions, such as knowledge mastery, practical ability, and comprehensive quality, to ensure the comprehensiveness and objectivity of evaluation results. For example, in terms of knowledge mastery, students' understanding

of theoretical knowledge is evaluated through data such as online tests and homework completion; in terms of practical ability, students' hands-on ability and problem-solving ability are measured through quantitative indicators such as experimental reports and project results [11]. In addition, combined with AI technology, machine learning algorithms are introduced to conduct in-depth analysis of evaluation data, identify students' weak links in learning, and provide them with targeted improvement suggestions. This multi-dimensional evaluation method not only improves the accuracy of evaluation but also provides important references for teaching improvement.

5. The impact of artificial intelligence application on network engineering course teaching

5.1. Impact on students' learning effects

The application of AI technology in network engineering course teaching has a significant impact on students' learning effects, specifically reflected in aspects such as knowledge mastery, practical operation ability, and learning interest. First, in terms of knowledge mastery, AI technology provides students with more accurate learning support through intelligent tutoring systems and personalized resource recommendation mechanisms. Studies have shown that student behavior modeling based on big data analysis can accurately identify students' learning difficulties and provide them with targeted learning resources, thereby helping students master complex knowledge points more efficiently [12].

Second, in terms of practical operation ability, virtual laboratories and simulation systems supported by AI technology provide students with rich practical opportunities. These tools can not only simulate real network environments but also provide real-time feedback based on students' operation performance, helping students identify and correct errors in a timely manner. Data comparison shows that students using AI-assisted teaching generally achieve higher scores in practical operation assessments than those in the traditional teaching group, indicating that AI technology has significant advantages in improving students' practical abilities.

5.2. Transformation of teachers' roles

The widespread application of AI technology has promoted the transformation of network engineering course teachers from traditional knowledge imparters to learning guides and course designers. In the traditional teaching model, teachers are responsible for explaining and imparting knowledge; however, in an AI-assisted teaching environment, teachers play more of the role of guides and coordinators in the students' learning process. Intelligent tutoring systems and automated evaluation tools can undertake some teaching tasks, such as answering questions and correcting homework, thereby reducing teachers' workload and allowing them to invest more energy in teaching design and personalized guidance. This role transformation not only improves teaching efficiency but also promotes the further development of teachers' professional abilities [13].

In addition, the application of AI technology also requires teachers to have stronger course design and resource integration capabilities. In network engineering course teaching, teachers need to design course content that meets the requirements of the times based on students' learning needs and technological development trends. For example, the construction of network space security courses combined with AI technology requires teachers to be proficient in relevant knowledge fields and integrate them into teaching design. At the same time, teachers also need to cooperate closely with technical personnel to develop intelligent teaching tools and platforms to support the smooth development of teaching activities. This interdisciplinary cooperation model not only expands teachers' teaching horizons but also provides them with more career development opportunities. Therefore,

the introduction of AI technology has not only changed the role positioning of teachers but also promoted the updating and upgrading of educational and teaching concepts.

6. Challenges and countermeasures of artificial intelligence application in the network engineering course teaching

6.1. Challenges at the teacher level

In the process of AI technology gradually integrating into network engineering course teaching, teachers face various challenges. First, the insufficient technical application capabilities of teachers have become one of the main obstacles. Many teachers have a limited understanding of AI technology and struggle to proficiently master the operation methods of intelligent teaching tools, which directly affects the effective implementation of AI technology in teaching. Second, changing teaching concepts is also a major difficulty. Under the traditional teaching model, teachers usually play the role of knowledge imparters; however, in AI-assisted teaching, teachers need to transform into learning guides and course designers. This transformation requires teachers to reposition their responsibilities and adjust teaching strategies [14]. To help teachers overcome these difficulties, systematic training and development strategies should be adopted.

6.2. Challenges at the student level

Students also face a series of challenges when adapting to a network engineering course teaching supported by AI technology. First, the new teaching methods may make students feel uncomfortable. For example, the personalized learning paths and automated evaluation feedback mechanisms provided by intelligent teaching platforms can improve learning efficiency, but they also require students to have strong autonomous learning abilities. For students accustomed to traditional classroom teaching, this transformation may bring certain learning pressure. Second, the application of AI technology may lead some students to over-reliance on technology, neglecting the solid mastery of basic knowledge and the cultivation of practical abilities.

7. Conclusion

This study focuses on the application of AI in network engineering course teaching and explores its key role in optimizing teaching models and improving teaching effects [15]. Through systematic analysis of models such as intelligent teaching resource recommendation, intelligent tutoring and Q&A, and intelligent teaching evaluation, the broad application potential of AI technology in the field of education is revealed. In terms of intelligent teaching resource recommendation, the student behavior analysis and personalized resource recommendation mechanism based on big data have significantly improved the adaptability and utilization efficiency of learning resources. The function realization of virtual teaching assistants and the planning of personalized learning paths provide more accurate support for students in network engineering courses, effectively meeting their diverse learning needs. In addition, the construction of automated evaluation indicators and real-time feedback mechanisms not only improves the scientificity of teaching evaluation but also provides an important basis for teachers to adjust teaching strategies. These research results show that the application of AI technology can significantly improve the shortcomings of traditional network engineering course teaching, thereby promoting the improvement of teaching quality.

Disclosure statement

The author declares no conflict of interest.

References

[1] Wang R, 2025, Research on the Integration Path of "Computer Fundamentals" Course Teaching Under the Background of Artificial Intelligence. Wireless Internet Technology, 22(18): 120–124.

[2] Zhou C, Liu X, Liu L, et al., 2025, Research on the Development and Application of Artificial Intelligence Technology in Computer Network Education. Education and Teaching Forum, (33): 77–80.

[3] Rong R, 2023, Application of Artificial Intelligence Technology in Computer Network Teaching. Digital Technology and Application, 41(09): 75–77.

[4] Tao S, 2024, Discussion on the Application of Artificial Intelligence Technology in Computer Network Education. Communication World, 31(09): 55–57.

[5] Bai Y, Zhou Y, 2024, Research on the Application of Artificial Intelligence Technology in the Construction of Cyberspace Security Disciplines. Journal of the Chinese Society of Education, (2): I0037–I0037.

[6] Zou M, 2020, Research on the Multi-Dimensional Integrated Teaching Model of Computer Network Courses Supported by Artificial Intelligence. University Education, (3): 95–97.

[7] Wang M, 2024, Research on AI-Driven Network Engineering Fault Diagnosis and Cloud Computing Resource Scheduling. China Broadband, 20(08): 169–171.

[8] Feng Y, Yang J, 2022, Application of Artificial Intelligence in Computer Network Engineering. Electronic Technology, 51(09): 198–199.

[9] Sun Y, 2023, Discussion on the Application of Artificial Intelligence Technology in the Development of Computer Networks. China New Telecommunications, 25(16): 78–80.

[10] Yang J, 2024, Application of Artificial Intelligence in Computer Network Technology Innovation and Economic Benefit Improvement. Modern Industrial Economy and Informationization, 14(02): 161–163.

[11] Cui Q, 2024, Application and Strategies of Artificial Intelligence Technology in Computer Network Education in Colleges and Universities. Journal of Hubei Open Vocational College, 37(07): 166–168.

[12] Wang J, 2025, Exploration of the Training Model for Applied Talents in the Big Data Application Technology Major Under the Digital Background. China Collective Economy, (25): 181–184.

[13] Yang Y, 2025, Design of the Development System for Computer Teaching Resources in Secondary Vocational Schools Supported by Artificial Intelligence Technology. China Information Times, (09): 226–228.

[14] Chen Y, 2024, Construction of a Practical Teaching System for Computer Majors Supported by Artificial Intelligence. China Computer & Communication, 36(24): 215–217.

[15] Wang K, 2023, Research on the Training Model of Innovative and Entrepreneurial Talents in Computer Application Majors Under the Background of Artificial Intelligence. Proceedings of the 7th Innovative Education Academic Conference, 377–378.