Interdisciplinary Curriculum Integrating Communication Technologies and Artificial Intelligence

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Abstract. With the deep integration of communication technology and Artificial Intelligence (AI), the construction of interdisciplinary curricula has become a crucial pathway for cultivating interdisciplinary talents in higher education. However, traditional communication courses are somewhat disconnected from AI technologies, making it challenging to meet the industry's demand for multidisciplinary talents. Based on the integrated development trend of communication and AI technologies, this paper systematically discusses the construction strategies of interdisciplinary curricula from three aspects: curriculum system design, teaching content restructuring, and practical pathways. By introducing Project-Based Learning (PBL), case analysis, and virtual simulation platform support, the study aims to enhance students' comprehensive application capabilities and interdisciplinary collaboration skills. The research results show that this curriculum reform path effectively promotes integrated teaching of communication and AI, providing a reference for the cultivation of relevant professional talents.

Keywords: Communication Technology, Artificial Intelligence, Interdisciplinary Cur-riculum, Curriculum Reform, Teaching Practice.

1 Introduction

With the rapid development of 5G and future 6G technologies, communication networks are evolving towards intelligence and adaptability. The introduction of AI technology has demonstrated enormous potential in optimizing resources, channel prediction, and network management in traditional communication networks[1][2]. Currently, research and practice on interdisciplinary curricula integrating "Communication Technologies and Artificial Intelligence" are steadily advancing both domestically and internationally. Countries such as China, India, and the United States have incorporated related courses into their educational systems, emphasizing the deep integration of artificial intelligence with communication technologies to meet the demands of future technological development. These courses not only focus on cultivating core competencies such as resource optimization, intelligent decision-making, and network management but also face multiple challenges, including teacher training, ethical standards, and curriculum design[3]. However, in the field of communication studies in China,

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specific curriculum reforms targeting this interdisciplinary direction remain insufficient, highlighting the need for further improvement and exploration. Existing communication engineering courses are often relatively independent of AI technology, leading to a lack of understanding and practical skills in machine learning, deep learning, and other AI algorithms among students.

To address this challenge, This paper focuses on the "Interdisciplinary Curriculum Construction and Practice Research in the Context of Communication and Artificial Intelligence Integration" and proposes a systematic curriculum design and implementation plan, which has been verified through practical teaching.

2 Research Background

2.1 The Integration Trend of Communication and Artificial Intelligence

With the rapid development of 5G, the Internet of Things (IoT), and future 6G technologies, the demand for real-time data processing and intelligent optimization in communication systems is constantly increasing. The introduction of AI technologies provides novel solutions for adaptive signal processing, network routing optimization, and resource scheduling in communication systems. For example, predicting channel states through deep learning models can significantly improve spectrum utilization and transmission efficiency [4].

2.2 The Necessity of Interdisciplinary Curriculum Construction

Traditional communication engineering courses mainly focus on signal processing, network protocols, and hardware architecture, while AI-related content is independently taught in computer science and data science courses. Students often struggle to establish effective knowledge connections between disciplines, making it challenging to apply multi-domain integrated solutions to practical complex engineering problems. Therefore, constructing interdisciplinary courses that integrate communication and AI technologies has become a critical pathway to enhancing students' practical abilities and engineering innovation skills[5].

3 Curriculum Design and Implementation

3.1 Curriculum Objectives and Positioning

The curriculum system is designed to cultivate students' comprehensive capabilities in the fields of communication technology and AI[6], enabling them to meet the development needs of future 6G and intelligent communication networks. Through systematic curriculum modules and practice platform construction, students will master core skills such as communication network optimization, AI algorithm modeling, intelligent prediction, and network scheduling.

3.2 Curriculum Module Design

The curriculum system consists of three core modules:

- Communication Fundamentals Module: Covers signal processing, wireless communication principles, and network protocols to help students solidify their foundational knowledge in the field of communication.
- AI Technology Module: Focuses on machine learning, deep learning, and data processing, enabling students to understand the practical applications of AI incommunication networks.
- Integration Application Module: Centers on intelligent optimization and interference coordination in high-load communication scenarios, including channel prediction, resource scheduling, and network routing optimization.

With the rapid advancement of communication technologies and artificial intelligence, it is crucial for curriculum content to be updated promptly to incorporate the latest research findings and industry trends, ensuring that students are equipped with cutting-edge knowledge and practical skills. This includes integrating emerging topics such as 5G/6G networks, edge computing, machine learning for communication optimization, and intelligent network management into course modules. Additionally, practical training through lab experiments, simulation platforms, and industry collaboration projects should be emphasized to bridge the gap between theoretical knowledge and real-world application. Furthermore, interdisciplinary learning that combines technical expertise with ethical considerations, data privacy, and sustainable development is essential to prepare students for the complex challenges of modern communication networks.

3.3 Teaching Methods and Practical Pathways

A combination of Project-Based Learning (PBL) and case analysis is adopted to guide students in completing the entire process from requirement analysis, solution design, to system implementation in real or simulated engineering scenarios. Additionally, with the support of a virtual simulation platform, students can perform communication signal acquisition, modeling, AI algorithm deployment, and performance evaluation, strengthening their practical operations and interdisciplinary integration capabilities.

4 Experimental Platform and Data Analysis

4.1 Experimental Platform

To achieve seamless integration of theory and practice, a virtual simulation platform integrating communication technology and AI technology has been constructed. The platform features the following core functions:

- Signal Acquisition and Processing: Supports the acquisition and preprocessing of various simulated and real signals.

- AI Modeling and Simulation: Students can load machine learning and deep learning algorithms in the platform to complete simulations of channel prediction, interference suppression, and network optimization.
- Multi-Scenario Experiment Support: Supports experiments in typical communication scenarios such as wireless transmission, interference coordination, large-scale MIMO, and edge computing optimization.

4.2 Data Analysis

Through multiple sets of comparative experiments, including traditional network optimization and AI algorithm-based intelligent optimization strategies[7][8], students can clearly understand the significant effects of AI introduction on improving network performance, including channel prediction accuracy, reducing bit error rate, and enhancing network throughput, as shown in Fig.1.

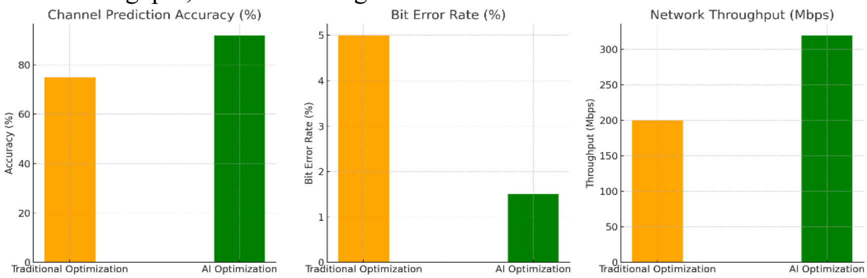

Fig. 1. Comparison Chart of Network Performance on Experimental Platforms

5 Teaching Effectiveness Evaluation

5.1 Course Module Learning Effect Comparison

As shown in Fig.2, the comparison of learning effectiveness in course modules aims to evaluate the differences in students' mastery of core knowledge and application capabilities between traditional courses and interdisciplinary courses. Specifically, the comparison focuses on three core modules: mastery of communication technology, understanding of AI algorithms, and interdisciplinary application capabilities[9].

- Communication Technology Mastery: Traditional courses primarily focus on fundamental theories and single-domain applications, whereas interdisciplinary courses emphasize the integration of multi-domain knowledge.
- AI Algorithm Understanding: Interdisciplinary courses introduce machine learning and deep learning concepts, enabling students to not only learn theoretical knowledge but also perform modeling and algorithm optimization through experimental platforms.
- Interdisciplinary Application Capability: Traditional courses are often limited to in-depth research on a single technology, while interdisciplinary courses, driven by

Project-Based Learning (PBL) and case analysis, guide students to explore the intersections of communication and AI.

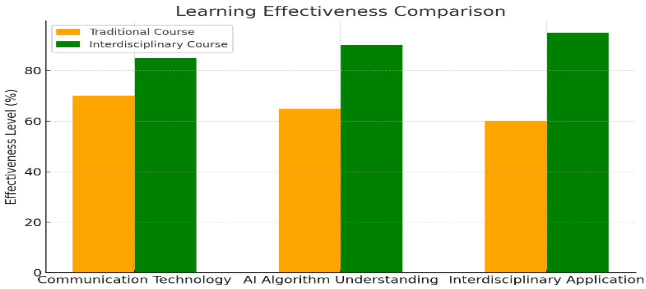

Fig. 2. Comparison Chart of Learning Effectiveness in Three Modules

5.2 Student Interdisciplinary Capability Improvement Comparison

As shown in Fig.3, the enhancement of students' interdisciplinary capabilities is mainly reflected in their mastery and practical skills in communication technology, AI algorithms, and multi-domain integrated applications[10]:

- Communication Technology Capability: Traditional courses focus more on signal processing and network protocols in theory, while interdisciplinary courses introduce AI-driven optimization and intelligent scheduling, deepening students' understanding of communication mechanisms in complex network environments.
- AI Algorithm Capability: Interdisciplinary courses emphasize practical applications of machine learning and deep learning in communication networks, including channel prediction, interference cancellation, and resource scheduling optimization, allowing students to design and optimize models through practice rather than just theory.
- Multi-Domain Application Capability: Through PBL and case analysis, students can organically combine communication technology and AI algorithms to solve network optimization and interference coordination in high-load scenarios, a skillset not achievable in traditional courses.

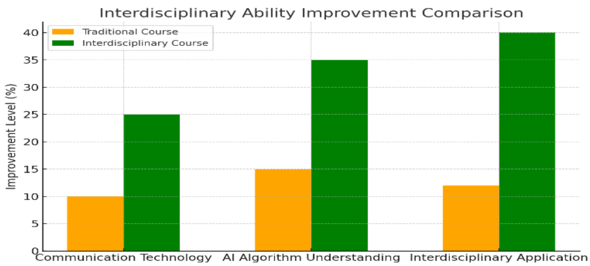

Fig. 3. Comparison Chart of Interdisciplinary Capability Improvement in Three Modules

6 Conclusion

This study, based on the integrated development of communication technology and artificial intelligence, proposes a systematic interdisciplinary curriculum construction and practical pathway. By optimizing the curriculum system, introducing Project-Based Learning (PBL), and building a virtual simulation platform, students' interdisciplinary application capabilities and practical innovation skills in communication and AI technologies are significantly enhanced.Looking forward, the curriculum system can be further expanded to more complex network scenarios, combined with edge computing, big data processing, and 6G technologies to explore personalized teaching pathways and intelligent evaluation methods. Moreover, by deepening the construction of interdisciplinary teaching teams and promoting international cooperation, higher education can better align talent cultivation with industry demands, supporting the technological development of future intelligent communication networks.

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