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RESTRUCTURING AND UPGRADING THE PEDAGOGICAL APPROACHES TO THE STUDY OF ARTIFICIAL INTELLIGENCE WITHIN THE FRAMEWORK OF EMERGING FINANCIAL AND ECONOMIC PARADIGMS

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ABSTRACT

As the information age unfolds, universities specializing in finance and economics confront novel challenges in talent cultivation. Accordingly, curriculum development requires timely adaptation. Using the course Introduction to Artificial Intelligence at Hebei University of Economics and Business as a case study, this paper elucidates the course's distinctive features, direction, goals, content, and instructional methodologies. Ultimately, it reflects on the teaching outcomes, actively probing the integration of disciplines and advancing new paradigms in finance and economics.

INTRODUCTION

Artificial intelligence (AI) stands as a pivotal domain within computer science. Initially, Introduction to Artificial Intelligence (AI Introduction) was a core professional course within computer science and technology. However, with the advent of industrialization and informatization, society is transitioning towards an intelligence era. Governments worldwide have introduced policies and national strategies concerning AI [1, 2]. It is foreseeable that AI methodologies will evolve from specialized knowledge to becoming general and indispensable [3-5].

Numerous scholars have delved into the methodologies for teaching AI courses in universities [6-8]. Liu explored the teaching of AI Introduction, delineating course construction regarding textbook selection, teaching content, methods, and assessment [9]. Wang proposed a teaching case design strategy for AI Introduction, emphasizing the integration of research, production, and teaching to enhance teaching efficacy and achieve curriculum-training objectives [10]. Li investigated the training mode for cultivating innovative AI talents by deeply integrating university and enterprise resources [11]. Lin underscored the importance of ideological and political education in AI Introduction, studying reform initiatives based on the Outcome-Based Education (OBE) concept [12].

In response to a new wave of scientific and technological revolution, Hebei University of Economics and Business has undertaken reforms to cultivate new talents in finance and economics. These reforms concentrate on advancing the application of modern information technology and financial education through experimental classes [13, 14]. These classes encompass six domains: artificial intelligence law, financial technology, innovative business administration, digital accounting, intelligent logistics management, and digital economy. All courses within these experimental classes are interconnected with artificial intelligence, as depicted in Figure 1.

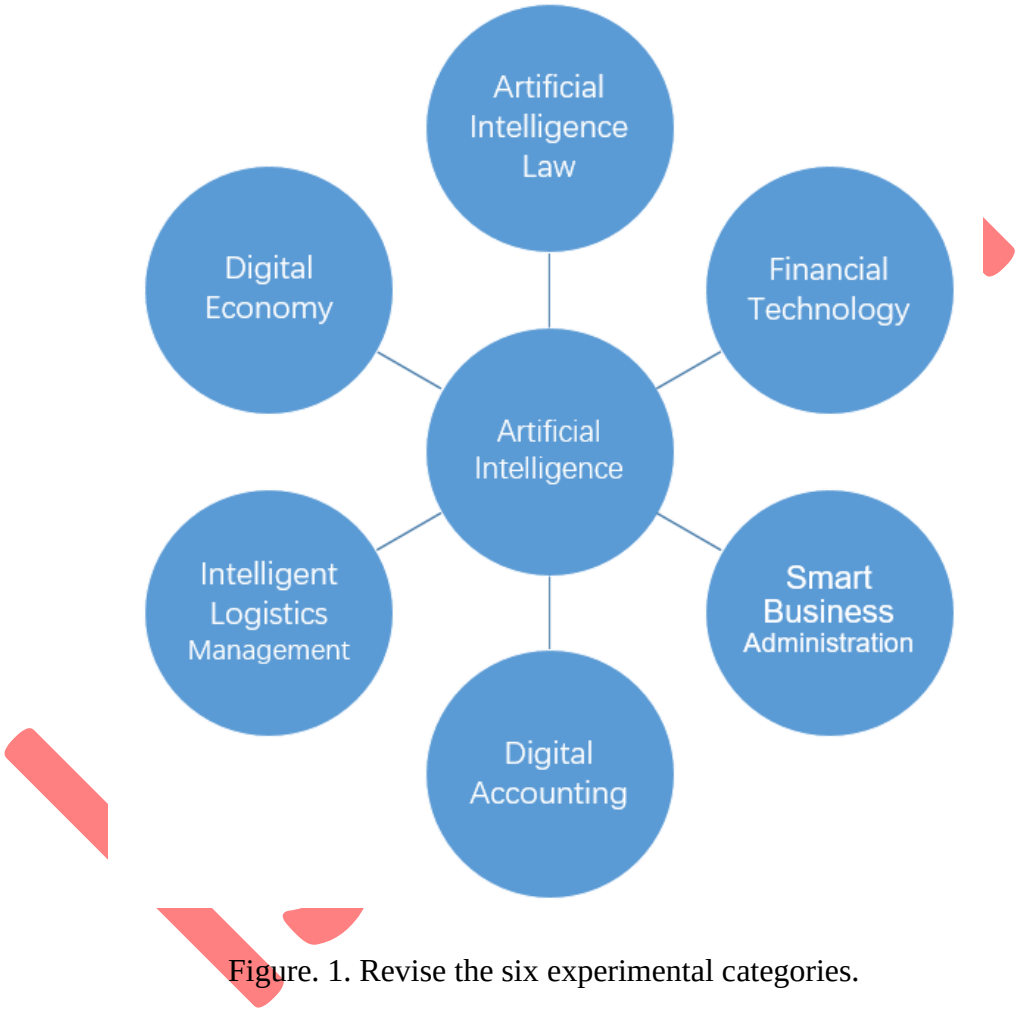

Figure. 1. Revise the six experimental categories.

This paper introduces the teaching reform of AI, which is tailored to the emerging fields of finance and economics. It provides a comprehensive overview of the course's characteristics, direction, objectives, content, instructional methodologies, and a reflection on teaching outcomes. The paper actively explores the implementation of discipline integration and the advancement of emerging finance and economics.

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COURSE CHARACTERISTICS OF INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Introduction to Artificial Intelligence (AI-Introduction) is a guiding course within artificial intelligence, primarily offering an introduction and guidance to the subject matter. The course aims to equip students to understand the developmental trajectory, fundamental concepts, and artificial intelligence methodologies. It also familiarizes students with the current status of development and application requirements of AI technology, fostering their practical application skills in the field and laying a foundation for subsequent learning.

Compared to traditional courses, AI-Introduction possesses several distinctive features:

A. Strong Theoretical Foundation:

The content of artificial intelligence encompasses numerous abstract theories, necessitating support from related disciplines such as discrete mathematics, probability theory, and mathematical statistics. This complexity often instils apprehension among students due to perceived difficulty.

B. Rapid Technological Advancements:

Artificial intelligence is a rapidly evolving field characterized by continuously emerging new technologies. Hence, educators must stay abreast of the latest advancements and maintain a disposition towards continuous learning throughout the teaching process.

C. Wide-ranging Applications:

AI is inherently interdisciplinary, fostering the "cross-border integration" of multiple disciplines, sectors, and industries. Its applications span various domains, influencing advancements in theory and practical implementation, thereby delineating the trajectory and objectives for its ongoing development.

COURSE ORIENTATION AND OBJECTIVES

The aim of AI-Introduction within the context of training new financial talent and reforming experimental classes is to deliver an understandable, interdisciplinary, and broadly guided course. Its objectives include equipping students with an understanding of artificial intelligence's primary methodologies and developmental trends, thus laying a foundation for future interdisciplinary integration and advanced study.

Given artificial intelligence's dynamic nature, characterized by the incessant emergence of new ideas, technologies, and applications, student training should prioritize critical thinking, innovation, technological prowess, and practical skill development. This course gives students a nuanced understanding of artificial intelligence's developmental trajectory and its pivotal role in social and economic advancement. They also acquire fundamental knowledge and skills in AI and practical applications.

AI-Introduction for the new finance and economics serves as a professional elective course within the framework of talent training reform. It significantly enhances the knowledge structure of finance and economics professionals in artificial intelligence technology, thereby contributing to developing intelligent finance and economics talent.

This course primarily introduces general principles and basic problem-solving concepts in artificial intelligence alongside some advanced topics. It furnishes students with essential AI technology knowledge and an introductory understanding of related issues. It serves as a stepping stone for further exploration and research into AI theory and applications.

Aligned with the curriculum system of the new finance and economics experimental class, the orientation and objectives of AI-Introduction can be summarized as follows:

A. Built upon Computer Fundamentals:

AI-Introduction extends and supplements computer foundational knowledge, aiming to impart basic AI concepts and methods.

B. Accessible Science and Methodology:

The course targets liberal arts students, aiming to broaden their knowledge and foster interdisciplinary thinking, minimizing reliance on formulas and code explanations.

C. Essential Support for Subsequent Courses:

It provides crucial knowledge support for subsequent courses like Smart Finance and Smart Law, aligning with the curriculum construction plan of the new financial talent training and reform experimental class.

D. Characteristic Training in "New Finance and Economics":

The course emphasizes the practical application of computers in tasks such as information acquisition, data analysis, and decision-making reporting, reflecting the distinctive features of "new finance and economics" and cultivating practical skills accordingly.

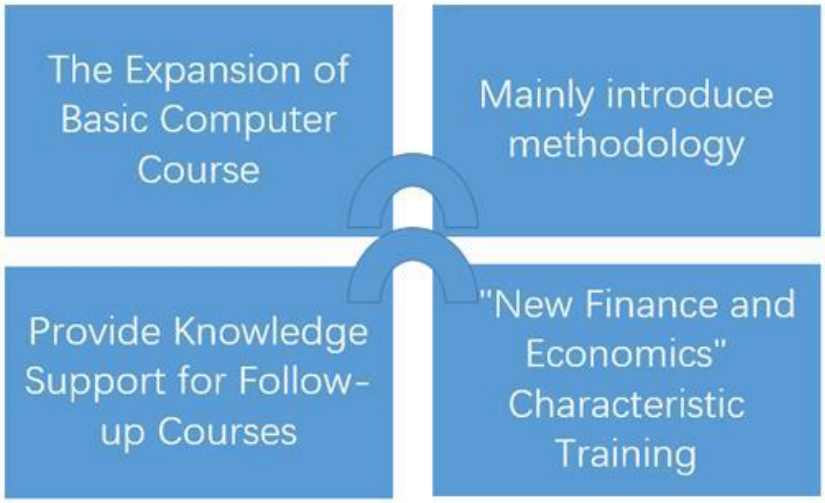

Fig. 2 Refashion the course orientation and objectives.

COURSE CONTENT

Artificial intelligence (AI) has witnessed extensive integration across various scientific and technological disciplines and societal domains. Its technology encompasses knowledge engineering, machine learning, pattern recognition, computer vision, natural language processing, intelligent robotics, neural computing, and other areas. Teaching AI encompasses many subjects, with liberal arts students as the target audience. Given the constraints of limited class hours, striking a balance between breadth and depth is essential in course planning.

When faced with fixed total class hours, prioritizing breadth and depth becomes imperative to meet the student's needs. To manage this, the teaching content is divided into two modules: the basic module and the expansion module. Each module comprises several sub-modules, facilitating process control and management while enhancing teaching quality.

A. Basic Module

The basic module primarily introduces concept representation, knowledge representation, and mapping. Concept representation delves into classical concept theory, mathematical logic, set theory, and modern representation theories. Knowledge representation covers first-order predicate logic, production representation, understanding framework representation, state space representation, and ontology and World Wide Web knowledge representation methods. This module also explores search technology, evolutionary intelligent algorithms, machine learning, and neural networks, covering blind search, heuristic search, game search, basic concepts of evolutionary intelligent algorithms, machine learning definitions, supervised and unsupervised learning algorithms, and neural network fundamentals such as neuron concepts, BP neural

networks, convolutional neural networks, and generative adversarial networks, encapsulating mainstream research methods in artificial intelligence.

B. Expansion Module

This segment provides essential support for subsequent course learning and introduces widely adopted AI technology applications, focusing mainly on financial applications and practical achievements in diverse fields. It presents real-life cases of AI implementation in law, financial technology, innovative business management, digital accounting, intelligent logistics management, and digital economy to enhance students' problem-solving abilities.

Overall, the course targets liberal arts students, aiming to broaden their knowledge and foster interdisciplinary thinking while minimizing the use of formulas and codes. Core concepts are elucidated through simple and relatable examples, such as "game chasing" in search technology and "gender classification" in machine learning. The course also integrates recent advancements in AI methods, making it more engaging and relevant.

TEACHING METHODS

A. Integration of Theoretical Instruction and Practical Application

Artificial intelligence (AI) intersects theory and practice, making a balanced approach essential. Tailored training questions and detailed case descriptions are provided to help students grasp theoretical principles through practical application. Employing heuristic teaching methods alongside multimedia demonstrations enhances engagement and understanding. Each course module uses interactive teaching processes, including posing questions, elucidating theories, explaining methodologies, and demonstrating practical applications, fostering student initiative, enthusiasm, self-study capabilities, hands-on skills, and innovation.

Computer practice sessions reinforce learning and significantly impact teaching efficacy. When designing practical cases, careful consideration is given to aspects such as case selection, content practicality, and topic breakdown. An AI learning group specifically for the new finance experimental class facilitates flexible, stimulating practice opportunities. Students are encouraged to establish their platforms, with teachers providing high-quality resources such as open courses and open-source communities, fostering independent learning across multiple channels.

Task-based learning encourages collaboration, with students partnering to tackle tasks independently, fostering teamwork and practical skill application. By engaging in data collection, design, refinement, and testing processes, students gain practical experience and familiarity with AI methodologies, paving the way for solving real-world problems using intelligent methods.

Incorporating AI knowledge with relevant professional domains enriches the learning experience. Designing case studies tailored to students' majors or enabling them to independently design papers related to their professional backgrounds encourages the practical application of AI concepts within their respective fields.

B. Integration of Online and Offline Teaching

Offline teaching offers direct interaction and immediate problem-solving opportunities but is constrained by time and space limitations. The AI Introduction course, with its expansive content and limited duration, benefits from leveraging online resources to supplement classroom learning. Offline sessions systematically address key concepts, augmented by online resources to boost student participation, inquiry, self-study, and deeper understanding. MOOC platforms like those offered by the University of China and online resources such as Peking University's Artificial Intelligence Practice enrich the learning experience. Utilizing WeChat and QQ groups facilitates real-time communication, resource sharing, homework submission, and query resolution, enhancing learning outcomes.

C. Reconstruction of the Teaching Content System

Tailoring the teaching content to suit students of new finance and economics necessitates a systematic approach. AI's theoretical nature and scattered knowledge points require attention to logical coherence. Chapters are organized logically, beginning with an overview of AI and progressing to knowledge representation, deterministic reasoning, uncertainty reasoning, search technology, evolutionary intelligence, machine learning, and neural networks. Content alignment with future career paths, such as business administration, ensures relevance and applicability. Practical application scenarios and real-world examples deepen understanding and cultivate AI awareness among students.

TEACHING EFFECT AND REFLECTION

Throughout this semester, Introduction to Artificial Intelligence has employed a blend of classroom and practical teaching methods, integrating offline and online instruction, heuristic teaching, case studies, and other approaches. This multifaceted approach aims to deepen students' understanding of common AI algorithms' principles and application scenarios, enhance their awareness of AI knowledge application, and lay the groundwork for future study and professional endeavours.

An evaluation conducted via QQ questionnaires among 76 students enrolled in the Smart Business Class revealed positive outcomes. The majority expressed a heightened understanding of AI algorithm working principles and a proactive inclination towards contemplating data processing

challenges in daily life. Some students even embarked on programming endeavours to address everyday tasks.

Overall, the training has notably bolstered students' awareness of AI principles and applications, significantly improving their comprehension and engagement with artificial intelligence concepts.

CONCLUSION

The advent of the information age has presented universities specializing in finance and economics with new challenges in talent cultivation. Consequently, curriculum development requires timely adaptation. Against emerging finance and economics, the elective course Introduction to Artificial Intelligence, specifically designed for the experimental class of economics and management, has departed from traditional pure theory teaching methods. Leveraging the teaching experiences of the research group members in artificial intelligence, a diverse array of teaching methodologies have been employed and tested in practice, yielding commendable teaching outcomes. This paper has actively explored the integration of disciplines and the advancement of new paradigms in finance and economics.

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