An In-Depth Study on Reformation of the Pedagogical/Teaching Approaches to Artificial Intelligence as Linked to the Current Trends in Finance and Economics

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ABSTRACT

In the era of information technology, universities specializing in finance and economics are encountering novel challenges in talent cultivation, necessitating adjustments in curriculum development. Drawing from the experience of Hebei University of Economics and Business, this paper elucidates the distinctive features, objectives, content, and instructional approaches of the Introduction to Artificial Intelligence course. Furthermore, it assesses the effectiveness of teaching methodologies and reflects on the outcomes. This study actively investigates the integration of disciplines and the advancement of modern finance and economics.

INTRODUCTION

Artificial intelligence (AI) stands as a pivotal field within computer science. Initially, Introduction to Artificial Intelligence (AI Introduction) constituted a core course within computer science and technology. However, with the advent of industrialization and informatization, society is poised to transition into an era of intelligence. This shift is underscored by governments' formulation of AI-related policies and national strategies worldwide. It is foreseeable that AI methodologies will evolve from specialized knowledge to becoming ubiquitous and indispensable.

Numerous scholars have researched practical approaches to teaching AI courses at universities. Liu, for instance, explored the pedagogy of AI Introduction, delineating course development considerations encompassing textbook selection, teaching content, methodologies, and evaluation techniques. Wang advocated for a teaching case design strategy grounded in the integration of research, production, and teaching to enhance instructional efficacy and achieve curriculum objectives. Li delved into the training model for cultivating innovative talents in AI, emphasizing deep integration between universities and enterprises. Lin underscored the ideological and political education imperative within AI Introduction, proposing reforms based on Outcome-Based Education (OBE) principles.

In response to the demands of the new scientific and technological revolution, Hebei University of Economics and Business has embarked on reforms to nurture fresh talents in finance and economics. The focus is on advancing the application of modern information technology and financial education through experimental classes. Six experimental courses have been established: artificial intelligence law, financial technology, innovative business administration, digital accounting, intelligent logistics management, and digital economy. Notably, all courses within these experimental classes are intertwined with artificial intelligence, as illustrated in Figure 1.

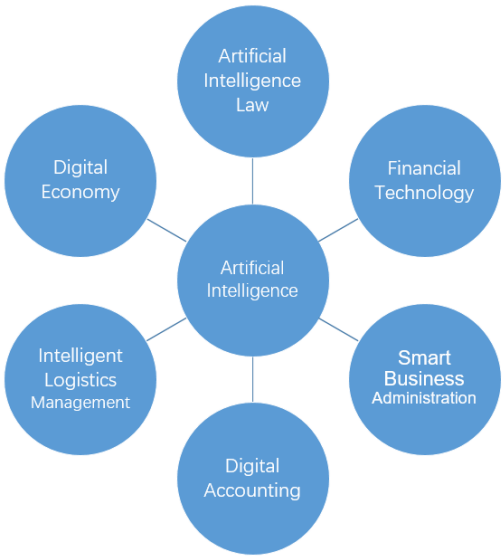

Fig. 1. The six experimental classes

This article presents a teaching reform initiative for AI Introduction tailored to the evolving landscape of finance and economics. It provides a comprehensive overview of the course's distinctive features, orientation, objectives, content, and instructional methodologies, along with an assessment of its teaching efficacy. Moreover, this paper actively investigates the integration of disciplines and the advancement of new paradigms within finance and economics.

CHARACTERISTICS OF INTRODUCTION TO ARTIFICIAL INTELLIGENCE COURSE

Introduction to Artificial Intelligence (AI-Introduction) serves as a foundational course in the realm of artificial intelligence, offering guidance and insight to students. Its primary focus lies in acquainting students with the developmental trajectory, fundamental concepts, and methodologies of artificial intelligence. Additionally, it familiarizes students with the current state of development and application requirements of AI technology while fostering their practical application skills. This course sets a crucial groundwork for subsequent learning endeavors. Compared to traditional courses, AI-Introduction boasts distinctive attributes:

A. Strong Theoretical Foundation:

Artificial intelligence delves into numerous abstract theories, necessitating a grasp of relevant mathematical foundations such as discrete mathematics, probability theory, and mathematical statistics. This theoretical depth often presents a challenge to learners.

B. Rapid Technological Updates:

Being at the forefront of innovation, artificial intelligence witnesses continuous emergence of new technologies, leading to swift advancements. Consequently, educators must stay abreast of the latest developments, maintaining a state of perpetual learning.

C. Wide-ranging Utility:

AI transcends disciplinary boundaries, fostering interdisciplinary development across various fields and industries. Its pervasive application across diverse domains not only propels advancements in AI theory but also delineates its developmental trajectory and objectives.

COURSE ORIENTATION AND OBJECTIVES

AI-Introduction, tailored for the new finance talent training and experimental class reform, aims to deliver an accessible, interdisciplinary, and comprehensive curriculum. Its overarching objectives are to equip students with a solid understanding of basic AI methodologies and developmental trends, thereby laying the groundwork for future interdisciplinary integration and study.

Given the dynamic nature of AI, characterized by incessant innovation, the course advocates for critical thinking, innovation, technical prowess, and practical skill development. Through AI-Introduction, students gain a nuanced

understanding of AI's developmental journey, recognizing its pivotal role in social and economic progress. They acquire essential knowledge and skills in AI, as well as its general applications.

For the new finance and economics talent training reform experimental class, AI-Introduction serves as a specialized elective, augmenting the knowledge structure of finance and economics students in AI technology. This course primarily elucidates general principles, basic problem-solving approaches in AI, and cutting-edge advancements, laying a foundation for further theoretical exploration and practical application.

Summary of Course Orientation and Objectives:

Based on Computer Fundamentals:

AI-Introduction extends and complements foundational computer knowledge, aiming to impart basic AI concepts and methodologies.

Accessible Science and Methodology:

The course targets liberal arts students, emphasizing knowledge expansion and interdisciplinary thinking, minimizing reliance on formulas and code explanations.

Support for Subsequent Courses:

Aligned with the curriculum of the new finance talent training program, AI-Introduction provides essential knowledge support for subsequent courses like Smart Finance and Smart Law.

Distinctive Training in "New Finance and Economics:

Reflecting the ethos of "new finance and economics," the course hones practical skills in utilizing computers for tasks such as information acquisition, data analysis, and decision-making reporting.

COURSE CONTENT

Artificial intelligence (AI) permeates various scientific and technological disciplines and social spheres, encompassing knowledge engineering, machine learning, pattern recognition, computer vision, natural language processing, and intelligent robotics. The teaching content of AI courses spans a wide array of subjects tailored for liberal arts students. Given limited class hours, a strategic division between breadth and depth is necessary. The course content is segmented into two modules:

A. Basic Module:

This Module primarily introduces concept representation, knowledge representation, and knowledge mapping. Concept representation covers classical concept theory, mathematical logic, set theory, and modern representation theories. Knowledge representation delves into first-order predicate logic, production representation, understanding framework representation, state space representation, and ontology and World Wide Web knowledge representations. Additionally, it touches upon search technology, evolutionary intelligent algorithms, machine learning, and neural networks, covering mainstream research methods since AI's inception.

B. Expansion Module:

This segment provides requisite knowledge for subsequent course learning and showcases popular AI applications, particularly in finance, law, financial technology, business management, accounting, logistics, and the digital economy. Real-world cases illustrate AI's practical prowess, enhancing students' problem-solving abilities.

Table I. Teaching Content System

Chapters	Content	Teaching requirements
1	Overview of artificial intelligence	Understand the basic concept, generation and development process of artificial intelligence; Understand the schools and application fields of artificial intelligence research.
2	Knowledge representation	Understand the concept of knowledge representation; Master common knowledge representation methods; Understand the production system structure; Understand the reasoning process under various knowledge representations; Understand the concept of knowledge map.
3	Deterministic reasoning	Understand the definition of propositional formula; Master five kinds of conjunctions: negation, disjunction, conjunction, implication and double conditions; Understand the concepts of replacement and unity; Master the method of transforming the predicate formula into the Schelling normal form, and the definition of clauses and clause sets; Understand natural deductive reasoning; Master the resolution principle of propositional logic and first-order logic, and be able to use the resolution principle to realize automatic theorem proving.
4	Uncertainty reasoning	Understand the concept of uncertainty reasoning; Master CF model, that is, uncertainty reasoning model when knowledge is production expression.
5	Search technology	Understand the concept and category of search, and understand the state space graph search model; Master the blind search strategy: width first search algorithm, depth first algorithm; Master heuristic search strategy and A* search.
6	Evolutionary intelligence and genetic algorithms	Understand the concept of evolutionary algorithm; Understand the biological background of evolutionary algorithms and the design principles of evolutionary algorithms; Understand the core operations of genetic algorithm: coding, fitness function, selection, crossover, and mutation; Master the steps of genetic algorithm, and be able to solve optimization problems with genetic algorithm.
7	Machine learning	Understand the concept and classification of machine learning; Master ID3 algorithm of inductive learning (supervised machine learning); Master the K-means algorithm of cluster analysis (unsupervised machine learning); Learn about the latest machine learning platforms and tools
8	Neural network	Understand the concepts of neurons and neural networks; Master BP neural network and its learning algorithm; Understand the concept of deep learning.

The course targets liberal arts students, emphasizing knowledge expansion and interdisciplinary thinking. Formulaic and code-centric explanations are avoided in favour of simplified, relatable examples. For instance, "game chasing" illustrates search technology, while "gender classification" demonstrates machine learning principles. Incorporating recent research advances in deep learning enhances the course's relevance and accessibility.

TEACHING METHODS

A. Integration of Theory and Practice:

AI's inherent fusion of theory and practice necessitates a teaching approach that blends theoretical concepts with practical applications. Textbook exercises and detailed case studies aid in understanding theoretical principles through practical implementation. Heuristic teaching methods complement multimedia demonstrations, fostering active student participation and cultivating self-study, hands-on, and innovative capabilities. Computer-based exercises reinforce learning and directly influence teaching efficacy.

B. Blend of Online and Offline Teaching:

Combining traditional classroom teaching with online resources enriches the learning experience beyond physical confines. Systematic explanation of key concepts in class, coupled with online resources like MOOC platforms and academic forums, expands students' horizons. Social media platforms like WeChat and QQ groups facilitate real-time interaction, cutting-edge information dissemination, and remote guidance, enhancing students' engagement and understanding.

C. Curriculum Restructuring:

Tailoring the curriculum to suit the needs of finance and economics students involves logical restructuring of AI concepts. Emphasis on knowledge integration and reasoning, mainly through knowledge mapping, aligns with future business administration roles. Following knowledge representation, deterministic and uncertainty reasoning methods and search technology are introduced. Application-oriented examples underscore AI's practical utility, fostering awareness and application proficiency. The teaching content system is meticulously designed to ensure logical coherence and relevance to students' backgrounds and career trajectories.

Considering the students' characteristics and learning situations, the teaching content emphasizes the principles and application scenarios of algorithms. Additionally, there's a focus on integrating algorithms into real-life production and situations. This approach allows students to fully immerse themselves in experiencing how artificial intelligence algorithms are applied in practical settings, enhancing their awareness of AI applications.

CONCLUSION

The advent of the information age has brought forth unique challenges for universities specializing in finance and economics, necessitating adjustments in curriculum construction. In this dynamic landscape, the elective course Introduction to Artificial Intelligence, tailored for the economics and management experimental class, stands out for its departure from pure theoretical instruction. Leveraging the teaching experience of the research group members in AI courses, a diverse range of teaching methodologies has been employed and successfully implemented, yielding positive teaching outcomes. This paper has actively explored strategies for integrating disciplines and advancing the realm of new finance and economics.

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