Analysis on the Ideological and Political Education of Artificial Intelligence Fundamentals in the Professional Major of Unmanned Intelligence

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Abstract. Artificial intelligence fundamentals, as a professional foundation course in the field of unmanned intelligence, has become increasingly important in higher education. How to practice the educational concept of "three in one", especially the construction of ideological and political education, is a topic that needs to be deeply explored. Starting from the needs of ideological and political education in the field of unmanned intelligence, combined with the characteristics of artificial intelligence basic courses and innovative modern educational technologies and teaching methods, this article provides a considerable plan, providing a good reference for the construction of ideological and political education in the course Artificial Intelligence Fundamentals.

Keywords: ideological and political education; artificial intelligence fundamentals; unmanned intelligence major

1   Introduction

Artificial intelligence (AI) utilizes computers to mimic the reasoning, proof, recognition, understanding, design, learning, thinking, planning, and problem-solving activities of the human brain to solve complex problems that require human processing. Research fields are very extensive, including problem solving, natural language understanding, expert systems, machine learning, knowledge representation and inference, neural networks, intelligent robots, knowledge discovery and data mining, etc. Artificial intelligence, as a strategic technology that leads the future, is a globally recognized core driving force for a new round of technological revolution and industrial innovation, and its development level has become one of the key influencing factors of national competitiveness. In 2021, UNESCO released the "Artificial Intelligence and Education: A Guide for Policy Makers"[1-2]. Elaborate on the key definition, future development direction, opportunities, risks, and impact on teaching of artificial intelligence, aiming to remind policy makers in various countries to prepare for the arrival of the era of artificial intelligence. Obviously, as a new discipline field, artificial intelligence still

lacks effective theoretical support and practical experience for governments, schools, and teachers in defining and designing artificial intelligence courses.

Key universities both domestically and internationally attach great importance to the teaching and research of this course, and many have their own independent artificial intelligence research institutes or professional teaching organization teams[3]. Chinese universities generally consider it as a compulsory course for undergraduate and master's students in information majors such as computer science and automation, as well as an elective course for doctoral students. In 2020, the Ministry of Education issued the "Guidelines for the Ideological and Political Construction of Curriculum in Higher Education Institutions", which clearly stated that the ideological and political construction of curriculum is an important task to comprehensively improve the quality of talent cultivation, indicating the direction for the ideological and political construction of professional courses. Our school has a history of offering courses related to artificial intelligence for over 20 years, gradually forming a series of intelligent courses with intelligent unmanned systems as the main theme[4]. It is even more necessary to combine the guidance outline for ideological and political construction to provide good scientific literacy and spiritual nourishment for the cultivation of future information technology talents, especially for the cultivation of unmanned intelligence professionals.

2 Basic Situation of Curriculum Construction

2.1 Knowledge Matrix

As shown in Table 1, the knowledge module matrix of   Artificial Intelligence Fundamentals logically clarifies the logic and knowledge matrix relationship of the course[5].

2.2 Ideological and Political Education construction needs

Through the organic integration of knowledge teaching and ideological and political elements, the quality and efficiency of the curriculum can be improved. The course " Artificial Intelligence Fundamentals" includes a large amount of cutting-edge scientific and technological content, presenting characteristics such as rapid interdisciplinary integration, rapid change of knowledge points, multiple key scientific problems faced, and close integration with application scenarios, making the course more difficult. Therefore, the reform of the course "Fundamentals of Artificial Intelligence" needs to strengthen top-level design, clarify target positioning, focus on the direction of education, systematically integrate the connotation of ideological and political education into the course design and implementation, so that ideological and political knowledge and professional knowledge can go hand in hand, and promote the improvement and efficiency of the course.

Table 1. Course logic and knowledge matrix

Main modules	Logical description of module	Knowledge Matrix

Development history of AI	Standing on the shoulder of Giants	Main genres and critical stages
Machine learning	Multidisciplinary interdisciplinary approach	Inductive learning, interpretive learning, analogical learning, reinforcement learning, statistical learning, etc
Classification clustering	Basic methods of data analysis	Bayesian classification and K-means clustering
Deep learning	Opening the gate of the intelligent era	Artificial neural network, Hebb learning algorithm, error correction algorithm, random learning algorithm
Convolutional neural network	Starting from computer vision	CNN, reinforcement learning, transfer learning, ant colony algorithm, etc
Recurrent neural network	Natural language processing technology	Language processing, word vectors, variants of recurrent neural networks
search problem	Seeking and finding answers	Universal graph search strategy, heuristic graph search A algorithm, best graph search A * algorithm, etc
Knowledge Representation	Storing the great world into a computer	Proposition logic, predicate logic, production systems, semantic networks, framework representation
logical reasoning	How to read Sherlock Holmes	Deterministic reasoning, predicate formulas, deductive reasoning, resolution principles

In the "trinity" of talent cultivation goals of value shaping, knowledge imparting, and ability cultivation, the ideological and political education course of "Artificial Intelligence Fundamentals" must be based on solving the fundamental problems of who to cultivate, how to cultivate people, and for whom to cultivate people. For the course "Fundamentals of Artificial Intelligence", it is necessary to deepen students' understanding and mastery of artificial intelligence knowledge through ideological and political reforms, cultivate students' critical thinking and innovative abilities, enhance students' unmanned intelligence literacy and mission spirit, and cultivate a group of high-quality new unmanned intelligence technology talents for the country.

Explore the connotation of the subject and explore the characteristic ideological and political teaching mode of artificial intelligence. With the rapid development of artificial intelligence technology, it has not only made human life more convenient and improved social welfare, but also posed various challenges to society, impacting traditional human values and ethical concepts, resulting in many problems such as big data fraud, personal information leakage, and unprotected privacy. Conducting in-depth discussions on these cutting-edge hot topics can help cultivate students' critical thinking ability and shape their correct worldview, outlook on life, and values. By exploring legal, ethical, and social issues related to artificial intelligence, a distinctive ideological and political teaching model for the field of artificial intelligence has been formed, providing reference for relevant curriculum reform.

3   Reflections on the Ideological and Political Construction of the Basic Course of Artificial Intelligence in Our School

Aiming at the needs of future intelligent technology, we aim to cultivate high-quality unmanned intelligence talents. Based on the characteristics of artificial intelligence courses and the cognitive abilities of the teaching objects, we attempt various teaching methods and means such as online and offline hybrid teaching, heuristic teaching, case teaching, flipped classroom, etc., and organically integrate mission oriented education, critical spirit, and innovative consciousness into the knowledge system of the course "Fundamentals of Artificial Intelligence" Ideological and political elements such as thinking training and artificial intelligence ethics are used to achieve a "nourishing and silent" educational effect, and to improve students' cognitive level and thinking state towards artificial intelligence.

3.1   Science and Philosophy

Science is a systematic and theoretical knowledge system that reflects objective facts and laws. Science is the knowledge system formed by discovering, exploring, and studying the objective laws of the movement of things. As a historical category, science is manifested in various images such as knowledge, methods, productivity, and social structure in its historical development. Science is a national undertaking, a professional department in society, an emerging social industry, and has become a national strategic industry. With the international exchange and collaborative research of science, science has become an international undertaking.

Science is not just a matter for scientists, but it is always related to them, and science is closely related to philosophy. Philosophy is the study of love for wisdom, expressing a state of human existence, a true state of existence that faces reality and opens up the mind. Wisdom is a state of consciousness, reflection, questioning, criticism, questioning, and tracing back to life, the world, and the universe. Philosophy begins when we suddenly realize how many things we don't know and how deep we don't know when we look at the world around us; The result is a 'awe inspiring sense of ignorance', where we are driven to seek answers by constantly observing the world, carefully thinking, and asking the right questions. If philosophy is understood as the pursuit of knowledge in the most universal and extensive forms, then obviously, philosophy can be regarded as the mother of all scientific research

Our school offers philosophy of science and technology courses for all undergraduate students to help them better understand science, scientific research behavior, and norms of scientific research behavior.

3.2   Invisible Ideology and Politics

Exploring the spirit of research, patriotism, responsibility, ideals and beliefs behind knowledge, and other ideological and political elements, seamlessly connecting ideological and political content with professional knowledge, achieving the goal of value

guidance while imparting knowledge. In the knowledge explanation and case setting, relevant content such as current politics and party history is naturally integrated, feeling the feelings of family and country, and subtly shaping students' character. From the Dartmouth Conference, which marked the birth of artificial intelligence, to Lenovo's First National Congress of the Communist Party of China, a group of young people seemed like an inconspicuous meeting, opening up a new field and inspiring students' entrepreneurial spirit. Taking the historical facts of the Long March of the Red Army as an example, this study explores the computer representation and reasoning of knowledge related to the Long March. While learning knowledge representation methods, it enables students to feel the greatness of the Long March spirit and inspires them to learn technology well and build a beautiful motherland.

3.3   Fully utilize black technology to solve technical problems

Project practice is an important way to cultivate innovative talents and is of great significance for achieving the training goals of courses such as "Fundamentals of Artificial Intelligence". In order to ensure that students have a certain practical ability through course learning, domestic independent research and development platforms such as EduCoder, University of Science and Technology Feixun, and Baidu AI Studio are introduced to carry out course project practice. Both teachers and students can register for free accounts on the platform, allowing teachers to independently create practical projects and utilize existing resources on the platform to create their own classrooms[6]. By joining the classroom created by the teacher, students can complete various projects within the course in a challenging manner under the guidance of the teacher. Through project practice, students can experience a sense of achievement in using their own technology to solve practical problems, stimulate their enthusiasm for scientific research, and enhance their ideological and political qualities. Mature educational technologies, such as ISW and FDW, also provide technical and instrumental guarantees for curriculum ideological and political education.

4   A BOPPPS Example of Course Ideological and Political Education - Perceptron

4.1   Case name

The linear unseparable (XOR) problem of single layer perceptron.

4.2   Bridge-In:

Minsky and Papert, one of the founders of artificial intelligence, conducted in-depth mathematical research on the functions and limitations of network systems represented by perceptrons. In 1969, they published a sensational book called "Perceptrons", pointing out that the functions of simple linear perceptrons are limited and cannot solve the classification problem of two types of linearly inseparable samples, For example, a

simple linear perceptron cannot achieve the logical relationship of XOR. This statement dealt a heavy blow to the research on artificial neural networks at that time, marking a 10-year low point in the history of neural network development.

4.3   Pre-test

Perceptors are neural networks that simulate human vision, receive environmental information, and transmit information through neural impulses. A simple single-layer perceptron indeed cannot solve simple XOR functions similar to those in Turing machines. But the use of perceptrons can be multi-layer, and linear indivisible problems can be decomposed. Is the 10-year low tide period of neural networks solely due to linear indivisibility problems?

4.4   Participatory learning:

The single-layer perceptron is somewhat similar to the previously learned classifier, as shown in Fig.1. When the input is input, it is weighted and summed, taking into account the neuron threshold. When the net input result is greater than or equal to 0, it is taken as 1, and when it is less than 0, it is taken as -1. Using a straight line with a net input of 0 as the dividing line, the samples are divided into two categories, so essentially, the perceptron is a linear classification model.
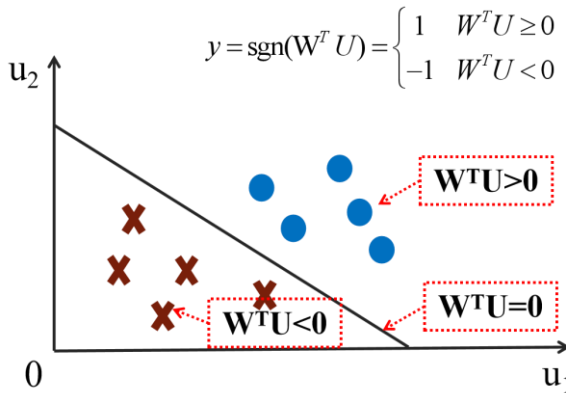
$$y = \text{sgn}(W^T U) = \begin{cases} 1 & W^T U \geq 0 \\ -1 & W^T U < 0 \end{cases}$$

Fig. 1. Perceptron linear classification model

1. The Network Structure of Single Layer Perceptron

A single-layer processing unit that maps n-dimensional input to m-dimensional output. There will be multiple perceptrons in the single-layer processing unit. The red part corresponds to neurons, while the white part represents inputs and does not represent neurons. In artificial neurons, inputs are also considered as one layer, but it does not perform any operations or processing on the data. The neurons are integrated and thresholded, and output is performed using transfer functions.

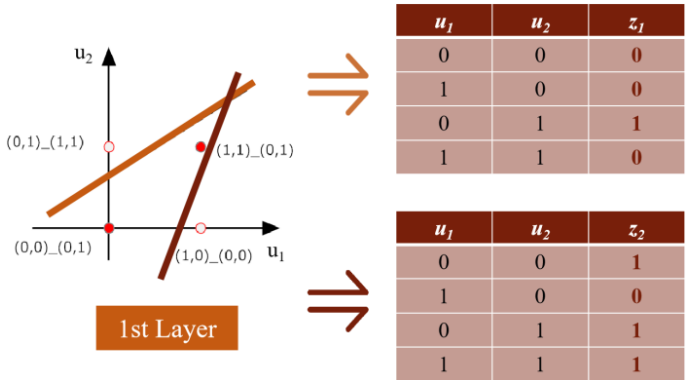## 2. The Solution to the Linear Unseparable (XOR) Problem

Fig. 2. Multi layer perceptron input space

u_1	u_2	z_1
0	0	0
1	0	0
0	1	1
1	1	0

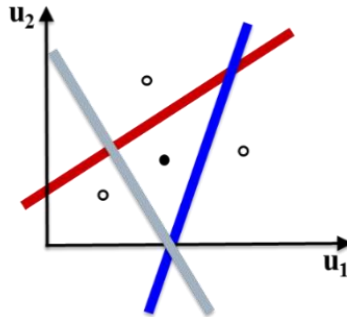| u_1	u_2	z_2
0	0	1
1	0	0
0	1	1
1	1	1

Fig. 3. Multiple lines form   convex domains

In the first layer, two perceptrons are used, as shown in Fig.2. In this way, we can use another perceptron to partition, which becomes a dual processing layer perceptron, as shown in Fig.3. When the input is a two-dimensional vector, each node in the hidden layer determines a boundary line, and multiple lines can form convex domains of various shapes. The two types of linearly indivisible samples are divided into intra domain and extra domain. The output node is responsible for classifying two types of samples within and outside the domain.

If an additional hidden layer is added, each node of the layer determines a convex domain, and various convex domains can form an arbitrarily shaped domain after being combined with output layer nodes. The classification ability of double hidden layers is greatly improved compared to single hidden layers. The more complex the classification problem, the more jagged the layout of samples of different categories in the sample space, and therefore the more neural nodes are required for the hidden layer. There is strict mathematical proof that dual hidden layer perceptrons are sufficient to solve any complex classification problem.

4.5   Post-test

What was the root cause of the low tide period of neural networks from the 1970s to the 1980s?

At that time, the computing power of computers was insufficient to support large-scale neural networks.

4.6   Summary

Is scientific research pursuing hot topics or persevering?

We should have an inclusive attitude towards failures, defects, and deficiencies in the innovation process. What other relevant cases are there? The importance of basic research is to prioritize theory and implement engineering before proceeding!

5   Conclusion

The exploration of ideological and political construction will implement the reform of ideological and political education in the course of "Artificial Intelligence Fundamentals" among undergraduate students majoring in fourteen majors[7-9], including unmanned system engineering, navigation engineering, mechanical engineering, measurement and control and instruments, and space science and technology, with an expected number of beneficiaries exceeding 380 in a single academic year. Integrating the reform results into the construction of online courses, it is expected that the number of beneficiaries in a single academic year will exceed 2000.

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