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Artificial Intelligence Convergence Education Programs Incorporating Humanities Elements

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ABSTRACT

Artificial intelligence (AI) is advancing rapidly due to the confluence of numerous areas and study. Among these, the confluence of AI and humanities has attracted academic interest. As a result, this study presents the findings of constructing AI Convergence education programs that incorporate humanities aspects. The first of the instructional programs described in this work uses Unhaeduchangjipyo, an old Korean historical book, to educate the system of experts, one of the uses of AI. The document's concept is similar to the modern expert system because Unhaeduchangjipyo exemplified how to cope with infectious diseases. This program was developed for middle school students and deals with how to analyze problems with infectious diseases, design medical-related expert systems, and develop expert systems through programming. The second educational program incorporates popular paintings of Monet's, and a fairy tale, Goldilocks and the Three Bears. The drawings make supervised learning easy for students to understand. Furthermore, Goldilocks, who has become an image of just the perfect condition with no scarcity or extra cash, is an example of an acceptable dataset for overfitting and underfitting. This application was created for primary school kids and covers the many forms of machine learning, understanding overfitting and underfitting, and playing a game based on the principles of overfitting and underfitting. With this research, we want to present the effects on AI humanism and AI converging education.

KEYWORDS

AI Humanities, AI Convergence, AI Education, Machine Learning

INTRODUCTION

Artificial intelligence (AI) has established itself as a key technology for societal transformation, combining with other technologies to spark the fourth industrial age. The fourth industrial revolution is driving technical innovation in businesses and society by hyperconnecting people and things, as well as time and geography. AI, which has been termed the most disruptive invention of all time, will usher in a world unlike any other. The rise of artificial intelligence and the Internet ushered in the era of superintelligence (Brunette et al., 2009). The analog and digital worlds, the virtual and physical worlds, goods and services, and humans, as well as machines, are all merging. AI encompasses technology, software, and computing devices that employ machines and computers to simulate human intellect (Glikson et al., 2020). As a result, knowing the humanities, which increase human understanding, is essential for developing, using, and advancing artificial intelligence.

As AI continues to transform numerous industries, resulting in major social changes, merging its technological features with humanistic knowledge becomes increasingly vital. This confluence enables people to understand the moral, cultural, and philosophical effects of these achievements. By combining AI and the humanities, a broader approach to AI is established, guaranteeing that advances are in line with cultural and social demands. Humanities literacy, combined with AI abilities, is essential for negotiating the complexities of the extraordinary intelligence era, allowing humanity to interact with AI more deliberately and ethically.

Although AI is merging with numerous fields, the combination of AI and humanities draws interest from a variety of fields. To avoid becoming an ineffective human in the age of destructive and inventive AI, it is vital to grasp AI and be humanities-literate. As a consequence, this study provided the findings from the development of a course of study that blends AI and humanities. The programs suggested in this work seek to improve knowledge

of AI through humanistic reasoning.

BACKGROUND

AI in Education: A Shift Towards Interdisciplinarity

The evolution of multidisciplinary education, especially concerning AI, is not new. Several investigations (e.g., Luckin, 2018; Russell, 2019) emphasize the need to broaden AI education beyond technical competencies. Traditionally, AI courses have concentrated on machine learning, data analysis, and algorithmic development and growth, but there is a rising emphasis on combining these abilities with analytical skills, ethical reasoning, and cultural awareness. The merger of arts and AI is a natural occurrence that cannot be ignored. The humanities, a subject that investigates human ideas and culture, and the scientific and social sciences mostly utilize methods of observation, but with an analytical and logical mindset. AI is a field that began with the ambition to make robots appear like people. Looking at AI from the humanities perspective serves as an essential foundation for using AI as a technology that benefits humanity. Therefore, in the AI humanities, it is crucial to analyze how AI technology affects human culture when it is with humans and how to cope with the influence. AI humanities is an interdisciplinary study with AI as the content and the humanities as the method (Kim et al., 2019). It can be seen as a study that defines human activities and values in the AI era. AI formed by machine learning and deep learning encompasses speech and image recognition, natural language recognition, robotics, and expert systems (Deloitte, 2018). While the humanities collectively refer to subjects related to human beings, such as literature, history, art, music, philosophy, Et cetera. Looking at AI from the humanities perspective serves as an essential foundation for using AI as a technology that benefits humanity.

AI Convergence in Education

Convergence is the process of combining two or more aspects to generate a coherent notion. Convergence in education refers to the act of developing shared conceptions for a specific goal and addressing difficulties together. In education, convergence refers to the establishment of shared conceptions for a given aim and the collaborative problem-solving process. AI convergence may be perceived in two ways. One is the confluence of numerous disciplines focused on AI. It is a method of education that considers AI principles and concepts to be essential curriculum while also introducing concepts such as math and morality. Ali et al. (2019) suggested an AI teaching model based on constructivism, morals, and creativity for pupils in primary and secondary schools. They created a robotic toolset for children's AI education, AI + Ethics instruction on data bias, and educational games using AI robots (Ali et al., 2019). Another example is educating by incorporating the notion of AI into numerous topics. They created a robotic toolset for children's AI education, AI + Ethics instruction on data bias, and educational games using AI robots (Ali et al., 2019). Another example is educating by incorporating the notion of AI into numerous topics. They created a robotic toolset for children's AI education, AI + Ethics instruction on data bias, and educational games using AI robots (Ali et al., 2019). When instructors of various disciplines have gained a basic understanding of AI, they incorporate the notion of AI into the topic of their area of instruction and educate it from a fresh viewpoint. Lee et al. (2021) created a program for primary science instructors that teaches machine learning ideas. Convergence education focused on AI can be achieved by collaboration between instructors of other courses and AI-specialized professors. In this study, AI convergence education is defined as a type of education that combines humanities expertise with an AI focus.

2.3. Challenges in Integrating AI and Humanities

Despite the benefits of merging AI and humanities, there are significant hurdles in developing convergence education programs. Studies have found a disparity between the skill sets necessary for AI and those associated with the humanities. A 2021 World Economic Forum (WEF) research highlighted the need for curriculum improvements that allow students to learn technical abilities as well as soft abilities, such as analytical thinking and making ethical choices, to negotiate the complexity of artificial intelligence. Bryson (2020) identified one difficulty as a lack of transdisciplinary preparation for instructors. Many AI professors have no training in the humanities, while humanities academics sometimes lack the technical skills required to teach AI-related subjects. This mismatch might cause impediments to the successful execution of convergence education.

4. Successful Models of AI-Humanities Integration

Despite these obstacles, certain projects and organizations have effectively combined AI and humanities. Stanford University's Human-Centered AI Institute, for example, stresses ethical AI research and includes humanities-based courses in its AI programs (Etchemendy & Li, 2021). Similarly, MIT's Media Lab promotes AI-humanities collaboration by concentrating on the convergence of technology, art, and culture. Furthermore, numerous institutions in Europe have developed multidisciplinary programs that teach AI and data science alongside the study of ethics and philosophy. These programs seek to produce graduates with diverse backgrounds who can manage AI's technological and societal ramifications, answering the rising demand for such skills in fields ranging

from health to politics (Mittelstadt & Floridi, 2016).

1. Strategies to Adopt Historical Documents into IT Humanities Concepts in Education

Overview of Procedures

To increase understanding of technological principles combining humanities, we developed artificial intelligence and humanities programs based on To increase the understanding of technological principles combining humanities, we developed artificial intelligence and humanities programs based on the hyper-blended practical model (Choi & Park, 2021; 2022). The approach allows teachers to deliver their lessons regarding on-time technology issues in online and/or offline settings. Herein in this section as one of those programs, we suggested the artificial intelligence and humanities program focused on expert systems. It included three modules "Analyzing the problem of infectious diseases through Unhaeduchangjipyo," "Designing an expert system for medical counseling on the diseases," and "Creating the expert system by programming." Unhaeduchangjipyo is a historical document written by Heo, Jun (1546-1615), who served as a physician during the reign of King Seonjo of the Joseon Dynasty in Korea; he also published momentous books regarding traditional Korean medicine such as natural herbal remedies that were easily attainable by residents. Since Unhaeduchangjipyo illustrated how non-medical experts should cope with variola epidemics, we exploited the historical content connected to producing a programmed system to support those who wonder about infectious diseases and need expert advice. The program comprised the four modules with embedded learning activities described below (see Table 1).

Table 1: Scope and Sequence of the Artificial Intelligence and Humanities Program for middle school students

Module	Topic	Main tasks and activities
1	Analyzing the problem of infectious diseases through Unhaeduchangjipyo	•To figure out the problematic situation of an epidemic from the historical text of Unhaeduchangjipyo •To understand the principle of expert systems •To analyze the problem of infectious diseases
2	Designing an expert system for medical counseling on the diseases	•To make a process modeling to attack a problem •To produce rules of inference •To explore tools to make artificial expert systems
3	Creating the expert system by programming	•To create a medical counseling program using the principle of expert systems •To share the learner outcomes of expert systems •To find practical examples of expert systems in the medical field
Note. Time is assigned approximately 1 to 2 hours per module excludes participants' self-directed learning time.		

Specific Examples of the Activities using the Historical Documents

The activities in the developed program focused on the understanding of the process of expert systems using Unhaeduchangjipyo as storytelling materials, reference data to analyze, or resources for knowledge base in an expert system (Fig. 1).

	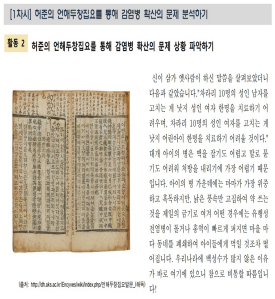	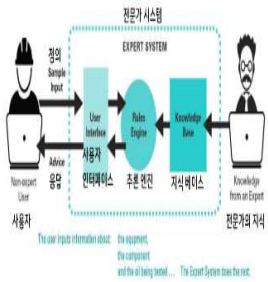
Storytelling	Reference data	Resource for knowledge base in an expert system
Participants can figure out problems in variola epidemics from the story of Heo, Jun.	Participants can read and analyze the physician's note from the historical text of Unhaeduchangjipyo.	Participants can create a medical counselling expert system based on the knowledge and inference.

Fig. 1: Examples of the teaching materials for IT humanities using the historical document

Previous research has shown that using historical materials in the instruction of scientific and technical subjects can help students understand complex ideas more successfully (Kim, 2016; Janica, 2020). Because every culture contains indigenous knowledge derived from people who have long lived and engaged with the mutually surrounding nature, traditional knowledge helps learners acquire learning based on contextual data (Lee & Shin, 2017). Furthermore, the tendency of convergence across diverse domains that were previously thought to be difficult to absorb was used in the instructional activities depicted in Figure 1. When an educator prepares integrated lessons utilizing history, selecting suitable historical resources and content that fosters student engagement and capabilities can play an important part in achieving effective lesson outcomes (Kim 2016).

2. Strategies to Adopt Paintings and Fairy Tales into IT Humanities Concept in Education

Overview of Procedures

In this section, we suggested the artificial intelligence and humanities program focused on overfitting and underfitting. The three modules for the program are "Learning about the types of machine learning," "Exploring the concept of overfitting and underfitting," and "Playing with the principle of overfitting and underfitting." The main learning topics of the program include artificial intelligence, machine learning, supervised learning, unsupervised learning, underfitting, and overfitting (see Table 2).

Table 2: Scope and Sequence of the Artificial Intelligence and Humanities Program for elementary school students

Module	Topic	Main tasks and activities
1	Learning about the types of machine learning	•To understand the Meaning of Artificial Intelligence •To Learn the concept of machine learning •To Explore supervised learning in machine learning •To Explore unsupervised learning in machine learning
2	Exploring the concept of overfitting and underfitting	•To guess the learning topic from the fairy tale "Goldilocks and Three Bears" •To learn about the concept and cause of underfitting •To learn about the concept and cause of overfitting
3	Playing with the principle of overfitting and underfitting	•To review the concepts and causes of overfitting and underfitting •To play by applying the principle of overfitting and underfitting

Specific Examples of the Activities using Notable Paintings and Fairy Tale

The three types of machine learning are supervised, unsupervised, and reinforcement. Module 1 focuses on comparing the differences between supervised and unsupervised learning. As fruits are familiar with young learners, we provided various fruit pictures as training data for artificial intelligence. Learners try to derive the essential features of certain fruit by looking at different pictures. For example, various apples have common

features of being spherical, red, and hollow at the top with a stem. This corresponds to the result of machine learning about apple labels in supervised learning. Then we show Monet's still life to the learners, who are also well-known to elementary learners.

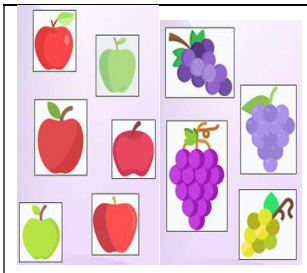	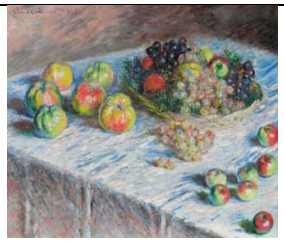	
Examples of training data	Apples and Grapes (Claude Monet, 1840)	Baskets of Apples (Claude Monet, 1880)
Participants should discover common features from training data with given lables.	**Participants observe famous Artist's paintings to think about output data in previous supervised learning models. They realize how AI distinguish input data.**	

Fig. 2: Examples of the teaching materials for IT humanities using the paintings

Meanwhile, the overfitting and underfitting are frequent problems situations that can occur during the AI machine learning process. Underfitting is a case where machine learning must be done more sufficiently to improve model accuracy. On the other hand, overfitting shows very high accuracy against training data, but the accuracy is significantly lowered with test data. This phenomenon is similar to the story plot of "Goldilocks and Three Bears" in that machine learning should not be excessive or insufficient. Accordingly, AI education combined with the humanities element of traditional fairy tales was conceived.

Emerging Trends in AI-Humanities Convergence

With AI's growing influence on numerous parts of society, the convergence of AI and the humanities is expanding in length and technique. As AI systems become more complex, the importance of incorporating principles of ethics, social accountability, and cultural understanding into AI instruction has grown. Recent research underlines the importance of integrating analytical humanities abilities such as historical understanding, cultural analysis, and moral reasoning into the AI curriculum. One developing topic in AI convergence instruction involves the incorporation of ethics by design into AI systems. This method seeks to create artificial intelligence and algorithmic systems that include moral decision-making as a core component. For example, bias in AI decisions has come under increasing criticism. Floridi (2020) and Mittelstadt & Floridi (2016) stress the necessity of recognizing historical and cultural biases and applying that knowledge to construct more equitable AI systems. This intersection of AI and the humanities is setting new norms for AI development, with ethical thinking becoming a fundamental component of technological design. Furthermore, AI and humanities education are now promoting cross-cultural competencies. Global organizations such as UNESCO and educational institutions throughout the world are launching programs that integrate AI technical abilities with historical knowledge and cultural sensitivity. These programs enable students to face a variety of global difficulties while utilizing AI technology that adheres to local conventions and standards. For example, AI algorithms are being used to document, evaluate, and maintain cultural practices to better understand indigenous knowledge systems.

Addressing Societal Challenges through AI-Humanities Convergence

Another important area where AI integration education is growing is in solving global social issues such as global warming, healthcare inequalities, and socioeconomic disparities. AI systems are becoming more prevalent to address these essential concerns, but without a thorough grasp of the social context, technology risks aggravating already existing problems. For example, in the context of global warming, AI systems may scan enormous datasets to forecast ecological shifts, but without taking into account the social and historical implications of these changes, the remedies provided may be unjust. Students may better understand the long-term social consequences of AI-driven environmental choices by including historical case studies and ethical considerations in their AI curriculum. This method teaches students not just to solve issues, but to do it in a socially responsible and sustainable way. In healthcare, AI technologies are changing diagnosis, but they also raise serious ethical concerns about privacy, permission, and accessibility. Programs like Etchemendy & Li (2021) at Stanford University's

Human-Centered AI Institute highlight patient rights, ethical considerations in data collection, and the equitable distribution of healthcare technologies by incorporating humanities-based conversations on the social implications of AI in healthcare. These transdisciplinary programs guarantee that AI-powered healthcare solutions are both creative and democratic.

Pedagogical Approaches to AI-Humanities Integration

The effectiveness of AI-humanities convergence education is primarily determined by the pedagogical approaches utilized. According to research, practical learning, collaboratively solving problems, and multidisciplinary team projects are very successful methods of presenting AI-humanities information. In particular, problem-based learning (PBL) has become known as a powerful pedagogical method for AI-humanities converging education. PBL challenges students to solve real-world issues using both AI approaches and humanities views. Students, for example, may be charged with developing an artificial intelligence system to alleviate urban inequality. To address this issue, students need to understand not just AI algorithms, but also the historical and social aspects that contribute to the urban gap. This strategy exposes students to the actual application of both AI and humanities abilities, encouraging analytical thinking and creativity.

Another interesting method is to include stories in AI-humanities teaching. Storytelling enables students to relate technical AI principles with human experiences, allowing them to better understand how AI technologies affect society. In the previously stated AI-humanities initiative, the incorporation of historical records and fairy tales helped in an improved understanding of complicated AI principles such as expert systems and machine learning. This narrative method may be used for other AI issues, such as autonomous decision-making or AI in governance, making them more understandable to students.

The Role of Teachers and Interdisciplinary Collaboration

Teachers play an important role in providing AI-humanities convergence education. However, one of the most significant problems with establishing such programs is a lack of multidisciplinary training for instructors. Many instructors concentrate on either AI or the arts, but not both. This poses a substantial challenge to successful teaching in AI-humanities converging education. To meet this challenge, teacher education programs must be redesigned to provide educators with both technical as well as humanistic expertise. Intercollegiate cooperation between AI scientists and humanities teachers is essential for creating courses that provide students with an understanding of AI's social ramifications. In reality, this could involve collaborations between university departments, with AI specialists collaborating with scholars of history, ethicists, and social scientists to create instructional resources and teaching methodologies. Institutions like as MIT's Media Lab and Stanford's Human-Centered AI Institute have successfully adopted multidisciplinary faculty cooperation, resulting in the development of unique programs that address both the technological and humanistic sides of artificial intelligence. Expanding similar collaborative models to additional educational institutions can assist to close the present skills gap when offering AI-humanities convergence courses.

Future Directions and Recommendations:

As AI continues to transform society, the combination of AI and humanities in education will become increasingly important. Future AI-humanities convergence initiatives should emphasize the following essential areas:

1. **Curriculum Development:** Education systems require a more adaptable, multidisciplinary curriculum that enables students to master AI technology while also acquiring important humanities-based abilities like moral reasoning, historical evaluation, and cultural understanding.
2. **Technological Access:** Ensuring equal access to AI technology and resources for all students, regardless of socioeconomic position, is essential for promoting inclusive learning. Programs must prioritize bridging the digital gap and making artificial intelligence accessible to marginalized populations.
3. **Ethical AI Development:** As AI technologies advance, educational programs must stress the value of ethical AI development. This involves teaching students how to spot and minimize biases in AI systems, as well as supporting ethical AI use for the benefit of mankind.
4. **Global Collaboration:** The AI-humanities convergence effort should go beyond national boundaries and encompass global viewpoints. Students will develop a better knowledge of the worldwide effects of AI technology by considering cross-cultural and international perspectives.
5. **Lifelong Learning:** Finally, AI humanities training should be available to students of all ages, not just those in official schools. Creating possibilities for lifelong learning through online courses, workshops, and seminars

can assist society as a whole stay up with AI's fast advances.

4. CONCLUSION

To cultivate competent people with the capabilities necessary for the upcoming future society, artificial intelligence education and convergence education are areas where interest and research are increasing in the educational field. Therefore, we developed artificial intelligence convergence education programs that integrated humanities elements. We introduced a historical document, Unhaeduchangjipyo, for the teaching-learning expert system. Artistic and literary materials, Monet's paintings and "Goldilocks and Three Bears", are used to explain types of machine learning, overfitting, and underfitting. We hope that research on effective artificial intelligence convergence education will be activated so that various learners can easily and interestingly learn about AI.

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