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The Development Status of Artificial Intelligence Generated Content

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Abstract

Artificial Intelligence Generated Content (AIGC) technology is developing rapidly, demonstrating immense application potential across multiple fields. While the inception times differ between domestic and international developments, with international starting earlier, domestic (China's) development pace has been more rapid, achieving localized applications. The integration of AIGC with the education sector is a prominent application scenario. Educational applications focus on three main directions: personalized learning, intelligent assessment, and teaching innovation. In the future, AIGC will continue to evolve in the directions of multimodal fusion and human-machine collaboration, bringing new opportunities to education and other fields.

Keywords

AIGC; AIGC educational applications.

1. Introduction

Amidst the wave of rapid development in artificial intelligence technology, Artificial Intelligence Generated Content (AIGC), as a disruptive technological paradigm, is profoundly reconstructing the underlying logic of content production and knowledge dissemination. In recent years, global AIGC technology has experienced explosive evolution: from the proposal of GANs in 2014 laying the foundation for generative models, to the Transformer architecture driving a qualitative leap in text generation, and further to multimodal technology enabling cross-media content creation. Technological maturity continues to rise. In China, driven by both policy support and industrial practice, AIGC has been implemented in fields such as film production (e.g., *The Wandering Earth II*), media innovation, and government auditing, accelerating the process of localization.

2. International Research Progress and Educational Applications

2.1. Development of AIGC Internationally

The development of AIGC can be roughly divided into four stages: the embryonic stage (1950-2007), the steady advancement stage (2007-2014), the rapid development stage (2014-2022), and the intelligent creation stage (2022-present). The rapid development of AIGC can be traced back to 2014 when scholars such as Ian Goodfellow proposed Generative Adversarial Networks (GANs). The core idea of GANs is to generate realistic content through the adversarial training of two networks: a Generator and a Discriminator. The generator attempts to create content similar to real data, while the discriminator tries to distinguish between generated content and real content. Through this adversarial learning, the generator gradually learns to produce high-quality content. The proposal of this model not only caused a significant sensation in the field of image generation but also provided new ideas for generating other types of content (such as audio and video). The success of GANs moved AIGC from concept to application and established it as an important research direction within AI.

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Following the proposal of GANs, other technologies in the generative model field also developed rapidly, including Variational Autoencoders (VAEs) and Autoregressive models. Particularly, the Transformer architecture within autoregressive models demonstrated powerful generative capabilities in language generation tasks. The GPT series (Generative Pre-trained Transformer) developed by OpenAI is a key representative of autoregressive models. It enhances generative capabilities through extensive pre-training on textual data. Since its initial release in 2018, the GPT series has progressively upgraded to larger-scale models, with GPT-3 standing as the most representative milestone.

Concurrent with advances in text generation were breakthroughs in image generation. GANs, as crucial tools in image generation, have been widely used to generate realistic faces, landscapes, artworks, etc. Research institutions like DeepMind and Google Brain introduced more advanced generative models such as BigGAN and StyleGAN, enabling AI-generated images to achieve astonishing levels of realism.

Beyond text and image generation, AIGC rapidly expanded into audio and video generation. For instance, WaveNet, developed by DeepMind, can mimic the natural fluency of human speech and generate music in various styles by modulating audio features. Video generation research is more complex as it involves not only image generation but also temporal consistency. The combination of GANs and Transformer models is beginning to show potential in this domain, making the generation of realistic dynamic videos possible.

Today, AIGC is widely applied across numerous fields, including education, entertainment, art, business, and scientific research. As model scales continue to increase and the quality of generated content improves, the potential and influence of AIGC are expected to expand further in the future.

2.2. Applications of AIGC in Education

The shift from "mass" education to "personalized" learning is one of the key trends in the digital transformation of education. Friedland G et al. point out that the introduction of artificial intelligence technology significantly promotes the development of personalized learning. By analyzing vast amounts of learning process data, including learners' styles, knowledge levels, and cognitive abilities, AI can tailor learning content for each student, driving the deepening of personalized learning. Research indicates that applying AIGC to education can significantly enhance the effectiveness of personalized learning. AIGC can not only provide customized answers and learning suggestions based on student needs but also assist teachers in offering timely feedback, stimulating student interest, and guiding them to actively explore new knowledge.

According to Bloom's taxonomy of educational objectives, skills in the cognitive domain can be divided into different levels, ranging from lower-order skills (such as remembering and understanding) to higher-order skills (such as applying, analyzing, evaluating, and creating). Research shows that traditional educational models often overemphasize the cultivation of lower-order skills, particularly memorization. However, with the advent of AIGC, AI has surpassed human capabilities in the breadth and depth of knowledge recall, prompting educational institutions to increasingly focus on the development of higher-order cognitive skills. This shift not only changes teaching priorities but also provides stronger support for cultivating students' critical thinking, problem-solving abilities, and creativity.

AIGC demonstrates significant advantages in promoting the cultivation of higher-order cognitive skills. Research shows that AIGC can create highly personalized and immersive learning environments, such as simulated experiments and virtual reality scenarios, enabling students to deeply understand and practically apply knowledge within these environments, thereby fostering innovative awareness and creative abilities. Furthermore, AIGC can generate complex problem scenarios that require students to analyze and solve them, thereby enhancing

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their ability to handle complex problems. This ability is crucial for students to address diverse real-world challenges. Simultaneously, AIGC can provide students with collaborative tools and platforms, facilitating communication and teamwork among them, which plays an important role in cultivating critical thinking and enhancing collaborative problem-solving. Huang et al. investigated the practical application of Artificial Intelligence Generated Content (AIGC) in the field of design thinking pedagogy, examining its potential impact on enhancing students' Higher-Order Thinking Skills (HOTS). The results indicate that AIGC can effectively improve students' self-efficacy and demonstrates unique advantages among student groups of different ability levels.

In educational assessment, AIGC technology also shows significant transformative potential. Compared to traditional assessment methods, AIGC-supported educational assessment can provide more detailed information, helping educators better understand students' learning processes and reshape teaching and learning through personalized assessment. Butzler points out that AIGC-supported learning assessment can visualize students' thought processes and problem-solving steps, evaluating higher-order skills such as critical thinking, problem-solving ability, and reflective reasoning. Ravindar et al. believe that AIGC can also provide instant assessment and feedback, enabling students to promptly understand their performance during the learning process, including acquired knowledge and skills as well as areas needing improvement. Through this timely feedback, students can reflect on their learning processes, accumulate effective learning experiences, and adjust their learning strategies accordingly. Kumar's research found that AIGC-empowered learning assessment can monitor students' learning status anytime and anywhere, providing personalized assessment suggestions for each student. Based on this personalized feedback, students can adjust their learning plans and behaviors for more efficient and targeted learning. It is evident that this dynamic, data-driven assessment approach not only enhances the flexibility and precision of assessment but also enables education to genuinely achieve comprehensive attention and support for individual learning needs.

3. Development of AIGC Domestically (in China)

3.1. Development of AIGC in China

AIGC (Artificial Intelligence Generated Content) technology started later in China but has risen rapidly under national policy support and the impetus of technology companies, gradually achieving localized applications. In recent years, with continuous advancements in AI technology, China has made significant progress in the field of AIGC, with its application scope covering multiple industries including education, media, entertainment, and healthcare.

Liu Jin discussed the specific application of AIGC technology in national auditing in their research, including intelligent support in audit planning, audit implementation, audit reporting, and rectification. By constructing an audit knowledge base and introducing a model of "open-source large language model + Retrieval-Augmented Generation (RAG)" technology, the audit process underwent intelligent transformation, reducing development costs and improving the quality of professional content generation, providing an innovative path for the intelligent upgrade of national auditing. He Yang pointed out that AIGC technology, through advanced technologies like deep learning, has achieved deep integration in fields such as film, news, television, and variety shows, offering new opportunities for content production and innovation in broadcasting and television. He believes that the introduction of AIGC not only improves the efficiency of content generation but also expands the innovation space for traditional media, providing technical support for the digital transformation of broadcasting and television. In the film industry, AIGC has also played an important role. Li Moxuan and Yue Dawei, through a case study of the film *The Wandering Earth II*, explored the application of

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AIGC technology in scriptwriting, character design, special effects synthesis, etc. The widespread use of AIGC significantly improved the efficiency of film production and advanced the industrialization process of Chinese cinema. The study notes that although there is still a gap between the Chinese film industry and top-tier Hollywood production levels, AIGC technology provides China with the potential to "overtake on bends," promoting the creation of high-quality films. Liu Jiaqi explored the application of AIGC technology in digital media design and production in their research, analyzing advances in deep learning and computer vision. The results show that AIGC technology can effectively improve the efficiency of video generation, reduce costs, and expand creative space. This technology not only provides digital media creators with a more diverse creative experience but also brings more possibilities and opportunities for future digital content production. Scholars like Duan Hui, based on information ecology theory, found that immersive experience, self-efficacy, and community influence significantly promote the continuous usage behavior of users on AIGC application platforms, and suggested enhancing user experience, model comprehensibility, and platform social attributes to promote platform development.

In summary, the localized development of AIGC technology in China has made significant progress, demonstrating broad application potential across multiple industries. These applications not only enhance production efficiency but also provide new momentum for future innovation and development. With continuous technological advancement, AIGC will have a profound impact in more fields, driving the comprehensive upgrade of China's digital economy and content creation sectors.

3.2. Applications of AIGC in Education in China

In recent years, the application of AIGC (Artificial Intelligence Generated Content) technology in China's education sector has risen rapidly. Wang Huang pointed out that as AIGC technology achieves major breakthroughs in fields such as text generation, programming, and image creation, educational technology has consequently been profoundly impacted. AIGC not only provides teachers with multi-dimensional teaching support, aiding them in lesson preparation and teaching evaluation, but also enhances students' professional skills and supports adaptive learning. Wang Youmei et al. believe that the widespread application of AIGC tools like ChatGPT has propelled education from universal to personalized but also brought a series of challenges such as algorithmic bias, data privacy, and ethical issues. To address these risks, the study proposes a risk-based regulatory framework to ensure the safety and rationality of AIGC in educational applications. This governance framework can address the ethical risks of AIGC in algorithms, data, technology, and applications, thereby providing reliable technical safeguards for educational use.

In practical teaching applications, AIGC is being used to innovate various teaching models. Fang Haiguang et al. designed learning prompt sheets suitable for primary and secondary school classrooms through educational prompt engineering, thereby helping teachers and students better use large models to solve practical problems. The research shows that educational prompt engineering can guide teachers and students in the reasonable application of large model technology, improving students' critical thinking and problem-solving abilities. Ning Weiran's research further indicates that the application of AIGC in film and television education also demonstrates its potential, especially in practical teaching. AIGC helps improve the efficiency of film and television creation and production while also presenting new challenges related to technological integration.

The popularization of AIGC technology has also promoted the development of vocational education, particularly in higher vocational colleges. AIGC provides new pathways for students' skill training and employability enhancement. Liu Yu et al. analyzed changes in the labor market in the AIGC era and proposed multi-dimensional paths for higher vocational students to

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enhance their employability through classroom learning, school-enterprise cooperation, and family education. This AIGC-based vocational education model not only helps students improve their professional skills but also enhances their comprehensive literacy to adapt to the complex future job market.

Furthermore, Su Tao's research combines AIGC with digital twin technology to explore the possibilities of personalized teaching paths and content generation. In the field of intelligent manufacturing, the digital twin teaching method can use AIGC to generate personalized learning paths, helping students better understand the working principles and operational processes of production lines, thereby enhancing their practical operational skills.

4. Summary and Outlook

In both domestic and international research, AIGC is currently in a stage of high development. Scholars across various fields are actively researching its applications. Its application in the education sector is becoming increasingly widespread. In the near future, more seamless integration is expected, propelling educational work towards a more.

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