

GIS Talent Training Paradigm in the Era of Spatial Intelligence: Reconstruction of Education System Driven by Generative AI

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Abstract: The fourth industrial revolution with generative AI as the core driving force is reshaping the ecology of geographic information science education. Aiming at the development trend of AI technology and its far-reaching influence on the field of GIS, this paper systematically discusses the reconstruction path of GIS education and talent training system in the era of spatial intelligence. The research points out that traditional GIS education faces challenges such as lagging course content, insufficient intelligence of practice platform and single evaluation mechanism, while generative AI technology further aggravates the demand for interdisciplinary talents by enabling data processing, model construction and decision support. To this end, this paper proposes a 'knowledge-ability-quality' trinity training framework, emphasizing the iteration of knowledge system, the strengthening of AI tool application ability and the improvement of scientific aesthetic literacy, and constructs specific implementation paths from the dimensions of progressive teaching reform, AI technology integration practice, production and education collaborative education. The research results aim to provide theoretical support for the innovation of GIS education in colleges and universities, help the education chain, talent chain and industrial chain to connect deeply, and promote the high-quality development of GIS in the era of spatial intelligence.

Keywords: AI Era; General Big Model; GIS Education; Talent Training; Reconstruction

1. Introduction

The great changes unseen in a century, the fourth industrial revolution, and the AI era, all of these hot words confirm that we are at a very important time in the history of human development. From the breakthrough and

development of AI technology, the broadening of application fields, the active investment and entrepreneurial activities in the industry, the policy support and promotion of various countries, landmark events and products, market growth and prediction, etc., it is enough to show that the AI era has come, and AI is profoundly affecting and changing our world. Among them, the breakthrough of generative AI technology such as big language model and diffusion model not only promotes the intelligent transformation of traditional industries, but also poses a subversive challenge to the field of education.

As an interdisciplinary subject integrating spatial analysis, data science and engineering technology, geographic information science [1] faces profound changes in its education system and talent training mode in the era of spatial intelligence. On the one hand, generative AI technology is reconstructing the technical path of GIS data processing, model construction and decision support. On the other hand, the industry's demand for GIS talents with AI literacy, interdisciplinary ability and innovative thinking has increased dramatically, while the traditional education model has lagged behind in curriculum design, practice platform and evaluation system.

In this context, this study focuses on the reconstruction of GIS education system driven by generative AI, aiming to explore how to cultivate compound talents to meet the needs of the era of spatial intelligence through technological empowerment and paradigm innovation. The research results will provide theoretical support for the education reform of GIS specialty in colleges and universities, provide reference for talent reserve and technological innovation in the industry, and help to realize the deep connection between education chain, talent

chain and industrial chain.

2. Status and Challenges

2.1 Current Status of GIS Education

The popularization and development of artificial intelligence technology is driving changes in the field of education [2]. The advent of the AI era has provided more possibilities for GIS education, but most colleges and universities still have the following problems:

(1) The traditional course content is out of touch with the technology frontier, which is mainly manifested in the lack of generative AI related courses, the lack of the latest technology teaching content such as 3D modeling, and the traditional principles and algorithms.

(2) The intelligent level of the practical teaching platform is insufficient, such as outdated experimental equipment, lack of AI training hardware, and emerging technologies such as digital twins and meta-universe have not yet been integrated into teaching practice.

(3) There are limitations in the evaluation mechanism, such as the lack of evaluation of AI tool development ability, interdisciplinary collaboration ability, and the lack of tracking of AI literacy, innovative thinking and other long-term development capabilities.

2.2 The Challenges of AI

In the field of AI-enabled GIS, first of all, in terms of technology integration, GIS is combining with artificial intelligence technology to achieve more intelligent data processing and analysis. AI GIS has been widely used in remote sensing data analysis, water resources research, spatial epidemiology and environmental health [3]. Secondly, in the application of deep learning, the introduction of deep learning technology has brought revolutionary changes to GIS. Thirdly, through deep learning algorithms, GIS can process complex geospatial data, extract useful features, and predict future trends. Fourth, in terms of data sharing and openness, with the trend of data sharing and openness becoming more and more obvious, GIS can access more geospatial data and resources. Fifth, in terms of three-dimensional spatial data representation, GIS has realized spatial data representation from two-dimensional to three-dimensional. Sixth, in terms of automatic processing and analysis, GIS has realized the automatic processing and analysis of remote sensing images and

geographic data. Seventh, in terms of real-time monitoring and dynamic updating, GIS has realized real-time monitoring and dynamic updating of geographic data.

In short, the development of artificial intelligence in the field of GIS is deepening and expanding. Through technology integration, deep learning applications, data sharing and openness, GIS is becoming more intelligent, efficient and convenient. GIS education should keep up with the development of technology to cultivate talents more in line with the needs of society.

3. Reconstruction of GIS Education and Talent Training System in AI Era

3.1 The Reconstruction of Talent Training Content of Knowledge, Ability and Quality

3.1.1 About imparting knowledge

Some people say that in the era of rapid development and even instrumentalization of AI, the learning and imparting of knowledge is no longer important. The author believes that knowledge in the AI era will be more important. Because when AI shows 'reappearance' of knowledge far beyond human beings so that people can't recognize and evaluate the output of AI, the consequences are unimaginable. Therefore, the knowledge reserve must be strengthened, and the key lies in how to reconstruct the knowledge system in the AI era [4].

3.1.2 About ability training

It is foreseeable that the reappearance of AI will inevitably bring about the reconstruction of ability training, especially the ability to use AI tools to solve specific problems.

3.1.3 About quality cultivation

Moral education is an important part of the education system. Under the background of the great changes that have not been seen in a century and the fourth industrial revolution, traditional quality education cannot be weakened but can only be strengthened. In addition, the content reconstruction of quality education should be inevitable. The author believes that it should be increased in the following aspects:

(1) Increase the teaching content in AI general education and AI experiments. The goal is to solve the understanding and understanding of AI and achieve better

coordination between AI and people.

(2) Add the teaching content of science and technology aesthetics. When AI outputs task results, we must have the ability to identify, evaluate, and appreciate the results.

3.2 Reconstruction of the System of Teaching and Learning

3.2.1 On the reconstruction of teaching

Under the background of AI + GIS era, it is very important to improve the level of teacher team construction. Teachers in the AI era should deal with the opportunities and challenges brought by keen discovery and strengthen their own learning [5]. In addition, teachers should strengthen their own learning, be able to skillfully use various AI tools, apply them to teaching, and carry out teaching and research activities.

3.2.2 On the reconstruction of learning

It should start in two ways. The first is the reconstruction of time in and out of class. For example, before the integration of AI technology, a course has 50 hours in class. When it has certain AI technical support, it can be adjusted to 30 hours in class. The other 20 hours are carried out after class through AI tools in the form of tasks. Secondly, it is necessary to reconstruct the teaching content and curriculum objectives, and extracurricular tasks also need to be carefully designed and scientifically assessed.

4. The Practical Path and Method of GIS Education and Talent Training in AI Era

4.1 Progressive Education and Teaching Reform Under the Background of AI+GIS

Taking the technical iteration of the AI big model as an example, it will be upgraded and updated about every 3 months. Therefore, in the face of rapid changes, the reconstruction of AI + GIS talent training should be a gradual process from top-level design to practice.

4.1.1 Make top-level design

From the perspective of decision-making and managers, we should do a good job in short-term planning and design based on the perspective of rapid development of AI + GIS, and gradually promote system construction such as team building, resource construction, and target assessment performance [6]. For teachers engaged in teaching work, in addition to changing concepts and actively applying AI technology, they should think about how to use

AI technology to mobilize students' learning consciousness in specific courses, identify the starting point of AI, and strive to break through the point [7]. For example, using AI to reform teaching design, synchronous teaching of generative large model, generating code, carrying out task teaching and so on.

4.1.2 Make full use of the magical effect of AI to stimulate students' enthusiasm for learning

The literary function of AI is the most mature technology at present. Using the functions of text-to-text and text-to-graph of the generative model, in the aspects of learning demonstration, data retrieval, knowledge point learning, logical map, and auxiliary writing papers, if used properly, it will greatly mobilize and stimulate students' interest in learning and curiosity. At present, 'Wen Xin Yi Yan', 'Dou Bao', 'Tong Yi Qian Wen', 'Hun Yuan' and so on can achieve the above goals. For example, interesting experiments such as AI-assisted extraction of remote sensing image patches are designed.

4.2 Promote AI + GIS Innovation to Achieve High-Quality Development through the Integration of Industry and Education and Collaborative Education

4.2.1 Cultivate high-quality AI + GIS compound talents based on demand

Taking the training of undergraduate applied GIS talents as an example, by deepening the cooperation between schools and enterprises, keeping up with the latest application of AI development, grasping the specific needs and pain points of employing enterprises [8], timely adjusting the goal of talent training, and cultivating the talents urgently needed by enterprises. If we have enough AI tools, we can train communication skills in a human-computer interactive way or complete some virtual GIS tasks with the help of AR-integrated AI system teams. We can also use the general large model to assist in writing GIS plug-ins or complete some GIS tasks on open-source models such as Transformer.

4.2.2 To cultivate GIS + AI talents oriented by industrial demand

Under the drive of enterprise scientific research, the scientific research ability and AI technology specialty of university teachers are brought into play to provide

strong support for enterprise scientific research innovation. This kind of problem is a good way for the cultivation of research talents or high-level universities such as master 's or doctoral students.

4.2.3 Create new quality productivity with AI + GIS technology of integration of production and education

Education should not only provide students with a solid theoretical foundation, but also cultivate students' practical skills and innovative thinking. The integration of industry and education has become one of the key paths to solve this problem [9,10]. We can use AI technology to improve the quality and efficiency of products or technical services from training, parameter adjustment, improvement and optimization of application methods for big models in enterprise applications, to working closely with enterprises to jointly develop end-to-side AI application systems based on enterprise scenario applications.

In a word, through the school-enterprise cooperation of industry-university-research and the cooperation mode of AI+GIS, it will surely benefit both production and learning, and provide a strong driving force for the cultivation and development of new productivity.

5. Conclusion

This study systematically reveals the urgency and feasibility of the reconstruction of GIS education system in the AI era. The research shows that the breakthrough of generative AI technology is profoundly changing the technical path and talent demand structure of GIS discipline, while the traditional education model lags behind in curriculum design, practice platform and evaluation mechanism. By constructing a three-in-one training framework of "knowledge-ability-quality", this paper puts forward the reconstruction path of AI technology-enabled curriculum innovation, practice platform upgrading and evaluation system optimization, and explores the collaborative education mode of progressive education reform and industry-education integration, which provides a solution to the problem of disconnection between education chain and industrial chain. The research results can not only provide theoretical support for the reform of GIS professional education in colleges and universities, but also point out

the direction for the industry to cultivate compound talents with AI literacy, interdisciplinary ability and innovative thinking. In the future, with the deep integration of technologies such as meta-universe and digital twin, GIS education needs to be continuously iteratively upgraded to meet the dynamic needs of the era of spatial intelligence and promote the deep connection and coordinated development of education chain, talent chain and industrial chain.

References

- [1] Zheng Guizhou, Hu Chuli, Guan Qingfeng, et al. Construction and practice of synergistic system for cultivating innovative talents in geographic information science. *Surveying, Mapping and Spatial Geographic Information*, 2024, 47(12): 6-9.
- [2] Jin Lu, Zhu Xiaoli. Research on the Change and Reshaping of Education by Intelligent Technology in the Age of Artificial Intelligence. *Coastal Enterprise and Technology*, 2024(1): 67-74. DOI:10.20119/ki.CN451227/n.2024.01.009
- [3] Song Guanfu, Lu Hao, Wang Chenliang, et al. A preliminary study of artificial intelligence GIS software technology system. *Journal of Earth Information Science*, 2020, 22(01): 76-87.
- [4] Wu Hao, Jiang Zhimeng, Hong Liang, et al. Evaluation and motivation strategy of innovative civic teaching of industry-academia-research in geographic information science. *Geospatial Information*, 2024, 22(12): 123-127.
- [5] Shuling Mou. Teachers' Breakthrough in the Age of AI: Creating Irreplaceable Educational Intelligence. *Inside and Outside the Classroom (High School Edition)*, 2025, (12): 54-65.
- [6] Xu Shaochun. Changes and constants for managers in the age of AI. *Shandong state capital*, 2025, (03): 97-98.
- [7] LI Ying, Wang Junjie, Zhang Shouzhong, et al. Research on Teaching Reform of GIS Application and Development Series Courses under the Background of New Engineering. *Shanxi Architecture*, 2024, 50(24): 192-195.

- [8] Dai W, Wang B, Qi W, et al. Industry-teaching integration in geographic information science education: comparison of school-enterprise curricula and reform path. *Beijing Surveying and Mapping*, 2025, 39(03): 396-402.
- [9] Cai Zhongliang, Weng Min, Su Shiliang, et al. Exploration of innovative ability cultivation mode of GIS students driven by "geographic literacy and mapping skills". *Bulletin of Surveying and Mapping*, 2020(8): 148-152.
- [10] Liu Xiaopeng, She Lu, He Jie, et al. Construction of Talent Training Mode for GIS Professionals under the Background of Industry-Education Integration. *Geospatial Information*, 2023, 21(6): 120-123.