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Analysis of the Current Situation of Artificial Intelligence Industry Development and the Demand for Applied Talents in Jilin Province

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Abstract: *This paper analyzes the market characteristics and the current demand for applied talents in Jilin Province under the background of artificial intelligence technology. It dissects the relevant policies, platform construction, key technologies of the artificial intelligence industry in Jilin Province in recent years, as well as the existing problems in talent cultivation in universities at present. It also puts forward reasonable suggestions and strategies for the cultivation standards and discipline development of applied talents in Jilin Province. The aim is to create a sustainable development model involving multiple regions, levels and parties for Jilin Province, improve the scientific and technological innovation system and industrial development system of the new generation of artificial intelligence, and provide reference basis for Jilin Province to build an artificial intelligence discipline, cultivate compound and applied talents, and form an artificial intelligence talent highland, so as to solve the current problems of shortage of highly skilled talents and labor shortage in enterprises in Jilin Province.*

Keywords: *Artificial Intelligence, Applied Talents, Cultivation Countermeasures*

1. Introduction

In recent years, China's artificial intelligence has developed rapidly, achieving remarkable results in empowering economic and social development. By 2024, the core industry scale of artificial intelligence in China is expected to exceed 600 billion yuan, with over 4,500 related enterprises. The application rate of generative AI in China ranks first globally. According to the "Global AI Talent Report", by 2030, China aims to become the world's leading center for artificial intelligence innovation. Currently, the proportion of robots in various Chinese enterprises is constantly increasing, and the replacement of human labor by machines is becoming a trend. Meanwhile, the shortage of talents in the field of artificial intelligence has also become the main problem existing at present. It is predicted that the total value of the artificial intelligence market will exceed 127 billion US dollars by 2025. In the next ten years, almost every field will incorporate a certain degree of artificial intelligence. Based on the actual economic development in the past, whether it is the development of emerging industries or the transformation and upgrading of traditional industries, the key lies in talents. The development of emerging technologies is far ahead of the acceptance level of human society, and education precisely shortens the gap between the two, enabling future talents to better adapt to it. Talent cultivation is the most fundamental issue in the development of artificial intelligence and also the most difficult problem to solve. Therefore, higher demands for talent cultivation have also been put forward for colleges and universities.

2. The current development status of the artificial intelligence industry in Jilin Province

In recent years, the artificial intelligence industry in Jilin Province has received increasing attention. It has developed rapidly in terms of policy guidance, the construction of big data centers, and the establishment of artificial intelligence industry platforms, achieving new breakthroughs. In the 2023 work report released by the Changchun Municipal Government, it was proposed to vigorously develop the digital economy in 2023, implement a batch of "four new facilities" such as 5G networks, industrial Internet, and artificial intelligence, complete and put into use the computing power center, digitally transform 400 enterprises, build 500 smart workshops, and introduce leading enterprises such as

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Douyin and 360 Group. The added value of the core industries of the digital economy accounted for 7.8% of the GDP [1]. However, there are still some shortcomings such as a small number of leading enterprises, an incomplete innovation ecosystem for the artificial intelligence industry, and a shortage of talents. These need to be continuously improved from aspects such as further improving policies, accelerating technological innovation, cultivating talents, and speeding up platform construction to promote the healthy development of the artificial intelligence industry in Jilin Province.

3. Challenges and problems Faced by artificial intelligence in Jilin Province

In recent years, the artificial intelligence industry in Jilin Province has developed rapidly under the guidance of policies, platform construction and other aspects, achieving significant breakthroughs. However, there are still problems such as an incomplete industrial system, insufficient talents, and a lack of innovation in key technologies. The main manifestations are as follows.

3.1 Supporting industries are not well developed

Artificial intelligence enterprises such as Huawei, Alibaba and Tencent have obvious advantages and influence in driving their own enterprises in the provinces where they are located. At present, the basic technological accumulation of the artificial intelligence industry in Jilin Province is weak, there is a lack of leading enterprises in the industry, and there is a lack of supporting industrial chains and structural chains. Resources are not rationally utilized, and the resource allocation structure needs to be optimized. There is a problem of "top-heavy" structural imbalance. In terms of scale and diversification, there is a need for improvement. The number of leading enterprises that are deeply rooted in the basic and technological layers is small, and there is a considerable gap compared with some leading enterprises in many technological aspects [2].

3.2 Lack of research on key common technologies

At present, Jilin Province lacks technologies with independent intellectual property rights. The key technologies in the field of artificial intelligence mainly lie in big data and aerospace. There is a lack of deep learning and core algorithms in related technical fields, and the digitalization level is relatively low. The construction of artificial intelligence platforms in Jilin Province lacks common research, and there is a lack of cooperation between universities and enterprises. This has restricted the leading capacity of cutting-edge technologies, scientific research and development capabilities, as well as the core technology research system in artificial intelligence, limited key technological innovation in the field of artificial intelligence and the coordinated development of related industries, and failed to effectively leverage the role of talents and promote the scientific research and development in the field of artificial intelligence.

3.3 Shortage of professional talents

The development of artificial intelligence cannot do without the support of talents. From the perspective of talent cultivation, the development of talent cultivation and discipline construction in universities in Jilin Province in the field of artificial intelligence is relatively backward. Artificial intelligence has a wide coverage, and the resources involved in the fields are relatively scattered, making it difficult to develop in a coordinated manner. It is necessary to improve the quality and quantity of talent cultivation. At present, among the colleges and universities in Jilin Province, the number of schools offering the major of artificial intelligence is not large. There are problems such as a short history and weak discipline, and there is a deficiency in the cultivation of talents. Colleges and universities mainly adopt three models: "adding an artificial intelligence major", "adding an artificial intelligence training direction to existing majors", and "reorganizing existing majors to establish an artificial intelligence college". The lack of leading scientific research talents, the inability to adjust professional Settings, course construction experience, and talent cultivation in a timely manner according to development needs, the difficulty in keeping up with technological frontiers, the shortage of high-quality big data sets, computing power and equipment support, as well as the lack of communication opportunities with the industry, etc.

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4. Countermeasures for Cultivating Artificial Intelligence Talents in Jilin Province

With the rapid development of artificial intelligence, in response to the current problems existing in talent cultivation in colleges and universities, the focus of cultivating artificial intelligence talents in colleges and universities in Jilin Province should revolve around the integration of industry and education between schools and enterprises, the cross-disciplinary integration, and classified talent cultivation, etc. It should also focus on the key technologies and core demands of the artificial intelligence industry chain and innovation chain. Based on the cultivation of applied talents in the artificial intelligence industry in Jilin Province, a course teaching implementation model is formulated, a diversified model for the cultivation of applied undergraduate talents is created, and a sustainable development model involving multiple regions, levels and parties is developed. The structure of the application-oriented talent cultivation model is shown in Figure 1.

4.1 Attach importance to the popularization of artificial intelligence education in the field of higher education

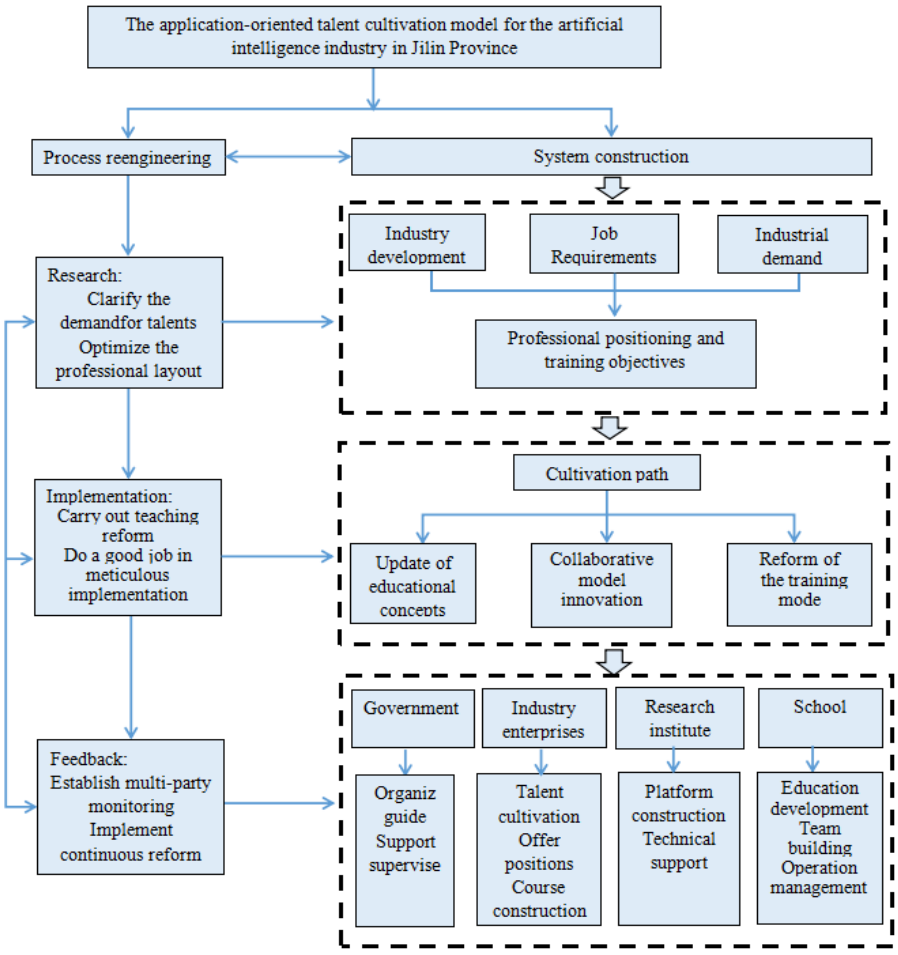

Figure 1: The structure diagram of the application-oriented talent cultivation model for the artificial intelligence industry in Jilin Province

In the field of artificial intelligence recruitment, the requirements for talents are rich experience and high academic qualifications. Among the artificial intelligence positions released in 2024, 42.19% require more than five years of experience. As many as 95.88% of the positions require applicants to have a bachelor's degree or above, among which the proportion of positions requiring a master's or doctoral degree or above reaches 44.17%. At present, Jilin Province still fails to meet the current demands of the artificial intelligence technology field in terms of talent cultivation. There are many problems that need to be urgently addressed in the future, which are manifested in the lack of high-level teaching staff in higher education institutions, overly simplistic curriculum systems, and the need to strengthen discipline construction. In recent years, China has successively issued documents such as

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the "Next Generation Artificial Intelligence Development Plan" and the "Education Informatization 2.0 Action Plan", accelerating the development of artificial intelligence in the field of education and at the same time adding relevant courses on artificial intelligence. However, Jilin Province still needs to further enhance the popularity of artificial intelligence-related courses in higher education institutions, attach importance to the integration of artificial intelligence education and teaching with courses in basic education and vocational education, strengthen the level and quality of artificial intelligence education and teaching as well as theoretical research in higher education, specify the educational development goals, and establish a corresponding quality evaluation system. Promoting practical exploration in education and teaching, through the above-mentioned approaches, the popularization and expansion of artificial intelligence education can be accelerated.

4.2 Strengthen the construction of the first-level discipline of artificial intelligence

Artificial intelligence will promote the generation of disciplines and majors or adjust the layout of traditional disciplines and majors. Artificial intelligence may also replace some disciplines and specialties, and eliminate some traditional industries with new technologies. Artificial intelligence will promote the in-depth integration and development among disciplines. In order to adapt to the new market demands, the direction of talent cultivation in colleges and universities should be adjusted in a timely manner. Actively carry out discipline construction, strengthen the construction of the first-level discipline of artificial intelligence, gradually establish an independent curriculum system, set up an artificial intelligence college, increase the enrollment plan for master's and doctoral students in the field of artificial intelligence, and gradually improve the talent cultivation mechanism for artificial intelligence. This year, Jilin Province has proposed to build more platforms for innovation and entrepreneurship, create a favorable environment for retaining and attracting talents, deepen the series of talent recruitment and introduction activities under the theme of "Start a Business and Strive, Stay in Jilin", and strive to exceed 150,000 college graduates staying in Jilin. Meanwhile, Jilin Province will actively introduce academicians from outside the region to establish academician workstations in enterprises, promote the inclusion of senior technical personnel such as master craftsmen urgently needed by the country in talent management, build the Changchun Talent Innovation Port at a high level, and accelerate the construction of high-energy talent platforms such as the "Future Mainland" Academician Port and the Institute for Training Outstanding Engineers[3].

4.3 Establish a sound system for school-enterprise cooperation

Colleges and universities should actively adapt to the new requirements of the market economy, establish and improve the talent cultivation model of school-enterprise cooperation, clarify the role positioning and responsibilities of all participants, namely the government, industry enterprises and higher education institutions, establish basic systems and operation mechanisms, and some teaching practice work and the revision of talent cultivation plans can be jointly completed by inviting enterprise engineers. While promoting the construction of artificial intelligence disciplines in schools and implementing relevant policies, it is also necessary to actively establish an information exchange mechanism for multi-party communication, increase the participation ratio of enterprises, rationally utilize off-campus resources, enhance the integration degree of artificial intelligence education and enterprises, and enable multiple social resources to jointly improve the educational level. Colleges and universities should encourage more enterprises to participate in the reform of artificial intelligence education. During the process of formulating the teaching content and standards of artificial intelligence courses, universities should invite multiple parties including technology companies, research institutes to participate. They should carry out professional education based on their own positioning and characteristics, accelerate the cooperation between schools and enterprises in artificial intelligence, and promote the coordinated development of industry, academia and research. This cooperative system not only enhances teachers' research capabilities but also provides more employment opportunities for students and strengthens their practical and innovative abilities.

4.4 Strengthen the construction of the talent cultivation system and curriculum system for artificial intelligence

Colleges and universities should establish an online platform for lifelong learning and a multi-level talent cultivation system. We should maintain research on the artificial intelligence education systems of other countries, especially promoting discussions on relevant policies and professional technologies of artificial intelligence with developed countries that have developed rapidly in this field, as well as

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the high-level and high-quality development of artificial intelligence education. We should explore new talent cultivation mechanisms, construct new teaching methods, and build new artificial intelligence curriculum systems. When organizing innovation and entrepreneurship practice activities, colleges and universities should focus on cultivating students' innovative practical abilities, communication and collaboration skills, etc. We should establish a high-level talent cultivation system that meets the current social demands in the field of artificial intelligence, set up an exchange platform for artificial intelligence industry, academia and research, strengthen in-depth cooperation among industry, academia and research, and promote the cultivation of artificial intelligence talents.

4.5 Pay attention to the construction of the laboratory platform for the course syllabus

With the goal of reforming the traditional professional training model in the past and combining the relevant teaching practice experience in the context of artificial intelligence, a distinctive professional training model is constructed. By integrating and sharing educational resources, universities should fully leverage the advantages of artificial intelligence to achieve personalized learning, with a focus on the revision of teaching and practical course syllabuses under the background of artificial intelligence, the construction of a training system for teachers' teaching and research capabilities, the development of laboratory software and hardware platforms, the research on school-enterprise cooperation training models, and the establishment of off-campus internship bases, etc[4], to make them important platforms for students to carry out innovative practices, cultivate students' practical abilities and problem-solving skills, promote students' all-round development, and improve the overall quality of education.

4.6 Strengthen the construction of the teaching team

At present, the main focus of higher education institutions lies in the construction of their disciplines, and they rarely carry out joint cultivation of artificial intelligence talents in the form of educational alliances. In the well-known Mathematical and Data Science Education Community project and enPiT project, the approach is to organize multiple universities to establish various forms such as course sub-associations, school alliances, teaching and research communities, and websites, thereby achieving co-construction of courses, intercommunication of management, co-allocation of teaching staff, and interaction of research and training. It actively explores a talent cultivation model involving multiple regions and universities. Colleges and universities should establish a multi-level and step-based talent cultivation structure, incorporate artificial intelligence popularization education into basic education and vocational education, formulate relevant curriculum standards, build a shared artificial intelligence talent cultivation platform integrating teaching, training and research, introduce senior engineers and top talents to serve as part-time teachers for artificial intelligence courses, and expand and share high-quality educational resources and improve the structure of the existing teaching staff [5]. The system adopts a combination of internal training, external recruitment and part-time work to make the structure of the team's teaching staff more reasonable and build a "dual-qualified and multi-skilled" teaching team with rich practical experience in the artificial intelligence-related industry and multi-disciplinary integration capabilities, enhance the scientific research level of the teaching team, strengthen the connection between team teachers and enterprises, send teachers out for study and exchange, and establish a teaching team that is "sufficient in quantity, reasonable in structure, high in quality, strong in ability and good in professional ethics".

5. Trends and Suggestions for the Development of Artificial Intelligence Industry in Jilin Province

5.1 Development trend

5.1.1 Breakthroughs in reinforcement learning

Reinforcement learning is a crucial branch in the AI technology layer. It enables machines to learn, improve and enhance themselves through experiments. With more powerful algorithms and more efficient computing capabilities, machines will be able to learn and make decisions in more complex environments, thereby achieving more advanced intelligence.

5.1.2 Application of AI in the medical field

In recent years, the application of AI technology in the medical field has achieved significant

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breakthroughs. In the coming years, it is expected that the development of AI in the medical field will be even more rapid. Through big data and cloud computing, AI can play a significant role in medical image analysis, disease diagnosis, and drug development, among other areas. Through artificial intelligence technology, medical services can achieve greater precision and efficiency, enhancing the accuracy and efficiency of diagnosis and treatment. Meanwhile, artificial intelligence technology can also enhance communication and interaction between doctors and patients, improving the medical experience of patients.

5.1.3 Combination of AI and the Internet of Things

The Internet of Things (IoT) refers to a technology that connects various physical devices, sensors, terminals, etc. through a network, thereby enabling information exchange and communication. The Internet of Things enables humans to perceive and control the surrounding environment, enhancing the convenience and efficiency of life and work. The Internet of Things generates a vast amount of data, and artificial intelligence can analyze and process this data, thereby achieving intelligent management and optimization of Internet of Things devices and systems. It is expected that AI will be more closely integrated with the Internet of Things in the future. By applying AI technology to Internet of Things (iot) devices, intelligent perception, autonomous decision-making and automatic control of the devices can be achieved. This will bring about more intelligent applications such as home furnishings, smart cities and intelligent transportation.

5.1.4 Popularization of AI in the field of education

The application of AI in the field of education has begun to emerge, but currently it accounts for a relatively small proportion. It is expected that AI will be more widely popularized in the field of education. With the help of personalized learning platforms and intelligent education systems, AI can formulate personalized teaching methods and learning contents based on the characteristics and needs of different students. This will enhance the quality and effectiveness of education and help students better develop their potential.

5.2 Suggestion

5.2.1 Strengthen the supporting role of higher education institutions in the cultivation of artificial intelligence talents

Each institution should, in light of its own talent cultivation goals and disciplinary strengths, build a curriculum system that matches the development of the artificial intelligence industry. It should also make overall plans for the concentrated research and development of major frontier issues and key core technologies in the field of artificial intelligence by key universities, pool high-quality resources, and focus on cultivating high-level talents serving the development of the industry in a targeted manner. Meanwhile, all institutions should reform the talent evaluation mechanism, promote the modernization of the talent development governance system and governance capacity, provide institutional guarantees for disruptive technological innovation in cultivating senior R&D talents, and also create a favorable academic ecosystem for attracting overseas doctoral students to return to China.

5.2.2 Build a collaborative development system of industry-university-research cooperation driven by high-level artificial intelligence enterprises

First, by enhancing communication among the government, schools and enterprises, especially in response to the talent demands of specialized, refined, distinctive and innovative enterprises with technological advantages in the segmented links of the industrial chain, our province will form a pattern of talent resource flow and sharing that is in line with the coordination of regional innovation chains and industrial chain division of labor. Second, our province should establish a dynamic adjustment mechanism for talent cultivation goals and an interaction mechanism between schools and enterprises as well as teachers. Schools and enterprises should collaborate on course development, construction of practical training bases, alternations of work and study, and entrusted and targeted training, etc., to carry out joint cultivation of talents and technological breakthroughs in key links of the artificial intelligence industry chain. Third, the government should take the lead in collaborating with leading enterprises and advantageous universities to promote the establishment of a national-level artificial intelligence industry-education integration innovation laboratory, and set up branches in universities. This will transform advanced research facilities into talent cultivation platforms and facilitate cooperation among enterprises at all links of the industrial ecosystem, and drive systematic innovation in the artificial intelligence science and education integration and industry-education

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integration education ecosystem.

6. Conclusion

From the current perspective, the cultivation of talents in the field of artificial intelligence in Jilin Province still requires continuous research and exploration by multiple parties including the state, schools, enterprises, research institutions and all sectors of society in terms of curriculum design, teaching methods, top-level design, hardware support and resource cooperation. It is necessary to build educational consensus, break through industry barriers, integrate high-quality educational resources and collaborate with multiple parties. Meanwhile, our province should enhance in-depth exchanges with various countries, provinces and the fields of artificial intelligence. In light of the actual situation in our province, we will gradually improve the scientific and technological innovation system and industrial development system for the new generation of artificial intelligence.

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