The Application Status and Development Prospects of Artificial Intelligence and Industrial Robots in the Manufacturing Industry

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Abstract. China has achieved quite good results in the research and application of information technology and other fields. The continuous advancement of technologies such as AI, 5G communications, and cloud computing have played a key role in the development of intelligence, convenience, and innovation in various industries in China. The application of AI as a technical means in the Internet industry has been relatively mature and has achieved relatively good results. However, AI has not yet achieved satisfactory results in the development and upgrading of the manufacturing industry. As the most critical industry in the real economy, the manufacturing industry has played a decisive role in the sustainable development of China’s real economy. Therefore, it is necessary to promote the deep integration of AI technology and manufacturing and to further advance the process of intelligent manufacturing. Accordingly, this article discusses the application status and development prospects of AI and industrial robots in the manufacturing industry.

Keywords: AI, Industry, Robotics, Manufacturing.

1. Introduction
The penetration and integration of intelligent technology in all walks of life, the concept of intelligent industry development has been deeply rooted in the hearts of the people. The technological innovation and service innovation achieved by AI technology in various industries have promoted the continuous improvement of the status of AI. AI exerts its unique advantages in promoting the China's economy rapid development, improving and improving people's living standards. In order to promote the application and development of AI, cloud computing and other information technologies in the industry, the state has continuously introduced a series of policy guidelines [1]. The The State Council emphasizes the integration of AI and national strategic planning, and encourages and supports the application of AI in all occupations. AI technology is of great significance to the manufacturing industry. It plays a huge leading role in improving the efficiency of the manufacturing and management process, optimizing the industrial structure, and fully realizing the process of intelligent manufacturing [1].
2. The Significance of AI for Manufacturing

2.1 Improve Manufacturing Efficiency and Reduce Labor Density
AI technology has replaced some traditional equipment in the manufacturing process, and the production line equipment. Intelligent robots will also replace the dangerous processing process [2]. Intelligent industrial equipment brings precision and high-efficiency production, as shown in Figure 1. Traditional product manufacturing processes require high requirements for workers’ working skills, work experience, etc., but there is no guarantee that there will be no deviations and errors in the processing process. The loss of raw materials and the wear and tear of equipment are all the manufacturing enterprises need to bear. The investment of intelligent equipment has replaced traditional manual jobs, especially in the face of the pressure of rising labor costs year by year and the problem of China’s aging population. Intelligent industrial equipment reduces the labor density in the manufacturing process [2]. It greatly improves the efficiency of production and is a very effective and necessary choice.

![Figure 1. Smart manufacturing improves productivity](image)

2.2 The Production Shifting from Standardization to Flexibility
Traditional manufacturing products have always paid attention to the standardization and mass production of products, and the quantity and quality of the products are highly valued. However, with the continuous innovation and development of the intelligent age, the differences in consumer demand are getting bigger and bigger, and the standardized production mode is increasingly unable to meet the demands of consumers [3]. The birth of AI technology has played a significant role in mining consumer demand data and characteristic behaviors. At the same time, the unique advantages of AI technology are used to predict and analyze the market prospects of related products, and the analysis results are used as a reference in the production process to effectively realize the control and management of the production plan of the production line, from the product supply chain. AI technology has changed the traditional production model. From the use of AI data analysis algorithms to predict market development trends, it considers the specific arrangements of supply and demand, production, distribution and other links [3]. AI technology is useful for improving and improving the process management of the manufacturing industry.

2.3 Strictly Control Product Quality and Realize Comprehensive Monitoring
The inspection of product quality in the manufacturing industry has always been a key factor in measuring the market competitiveness of manufacturing enterprises. It is difficult for traditional manufacturing enterprises to control product quality. On the one hand, the production process of workers cannot guarantee refinement and standardization; on the other hand, the traditional equipment production process lacks the process of information collection, testing and re-learning. As a result, the
quality of the product becomes difficult to control [4]. In the process of product inspection, AI equipment can not only strictly control the small details of the product that cannot be detected by the naked eye, but also realize the efficiency of product inspection, and give feedback on the quality of batch products in a short time, as shown in the figure. 2. Intelligent equipment can fully cover the entire process of product testing, greatly reducing the rate of defective products in the production process, collecting, analyzing and testing for product problems that have occurred, comprehensive coverage of product quality inspection and subsequent processing, effectively guaranteeing product quality [4]. This advantage of AI can create brand favorability for companies in the market and improve their competitiveness in the industry market.

![Figure 2](image_url)

**Figure 2.** Application of AI in quality control

3. Strategies for the Deep Integration of AI and Manufacturing

3.1 Build An Intelligent Manufacturing Research Base

The development of intelligent manufacturing requires continuous research and development of existing and new technologies, and information collection and analysis according to different product production environments. The actual application scenarios are key issues that need to be resolved in the deep integration of AI and manufacturing [5]. On the one hand, the establishment of a research base for intelligent manufacturing is to lay a certain theoretical and technical foundation for the development of China's intelligent manufacturing; on the other hand, it can be used as an equipment inspection management and control center, as shown in Figure 3. China has achieved very good results in the application of AI technology, but it has not taken the lead in the research and development of new technologies, the research and design of algorithms, and the production and research of core devices. It uses research bases to absorb research scholars in this field and concentrates on manpower

In addition to material costs, the establishment of research bases has played a powerful role in improving the status quo, accelerating the process of China's intelligent manufacturing, and improving the international status of China's manufacturing industry [5]. It also provides a certain degree of technology and talent guarantee.
3.2 Attach Importance to the Training of Interdisciplinary Talents in Related Majors
More and more talents have been attracted by the Internet industry, and there are many talents in the field of AI. The brain drain in the manufacturing sector is a fatal blow to the development of intelligent manufacturing [6]. In view of the current stage, most Chinese manufacturing companies do not have a deep understanding of the concept of AI, and are still at a simple level of understanding and lack the awareness of intelligent transformation. It is precisely because of the weak understanding of AI and the lack of mastery of related technologies by the personnel of manufacturing enterprises that the development of intelligent manufacturing has stagnated [6]. The scarcity of "AI" + "manufacturing" compound talents will not be able to support the integrated development of the two. Both of these fields need to go through a basic and specialized talent training process, and appropriately carry out a smart manufacturing pilot talent training plan in Chinese universities, and build a targeted professional knowledge system based on the results of the pilot development. Revise related courses, professional knowledge, practical technology and other issues.

3.3 Gradually Establish a Manufacturing Big Data-sharing Center
The in-depth integration of AI and manufacturing requires a large amount of manufacturing production data as a basis. In the past, the decentralization and obvious differentiation of data from various manufacturing enterprises have greatly hindered the establishment of manufacturing databases [7]. Establish a manufacturing big data sharing center, and gradually realize data standardization in the manufacturing market through data sharing, and realize automatic collection of information in the entire manufacturing process. Build a data platform for product quality testing in China's manufacturing industry, improve the management mechanism of manufacturing enterprises, create a centralized manufacturing production management, and optimize the market service mechanism of manufacturing enterprises while ensuring product quality [7]. In the process of establishing and using the big data center, it focuses on the supervision of data security, puts data security in the first place, establishes a manufacturing big data security system, and promotes the operation of the data sharing platform.

3.4 Give Full Play to the Advantages of AI Technology
The process of machine recognition and interaction is the focus of application in the process of manufacturing innovation and development. Visual AI technology is used to extract user characteristics, and algorithms are used for analysis and research. Collect and analyze from point to surface, make full use of new technologies such as AI, cloud computing, and machine learning to predict market development prospects to meet the changing needs of the market and determine the market positioning of manufacturing enterprises [8]. Due to the large differences in the equipment
functions, system processing algorithms, information collection content and other aspects required by the manufacturing industry, for the targeted research and development and design of smart devices, the algorithm optimization process is a problem that enterprises need to focus on. For manufacturing enterprises, machine learning is the only way to transform from manufacturing to service manufacturing. Large-scale production urgently requires equipment to collect and detect production information, and it can not only remind but also raise questions when there are problems [9].

4. The Development Prospects of AI

4.1 Human-machine Collaboration
Traditional robots must stay away from humans, and protect fences or other barriers to prevent humans from being harmed. This limits the application effects of industrial robots [10]. Human-machine collaboration combines human cognitive capabilities with the efficiency of robots, so that humans can it is safe and easy to use, which also makes programming easier and reduces the requirements for operators [10].

4.2 Autonomy
The current robots are mainly controlled by operating modes such as pre-programming and teaching and reproduction control. Later, the development of robots gradually develops in the direction of autonomous learning and autonomous operation. Industrial robots can automatically set and control according to the actual working environment and work content [11]. Optimize the trajectory path, perform detection, avoid obstacles and other functions.

5. Conclusion
The arrival of the intelligent era is a vital opportunity for manufacturing enterprises and a greater threat. It is the sustainable development process of China's manufacturing industry to cope with the disruptive changes brought about by the new era and fully integrate with new technologies. The key link in the process that needs to be paid attention to technical level, theoretical research level, and personnel thinking and awareness are all issues that need to be broken through in the integrated development of AI and manufacturing. When facing new technologies, new eras, and new challenges, manufacturing enterprises should strengthen their in-depth understanding and comprehensive application of existing technologies, and continuously use technology to improve product quality, optimize product functions, and provide more efficient products for their fields. Intelligent services to broaden the consumer market.

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