The Economic Impact of AI Technology – Take Claude and GPT-4 As Examples

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Abstract. With the rapid development of science and technology, artificial intelligence (AI) technology has become the core field of global economic competition. Especially in recent years, the emergence of advanced AI models such as Claude and GPT-4 has not only led to a new round of technological revolution, but also had a profound and extensive impact on the global economy. The competition in these AI technologies is reshaping the economic pattern of various industries, creating new growth drivers, but also bringing many challenges and uncertainties. In the manufacturing sector, the application of AI technology has greatly improved production efficiency and quality, but it also requires companies to constantly update equipment and train employees to adapt to new production models. In the service industry, the application of AI customer service, intelligent recommendation and other technologies has improved the customer experience, but also put forward higher requirements for the skills and quality of employees. In addition, the wide application of AI technology also poses new challenges to data security, privacy protection and other aspects. How to enjoy the convenience brought by technology while ensuring data security and personal privacy has become an urgent problem to be solved. Therefore, in the face of the economic changes brought about by AI technology competition, policy makers, entrepreneurs and researchers need to conduct in-depth research and discussion, formulate reasonable policies and strategies, to better respond to challenges, seize opportunities, and promote the sustainable and healthy development of the economy.

Keywords: AI technology; competition; Claude; GPT-4.

1. Introduction

The development history of artificial intelligence (AI) technology is a magnificent one. From the initial stage of enlightenment to the current highly complex and extensive application, each step has condensed the painstaking efforts and wisdom of countless scientific and technological pioneers. Since the 1950s, the concept of AI was first proposed, and in the few decades since, AI has undergone many technological innovations, from logical reasoning to knowledge representation to machine learning [1]. Especially in recent years, with the rapid development of big data, cloud computing and edge computing technologies, AI technology has been unprecedented promoted and gradually penetrated into every aspect of public lives. There are several key points worth mentioning in the development of AI technology. The first was the Dartmouth Conference in 1956, which formally proposed the term "artificial intelligence" and identified its research direction. Subsequently, in the 1960s and 1970s, a number of early expert systems emerged in the AI field, such as Dendral and Mycin, which demonstrated the initial application of AI within a specific field. In the 21st century, with the rise of deep learning, AI technology has ushered in explosive growth. The landmark events, such as AlphaGo's victory of Go world champion Lee Sedol and the launch of GPT series model, all mark that AI technology has reached a new height [2]. There are many participants in AI technology competition, from international tech giants, emerging startups and academic research institutions. Among them, international technology giants such as Google, Microsoft, IBM, Amazon and others occupy an important position in the development and application of AI technology with their strong technological strength and market share. Through these companies' continuous investment, they have developed a series of industry-leading AI technologies, such as Google's TensorFlow and Microsoft's Azure Machine Learning [3]. At the same time, as AI technology continues to mature, more and more startups are joining the competition. These companies often focus on a specific field, providing users

with more refined and personalized products and services through deep learning, natural language processing and other technologies. While their size and market share are relatively small, their ability to innovate and the speed of market response are often remarkable. In addition to companies and startups, academic research institutions are also important players in the competition in AI technology. These institutions usually have rich research resources and talent pool and can constantly explore the frontiers and potential of AI technology. Through the cooperation with enterprises and governments, they not only promote the rapid development of AI technology, but also provide strong support for the sustainable development of the society. This paper analyzes the major economic impact result from AI and proposes key strategies to leverage the full potential of AI technology.

2. Technical Features of the Claude and GPT-4

2.1. Technical Characteristics of Claude

Claude, a large language model developed by Meta, presents several striking technical features. First, Claude has highly advanced understanding and generation capabilities in natural language processing (NLP) areas. Its deep learning architecture enables it to handle complex human languages, ranging from simple everyday conversations to highly specialized literature. It can not only understand the context and implicit meaning, but also produce smooth and logical text output. Second, Claude demonstrates excellent multilingual processing capabilities. It is able to understand and generate texts in many languages, including but not limited to English, Chinese, Spanish, French, etc. This multilingual support gives Claude a wide range of applications worldwide. In addition, Claude also has a strong knowledge-based reasoning ability. It can extract information from a large amount of text data, conduct logical reasoning, and even simulate human creative thinking to a certain extent. This gives Claude unique advantages in intelligent question answering, text generation, machine translation and other fields. However, there are several technical challenges for Claude. As the model size expands, the demand for computational resources and data also increases substantially. Moreover, while Claude is well in addressing general issues, performance in specific domain and professional issues needs to be improved.

2.2. Technical Characteristics of GPT-4

GPT-4, as the latest generation of large-scale language model for OpenAI, also has its unique technical features. First, GPT-4 demonstrated amazing ability in text generation. Whether it is short stories, news stories, or academic papers, or programming codes, GPT-4 is able to generate high-quality, and logical text. This benefits from its advanced deep learning architecture and a large amount of training data. Second, GPT-4 has an excellent performance in understanding and processing natural language. It can understand complex linguistic structure, implicit meaning and contextual information, thus generating more accurate and closer to human expression habits. This understanding and generation ability provide GPT-4 the potential in intelligent question answering, text summaries, sentiment analysis and other fields. In addition, the GPT-4 also has strong cross-modal capabilities. It can be text, image, audio and other modal data fusion processing, so as to generate richer and more diverse content. This cross-modal capability gives GPT-4 unique advantages in multimedia content generation and multisensory interaction. However, similar to Claude, GPT-4 also faces several technical challenges. As the model size expands and the computational demand increases, the cost of training and reasoning is also increasing. Moreover, while the GPT-4 performs well in addressing general issues, performance to specific areas and professional issues remains to be improved.

3. Economic Impact of Claude and GPT-4

3.1. The Positive Impact on the Economy

3.1.1 To promote economic growth and industrial upgrading

With the rapid development of artificial intelligence technology, large language models such as Claude and GPT-4 have become an important force leading the new round of scientific and technological revolution and industrial transformation. These advanced AI technologies not only promote innovation in the field of artificial intelligence, but also have a profound impact on economic growth and industrial upgrading at the macro level.

First, AI technology competition promotes economic growth. The emergence of AI technologies such as Claude and GPT-4 has greatly improved the technological level in data processing and natural language processing, injecting new vitality into economic growth. The application of these technologies not only improves production efficiency, but also promotes the birth of many emerging industries, such as intelligent customer service, intelligent recommendation, autonomous driving, and so on [4]. The rapid development of these emerging industries has provided new impetus for economic growth and promoted the sustained prosperity of the global economy. In addition, from 2018 to November 2023, the amount of investment and financing in China's AI industry continued to rise. From 2018 to 2021, the investment in AI showed a growing trend, and the maximum amount of investment in AI reached 248.582 billion yuan in 2021. In 2022, the number and investment amount of AI investment decreased slightly, with the amount of investment reaching 118.272 billion yuan, and 733 investment events occurred. As of November 24, 2023, there were 531 AI investment events in China, with an investment amount of 66.048 billion yuan. Thus, AI plays a positive role in economic growth (see Figure 1).

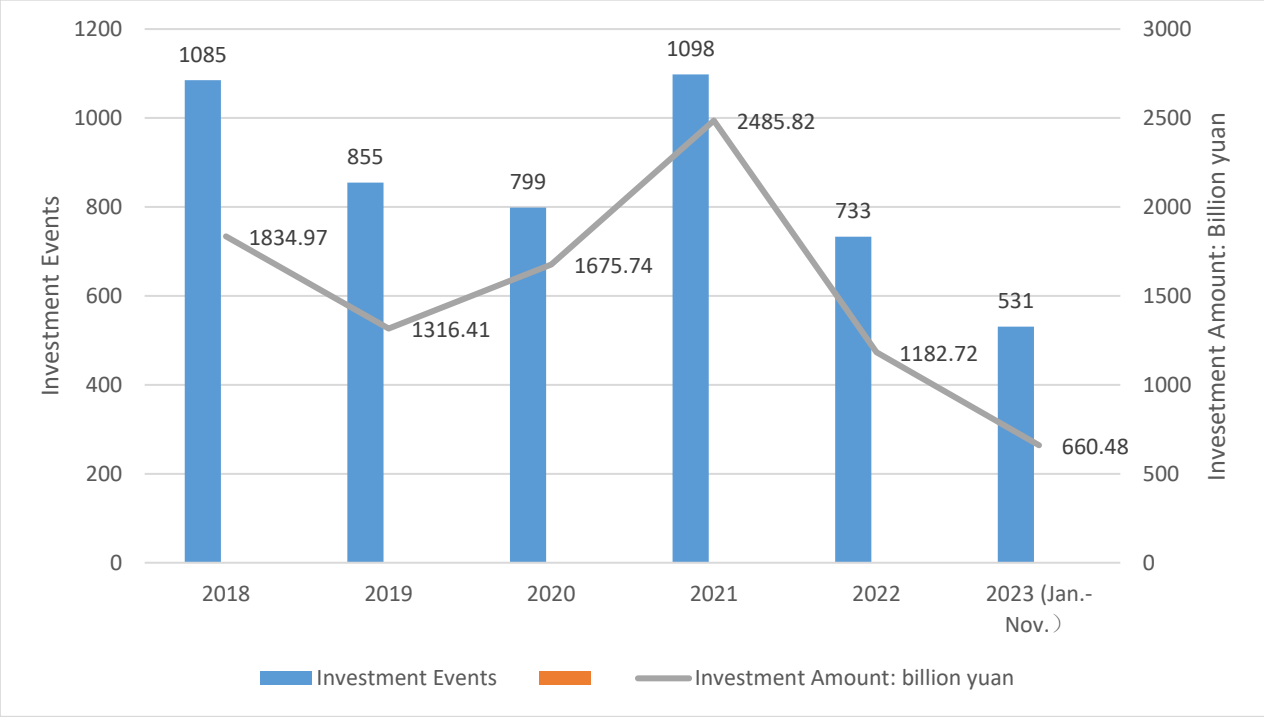

Fig.1 Investment and financing situation of China's AI industry in November 2018-2023

(Data source: IT Orange, China Commercial Industry Research Institute)

Second, AI technology competition has promoted industrial upgrading. In traditional industries, the application of AI technology is changing the production methods and business models. For example, in the manufacturing industry, AI technology can be used to build intelligent production lines to improve the level of production automation and product quality, and in the agricultural field, AI technology can be used for precision agriculture management to improve crop yield and quality

[5]. These industrial upgrading not only improve the competitiveness of traditional industries, but also inject new vitality into them and promote the sustainable economic development. In addition, AI technology competition promotes the formation of an innovation ecology. With the wide application of AI technology, more and more enterprises and research institutions begin to invest in the research and development and application of AI technology. The formation of this innovation ecology not only promotes the rapid development of AI technology, but also provides strong technical support for innovation in other fields. Such cross-field innovation cooperation will further promote economic growth and industrial upgrading.

3.1.2 Reshape the labor market and the employment structure

With the rise of advanced AI technologies such as Claude and GPT-4, the global labor market and employment structure are undergoing an unprecedented and profound change. This change has not only brought new job opportunities, but also had a profound impact on traditional occupations, requiring us to rethink the positioning of the workforce and skill needs.

First, the extensive application of AI technology has led to the automation and reduced employment in some traditional occupations. In manufacturing, robots and automated assembly lines are gradually replacing manpower. In the field of customer service, the intelligent customer service system can deal with a large number of inquiries and complaints, reducing the demand for human customer service. In addition, low-skilled jobs such as data entry and financial analysis have also been impacted by AI technology. These changes have not only led to the disappearance of some traditional occupations, but also spawned the need for more skilled, more complex jobs. Therefore, the labour market needs to rapidly adapt rapidly to such changes, repositioning the skills and knowledge of workers to adapt them to the new job market demands. However, AI technology has also brought us brand new job opportunities. With the wide application of AI in various industries, the demand for AI professionals has increased sharply [6]. New jobs, such as data scientists, machine learning engineers, and AI ethics experts, have emerged as hot jobs in the labor market. In addition, AI has also spawned many services related to AI technology, such as AI consulting and AI system integration. These emerging industries not only provide new employment opportunities for the labor market, but also drive economic growth. It is worth mentioning that AI technology has also promoted the globalization of the labor market. With the development of cloud computing, big data and other technologies, AI technologies can be deployed and applied worldwide. This makes it easier for companies to cross national borders and find the most suitable labor resources. At the same time, it also provides more transnational employment opportunities for workers, allowing them to find more suitable jobs around the world. However, the reshaping of the labor market by AI technology has also brought some challenges. For those workers hit hard by AI technology, governments and businesses need to provide opportunities for retraining and education to help them acquire new skills to meet the new job market needs. In addition, for those workers who benefit from AI technology, they also need to constantly learn and update their skills to remain competitive. Therefore, governments need to establish a sound lifelong learning system to provide continuous education and training support for workers.

In short, the rise of AI technology has had a profound impact on the global labor market and employment structure. Publics need to actively respond positively to this change, reposition workers' skills and knowledge, create new jobs, drive the globalization of the labour market and provide continuous education and training support for workers. Only in this way can publics make full use of the advantages of AI technology to achieve the sustainable development of the labor market.

3.2. The Negative Impact on the Economy

3.2.1 Challenges to economic security and privacy protection

With the rise of advanced AI technologies such as Claude and GPT-4, the issues of economic security and privacy protection have become increasingly prominent, bringing new challenges to the global economy [7].

First, the AI technology competition intensifies the economic security risks. The widespread use of advanced AI technologies makes processes such as economic decision-making, market forecasting and strategic planning more dependent on data analysis and machine learning. However, this dependence also increases the vulnerability to the economic system. If the AI system is wrong or attacked, it may lead to serious economic consequences, such as market collapse and supply chain disruptions. In addition, AI technology may also be used in improper economic activities, such as financial fraud and economic espionage, posing a threat to economic security. Second, the AI technology competition has raised privacy issues. With the continuous development of big data technology, AI systems need to collect and process large amounts of personal and enterprise data for training and optimization. This has raised concerns about personal privacy. On the one hand, the leakage and abuse of personal data may lead to the invasion of personal privacy and property loss; on the other hand, the abuse or theft of corporate data may also lead to the disclosure of trade secrets and the loss of competitive advantage. These privacy protection issues not only affect individual rights and interests, but also may have a profound impact on the economic security of enterprises and countries. To address these challenges, strengthen regulation and enforcement of economic security and privacy protection. The government should issue relevant laws and regulations to clarify the scope and restrictions of the use of AI technology and protect the legitimate rights and interests of individual and enterprise data. At the same time, supervision and law enforcement should be strengthened to crack down on the use of AI technology to commit economic crimes and violate privacy. In addition, more technology research and development and innovation are needed to improve the security and privacy protection capabilities of AI systems. Reduce the risk of data leakage and abuse by strengthening data encryption, access control and security audit. At the same time, promote the formulation and implementation of ethical norms and moral standards of AI technology to ensure that AI technology plays a positive role in economic development and does not infringe on people's privacy rights and interests.

3.2.2 Unbalanced allocation of resources

With the rapid progress of AI technology, especially the emergence of advanced models such as Claude and GPT-4, the problem of resource allocation has become increasingly prominent. These advanced AI technologies show strong capabilities and efficiency in certain areas, thus attracting significant investment, research and development resources and talent. However, this centralized way of resource allocation may also have a range of negative effects [8].

First, the uneven allocation of resources could fuel the digital divide. Although AI technology provides convenience for users around the world, the rapid development and application of technology are often concentrated in a few developed countries and regions. Due to the advantages of capital, talent and technology accumulation, these regions are easier to obtain advanced AI technology, and then occupy a more favorable position in resource allocation. Relatively backward regions may aggravate the digital divide because they lack the necessary resources and technical support to fully enjoy the benefits of AI technology.

Second, the uneven allocation of resources may lead to new economic monopolies. When a few enterprises or individuals have mastered the advanced AI technology, their competitiveness in the market will be greatly enhanced. These enterprises or individuals may take advantage of the technology monopoly position to conduct unreasonable control or distribution of resources, thus harming the interests of other enterprises and consumers. This may not only undermine the level playing field in the market but may also hinder the healthy development of the economy.

In addition, the uneven allocation of resources may also exacerbate social inequality. The development and application of AI technology may lead to the rapid rise of some industries and professions, but also to the gradual decline of some traditional industries. Such changes may lead to a redistribution of social wealth and resources, which in turn aggravates social inequality. At the same time, the benefits and opportunities brought by AI technology may also be more concentrated in the minority groups, making the bottom groups of society more marginalized.

Finally, uneven resource allocation may also challenge the Sustainable Development Goals (SDGs). Sustainable development requires cooperation and joint efforts on a global scale, and the rapid development and application of AI technologies may exacerbate the concentration and unequal distribution of resources, thus hindering the achievement of the SDGs. For example, some regions may not be able to achieve sustainable development goals such as environmental protection and poverty reduction due to the lack of necessary resources and technical support.

As a result, the negative impact of advanced AI technologies such as Claude and GPT-4 on resource allocation cannot be ignored. To ensure the healthy and sustainable development of the economy, governments, businesses and individuals need to work together to take effective measures to address these challenges. For example, the government can increase its support for backward areas to promote the balanced allocation of resources; enterprises can strengthen technology development and application while focusing on social responsibility and fair competition; and individuals can constantly improve their skills and abilities to adapt to the career and industry changes brought by AI technology.

4. Economic Strategies to Cope with the Competition in AI Technology

4.1. Strengthen AI Technology Research and Development and Innovation

In the fierce competition of artificial intelligence (AI) technology, technology research and development and innovation have become the core elements to enhance the competitiveness of the national economy. In order to occupy a dominant position in the global AI field, society must take practical and effective measures to promote the continuous breakthrough and development of AI technology.

First of all, the government, as the leading force in promoting scientific and technological innovation, should increase the investment in AI technology research and development. This does not only mean providing more financial support, but also requires efforts in tax incentives, policy guidance and other aspects. By optimizing the policy environment, the government can attract more enterprises, universities and research institutions to invest in the research in the AI field, and form an innovation system integrating industry, university, research and application. Such an innovation system will help to quickly translate scientific research results into practical applications and promote economic growth and social progress. In terms of specific operation, the government can support innovative and promising AI projects by setting up special AI research and development funds [9]. At the same time, certain tax incentives and teams that have achieved outstanding results in the field of AI should be given to encourage more innovative activities. In addition, the government should also strengthen the cooperation with universities and scientific research institutions, jointly establish AI laboratories and research bases, and promote the research and development and application of AI technology.

In addition to government support, companies also play a pivotal role in AI technology development. Enterprises should increase their efforts in independent innovation, and actively introduce and cultivate AI talents. Through the combination of internal research and development and external cooperation, publics constantly improve their own technical strength. In this process, enterprises also need to pay attention to the protection of intellectual property rights, form independent intellectual property rights, and enhance their competitiveness in the international market. In addition, strengthening international cooperation and exchanges is also an important way to promote the development of AI technology. Through the cooperation with international advanced enterprises and scientific research institutions, communities can share innovation resources and jointly promote the development of AI technology. This can not only accelerate the progress of China's AI technology, but also help to enhance China's voice and influence in the global AI field.

4.2. Optimize the Industrial Structure and the Labor Market

The wide application of AI technology is gradually infiltrating into all fields of the society, thus profoundly changing the face of the industrial structure and the labor market. In order to cope with this change, optimizing the industrial structure and the labor market has become an important economic strategy for us to cope with the AI technology competition.

In terms of the optimization of industrial structure, the government should play an active role in guiding enterprises to increase their investment in emerging industries [10]. These emerging industries, such as intelligent manufacturing, intelligent finance and intelligent medical care, are all the fields where AI technology can be widely used. By promoting the upgrading and transformation of these industries, the society can accelerate the optimization of the industrial structure and enhance the competitiveness and innovation capacity of the entire economic system. At the same time, the public should not ignore the transformation and upgrading of traditional industries. With the help of AI technology, publics can improve the production efficiency of traditional industries, improve product quality, and make them glow new vitality. Publics also need to take active measures to regulate and guide the Labour market. Although the development of AI technology has improved the production efficiency to some extent, it has also brought some employment problems. In order to cope with these problems, people need to increase investment in vocational skills training to help them improve their skills and enhance their competitiveness in employment. In addition, the government should also help workers adapt to the career changes brought about by the development of AI technology through policy support and employment services, so as to achieve fuller employment.

It is not enough to rely solely on the guidance and support of the government. People also need the joint efforts of the whole society, including the participation and cooperation of enterprises, educational institutions, social organizations and other sectors. While pursuing economic benefits, enterprises need to assume their social responsibilities and provide more training and development opportunities for workers. Educational institutions need to adjust the professional Settings and courses according to the market demand to cultivate more high-quality talents who meet the market demand. Social organizations can give full play to their unique advantages to provide more employment guidance and career consulting services for workers. In the process of coping with AI technology competition, society also need to pay attention to the impact of AI technology development on the labor market. On the one hand, the widespread application of AI technology may lead to the disappearance of some traditional occupations and the emergence of emerging occupations. Therefore, people need to adjust the structure of the labor market in time to provide support and guarantee for the development of emerging occupations. On the other hand, the development of AI technology may also lead to some workers facing the risk of unemployment. In order to prevent and solve the possible employment problems, publics need to establish a sound social security system to provide the necessary living security and re-employment services for the unemployed.

4.3. Strengthen Data Security and Privacy Protection

With the rapid development and wide application of artificial intelligence technology, the issue of data security and privacy protection have gradually surfaced and become the focus of attention of the public and enterprises. In this digital and information era, data has become an important resource, and the security and privacy of data is the cornerstone of safeguarding personal information and corporate secrets. Therefore, it is particularly important to strengthen data security and privacy protection in the economic strategies to deal with AI technology competition.

In order to ensure the security and privacy of data, the government should play its leading role in formulating and improving relevant laws and regulations. These laws and regulations should clarify the boundaries of the use and protection of data, standardize the process of the collection, storage, processing and application of data, and ensure the legitimacy and security of the data. At the same time, the government should also increase the punishment of illegal acts, so that offenders can pay the due price, to form an effective legal deterrent.

In addition to formulating laws and regulations, the government should also strengthen the supervision and evaluation of data security. This includes tracking and monitoring the source, flow, and use of the data to ensure that the data is fully protected in all aspects. At the same time, the government should also establish a data security evaluation mechanism, regularly evaluate the data management and protection of enterprises, find and solve problems in time, and improve the security of data.

In today's digital era, data has become an important asset for enterprise operation and development. As the main users and managers of data, enterprises shoulder the major responsibility of protecting data security and privacy. In order to achieve this goal, enterprises not only need to establish a sound data management and protection mechanism, but also formulate strict data use regulations to ensure that employees' data operation complies with the norms. In addition, strengthening internal management and staff training is also crucial, which can enhance the awareness and importance of data security for the entire organization. At the same time, the use of advanced technical means, such as encryption technology and firewall, is also an effective means to prevent data leakage and abuse. However, the strength of the enterprise alone is not enough, and the cooperation and supervision with the third-party institutions are also indispensable. Only by making joint efforts can publics safeguard data security and privacy rights and provide a solid guarantee for the sustainable development of enterprises.

In addition, public awareness and awareness of data security and privacy protection are also crucial. The government and enterprises should strengthen the education and publicity to the public, let the public understand the importance of data security and privacy protection, and improve the public's awareness of prevention and self-protection ability. By holding lectures, training, exhibitions and other activities, popularize the knowledge of data security and privacy protection to the public, governments can guide the public to correctly use and protect personal information, and jointly create a safe and reliable data environment.

5. Conclusion

With the rapid development of artificial intelligence technology, AI technology has gradually become an important driving force to promote economic development. This paper analyzes the economic impact of AI technologies, such as Claude and GPT-4, and reveals the positive effects and potential risks of AI technologies in the economic field. The study found that AI technology not only improves production efficiency, promotes the optimization of industrial structure, but also gives birth to new jobs and employment opportunities, injecting new vitality into economic growth. However, the widespread application of AI technology has also brought some negative effects, such as the reduction of traditional jobs, increased competition in the job market, and data security and privacy protection issues.

This paper proposes three key strategies. First, people should strengthen the research and development and innovation of AI technology. Governments should invest more resources in basic AI research and application innovation, and promote technological breakthroughs and achievement transformation, so as to master core technologies and intellectual property rights. At the same time, people will encourage cross-border cooperation and collaborative innovation to form an open, inclusive and cooperative innovation ecosystem. Second, public needs to optimize the industrial structure and the labor market. People should accelerate the transformation and upgrading of traditional industries, foster emerging industries, and build a modern industrial system with international competitiveness. At the same time, vocational education and skills training should be strengthened to improve the quality and skill level of the labor force to meet the needs of the AI era. Finally, society should strengthen data security and privacy protection. In the process of promoting the application of AI technology, society must attach great importance to data security and personal privacy protection, establish and improve relevant laws, regulations and standards system, and ensure that data security is controllable, and privacy is respected and protected. By implementing these

economic strategies, people can make full use of the advantages of AI technology to reduce potential risks and promote high-quality economic development. At the same time, publics will also inject new vitality and impetus into the sustainable development of human society.

Looking ahead, with the continuous progress of AI technology and the expansion of its application fields, its impact on the economy will be more profound. Public needs to leverage the full potential of AI technology, pay attention to the possible negative effects and take effective measures to deal with it. Only in this way can people seize the opportunity in the wave of AI technology and achieve sustainable economic development.

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