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THE ROLE OF ARTIFICIAL INTELLIGENCE IN SOCIAL INNOVATIONS

Human society has entered the era of intellectualization and use artificial intelligence to lead innovations and development. After several decades of accumulation, artificial intelligence began to enter the dividend period of its exponential growth, which is expected to last for quite a long time. This article attempts to discuss the peculiarities of and the relationship between artificial intelligence and social innovation. Applications, advantages, disadvantages of artificial intelligence, and its future challenges are also presented in the paper. Artificial intelligence can support and create (social) innovations in many ways, and can contribute to solving social problems, however, it can always be controlled to avoid the catastrophe of the human society.

Keywords: artificial intelligence, AI, social innovation, innovation

САБОЛЧ НАДЬ

РОЛЬ ШТУЧНОГО ІНТЕЛЕКТУ В СОЦІАЛЬНИХ ІННОВАЦІЯХ

Людське суспільство вступило в епоху інтелектуалізації та використовує штучний інтелект для керівництва інноваціями та розвитком. Після кількох десятиліть накопичення штучний інтелект почав входити в дивідендний період свого експоненціального зростання, який, як очікується, триватиме досить довго. Ця стаття намагається обговорити особливості та взаємозв'язок між штучним інтелектом та соціальними інноваціями. Застосування, переваги, недоліки штучного інтелекту та його майбутні проблеми також представлені в статті. Штучний інтелект може багатьма способами підтримувати та створювати (соціальні) інновації та може сприяти вирішенню соціальних проблем, проте його завжди можна контролювати, щоб уникнути катастрофи людського суспільства.

Ключові слова: штучний інтелект, AI, соціальні інновації, інновації

САБОЛЬЧ НАДЬ

РОЛЬ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В СОЦИАЛЬНЫХ ИННОВАЦИЯХ

Человеческое общество вступило в эпоху интеллектуализации и использования искусственного интеллекта для инноваций и развития. После нескольких десятилетий накопления искусственный интеллект начал вступать в дивидендный период своего экспоненциального роста, который, как ожидается, продлится довольно долго. В этой статье делается попытка обсудить особенности и взаимосвязь между искусственным интеллектом и социальными инновациями. В статье также представлены приложения, преимущества и недостатки искусственного интеллекта и его будущие задачи. Искусственный интеллект может поддерживать и создавать (социальные) инновации разными способами и способствовать решению социальных проблем, однако его всегда можно контролировать, чтобы избежать катастрофы человеческого общества.

Ключевые слова: искусственный интеллект, AI, социальные инновации, инновации.

Introduction

After more than half a century of development, artificial intelligence (AI) has gone through the stage of simply simulating human intelligence. The use of artificial intelligence has significantly been increased since the Millennium. Originally it has developed to study the law of human intelligence activities, build artificial systems or hardware with certain intelligence, so that it can carry out work that requires human brain, and expand the edge disciplines of human intelligence. It involves natural and social sciences such as information theory, cybernetics, computer science, automation, bionics, biology, psychology, mathematical logic and philosophy. Nowadays, the proliferation of the use of artificial intelligence can be seen. It is widely used in many industries to simulate innovations. However, it can also be used to attempt to solve social problems. Therefore, artificial intelligence can be the engine of social innovation projects.

1. Artificial intelligence defined

Artificial intelligence is a new technology science to research and develop theories, methods, technologies and application systems for simulating, extending and expanding human intelligence (Da and Cheng, 2018). According to Suzuki (2020) artificial intelligence is a branch of computer science seeks to understand how human intelligence works and create a new, intelligent machines that are similar to humans based on this knowledge. Artificial intelligence involves fields like robotics, language recognition, image recognition, natural language processing and expert systems.

Artificial intelligence studies the law of human intelligence activities to build an artificial system with intelligence. It makes an attempt to understand how to have the work that needs human intelligence done by computers. According to industry leader IBM, “artificial intelligence enables computers and machines to mimic the perception, learning, problem-solving, and decision-making capabilities of the human mind” (IBM, 2021). IMB also defines artificial intelligence as any human-like intelligence exhibited by a computer, robot, or other machine. The popular usage of AI is wider. It is the ability of a computer or machine to simulate the capabilities of the human mind and combining these and other capabilities to perform functions a human might perform (IBM, 2021).

Merriam-Webster (2021) defines artificial intelligence similarly as “a branch of computer science dealing with the simulation of intelligent behavior in computers”, and “the capability of a machine to imitate intelligent human behavior.”

The definition of AI can be divided into two parts, namely "artificial" and "intelligent". "Artificial" is better understood and less controversial. Sometimes we need to consider what is manufactured by human resources, or whether human intelligence is enough to create artificial

intelligence, and so on. But in general, "artificial system" is the artificial system in the usual sense.

However, there are many questions about what "intelligence" really means. This involves other issues such as consciousness, self, thinking or mind, including unconscious thinking and so on. It is universally acknowledged that the only thing people know about intelligence is their own intelligence. But our understanding of our own intelligence is very limited, and the necessary elements of human intelligence are also limited, so it is difficult to define what is "artificial" manufacturing "intelligence". Therefore, the study of artificial intelligence often involves the study of human intelligence itself. Other intelligence related to animals or other artificial systems is also generally considered as a research topic related to artificial intelligence.

2. Social innovations defined

According to EU definition social innovations are new ideas that meet social needs, create social relationships and form new collaborations. These innovations can be products, services or models addressing unmet needs more effectively (European Commission, 2021). According to the Centre for Social Innovation at Stanford Graduate School of Business, social innovation refers to “the process of developing and deploying effective solutions to challenging and often systemic social and environmental issues in support of social progress” (Centre for Social Innovation, 2021).

The term social innovation was coined first in the early 18th century (European Commission, 2017, p.14.). However, it is only 30 years since the concept of social innovation was “re-invented”. Since 2000, it has become a "buzzword" all over the world. Many developed countries and regions have set up special departments, funds and laws to promote social innovation.

Social innovation arise several questions: For whom does social innovation innovate? In what areas can social innovation occur? Who is promoting social innovation? And how does social innovation happen? Are there tangible outputs of social innovation? It sounds complex, but it's very simple in practice. That is, no matter what form, as long as it can bring about positive changes, we all think it is a kind of social innovation. Social innovation is to "innovatively solve social problems", while emphasizing sustainability, influence and economy.

3. Development stages of artificial intelligence

The brief history of artificial intelligence development can be divided into three stages: gestation, formation and development. The gestation stage dates to before 1956, the second stage took place between 1956 and 1969, and the third stage covers the time period after the 1970s.

Gestation stage of artificial intelligence

The research achievements which have great influence on the development of artificial intelligence mainly include the following foundations. First, the British philosopher Sir Francis Bacon systematically put forward induction and also put forward the phrase "knowledge is power", which had an important impact on the study of human thinking. Then, Leibniz, a German mathematician and philosopher, put forward the idea of universal symbols and reasoning calculation. He believed that a universal symbolic language could be established and reasoning on the symbols could be carried out. This idea not only laid the foundation for the generation and development of quantitative logic, but also was the germination of modern machine thinking design idea.

In 1936, the British mathematician Turing put forward the mathematical model of the ideal computer, that is, Turing machine, which laid a theoretical foundation for the subsequent advent of electronic and digital computers (Turing, 1936). Last, American neurophysiologist McLoch and mathematic logician Pitts built the first neural network model in 1943 (McCulloch and Pitts, 1943), which initiated the research field of Microsoft artificial intelligence and laid the foundation for the later research of artificial neural network. From the above development process, we can see that the emergence and development of artificial intelligence is the inevitable product of the development of science and technology.

Formation stage of artificial intelligence

This stage mainly refers to a two-month academic seminar held by Dartmouth College from 1956 to 1969 to discuss the terminology of machine intelligence. At the seminar, the term "artificial intelligence" was formally adopted on McCarthy's proposal. McCarthy was therefore called the father of artificial intelligence. In the years after the conference, artificial intelligence made many remarkable achievements in machine learning, theorem proving, pattern recognition, problem solving, expert system and language. The International Artificial Intelligence Conferences established in 1969 was an important milestone in the history of artificial intelligence. It marked that the emerging discipline of Artificial Intelligence had been recognized globally.

Development stage of artificial intelligence

As other emerging disciplines, the development of artificial intelligence was also not smooth. During the period of the development of artificial intelligence, great breakthroughs were made in the research of expert system in many fields. Various kinds of expert systems with different functions and different types have sprung up, resulting in enormous economic and social benefits. The success of expert system made people more and more aware that knowledge is the basis of intelligence, and the research of artificial intelligence must be knowledge centered. After 1986, also known as the integrated development period, computational intelligence made up for the shortcomings of artificial intelligence in mathematical theory and calculation, enriched the theoretical framework of artificial intelligence, and made artificial intelligence enter a new development period.

Today, the development of artificial intelligence has broken through a certain threshold. Compared with previous booms, this time artificial intelligence is more "real", which is reflected in the performance improvement and efficiency optimization in different vertical fields. The accuracy of computer vision, speech recognition and natural language processing is no longer at the level of "passing home", and the application scenario is no longer just a novel "toy", but gradually plays an important supporting role in the real business world.

4. The role of artificial intelligence in social innovations

The light of wisdom illuminates the road of innovation. Science and technology have always been the first productive force for human beings to understand nature, transform the world and create prosperity. In the era of information revolution, artificial intelligence based on internet, big data and deep machine learning is increasingly bursting out with tremendous energy to promote human civilization to a higher level, which also brings a rare historical opportunity for social development. Especially in the face of severe pressures on human social resources, environment and ecology, profound changes in productivity and production relations, structural remodeling of geopolitics and international situation, the rise of global protectionism and populism, and the great threat to human peaceful exchange and development and prosperity, the rational use of advanced information technology such as new generation of artificial intelligence has brought about tremendous benefits. Kinetic energy can better satisfy people's needs for a better life while serving the global human well-being. Therefore, artificial intelligence is the cornerstone of social innovation, and social innovation is the inevitable product of artificial intelligence. They are complementary and mutually reinforcing.

Artificial intelligence for innovations

The development of artificial intelligence has led to the emergence of (social) innovations. For example, "Intelligent+X" has become a paradigm of social innovation, such as "Intelligent+Manufacturing", "Intelligent+Medical", "Intelligent+Security", etc. Artificial intelligence powered technology has rapidly penetrated into innovative consumption scenarios and different industries to integrate and reshape the whole social development. Artificial intelligence is the key driving force in fourth technological/industrial revolution. For example, the participants in the field of intelligent driving are not only the leading traditional car-making companies such as Volkswagen, Toyota, General Motors, Ford and Mercedes-Benz, but also the new car makers such as Google, Tesla, Uber, Apple and Baidu.

Social innovations need the development of artificial intelligence

Application demand is the inexhaustible source of social innovations. The driving force leading the development of disciplines mainly comes from the two-wheel drive of science and demand. In addition to the inherent contradiction between knowledge and technology system, the driving force of the development of artificial intelligence is close to application and solving user needs, which is the biggest source and driving force of innovation. For example, expert system artificial intelligence has achieved a breakthrough from theoretical research to practical application. In recent years, the practical application needs of security monitoring, identity recognition, unmanned driving, Internet, and Internet of Things (IoT), big data analysis have led to the technical breakthrough of artificial intelligence.

Artificial intelligence innovation and entrepreneurship are in full swing. The global industry has fully realized the great significance of artificial intelligence technology leading a new round of industrial change and has adjusted its development strategy. For example, at its annual developer conference in 2017, Google explicitly proposed that the development strategy should shift from "Mobile First" to "AI First". Microsoft's FY2017 annual report for the first time made AI a vision for the company. The field of AI is at the forefront of innovation and entrepreneurship.

5. The Applications of Artificial Intelligence in Social Innovations

In traditional cognitive concepts, people seem to think that artificial intelligence refers to robots. In fact, robots are only a small part of all artificial intelligence applications. In addition to robots, artificial intelligence includes machine vision, fingerprint recognition, face recognition, expert system, automatic planning, intelligent search, game, language and image understanding, genetic programming, etc. It can be seen that the practical application of artificial intelligence is so wide, ranging from the mobile phone apps, all kinds of intelligent wearing equipment to medical education, financial industry, heavy industry manufacturing and so on. Mobile apps can provide great convenience for social services.

Voice recognition system

With the rapid development of artificial intelligence, speech recognition has become the standard for many devices. More and more people pay attention to speech recognition. Microsoft, Google, Facebook, etc. are developing new strategies and algorithms for speech recognition. Therefore, one of the most successful artificial intelligence applications are in the speech recognition technology. Just as there are no two identical leaves in the world, everyone has different characteristics and personalities from others, such as blood type, skeleton, skin color and so on. The more obvious one is voice. The voiceprint information of any two people is different.

Speech recognition, as one of the most representative technologies in the field of artificial intelligence, plays an increasingly important role in people's intelligent life. Speech recognition technology, also known as Automatic Speech Recognition (ASR), aims to convert the vocabulary content of human speech into computer readable input. The application of speech recognition technology includes voice dialing, voice navigation, indoor equipment control, voice document retrieval, simple dictation data entry and so on. Speech recognition technology combined with other natural language processing technologies such as machine translation and speech synthesis technology can build more complex applications, such as speech to speech translation. This kind of intelligent technology can improve our quality of life, provide effective intelligent assistance for our life, and make our life more convenient.

In smart homes, speech recognition technology can be applied in many ways including voice-controlled lights, voice-controlled furniture, voice-controlled multimedia, vehicle voiceprint system and so on. With a simple password, we can wake up smart home devices with our voice. Let us take the example of a sound control lamp. Lights in the living room used to be turned on or off by touching the switch with a finger, but with this technology, a disabled person only needs to say the command words to the sound control lights to turn on and off the lights. It is much more convenient than ever before. Another common example of speech recognition is the voice operation of

smartphones. Users can directly use voice to enable the mobile phone system to perform dial-up or search for relevant information. This option can also be beneficial to the disabled.

However, there is still a long way to go to achieve real human-computer interaction. At present, the recognition of user voice by computer is far from perfect and there are still some problems in human-computer interaction. Breakthroughs must be made in order to achieve better innovative applications, which is also the direction of future speech recognition technology development.

Unmanned operating system/ robot operating system

Unmanned operating system technology has been widely used in the retail field, such as unmanned convenience stores, intelligent supply chain, passenger flow statistics, unmanned warehouse/unmanned car, etc. Through the use of a large number of intelligent logistics robots for collaboration and cooperation, through artificial intelligence, in-depth learning, image intelligent recognition, large data application and other technologies, industrial robots can make independent judgments and behavior, complete various complex tasks, and realize automation in commodity sorting, transportation, warehousing and other links. Another example is the logistics industry through the use of intelligent search, reasoning planning, computer vision and intelligent robots technology in transportation, warehousing, etc. Distribution, loading and unloading processes have been automated to basically achieve unmanned operation. For example, using big data for commodities. Intelligent distribution planning, optimize the allocation of logistics supply, demand matching, logistics resources, etc.

6. Advantages, disadvantages of artificial intelligence, and its future challenges

The disadvantages of AI in social innovations

At present, artificial intelligence has created considerable economic benefits for human beings. It can replace human beings to do a lot of work that we do not want to do and /or not able to do. Moreover, the probability of machine errors is lower than that of human beings, and it can continue to work, greatly improve work efficiency, and save a lot of costs. In the future, artificial intelligence may also replace human work and do it instead of human beings including doing the chores, supporting human learning, even taking care of the disabled, the elderly and the children, real-time monitoring of human health and prolonging human life.

But the development of science and technology is a double-edged sword. The invention of automobile has subverted the traditional carriage industry. The development of artificial intelligence will also subvert many industries. Robots replacing many human jobs will result in a large number of unemployed people. At the same time, artificial intelligence is facing the danger of technology out of control. Even high-profile physicists as Stephen Hawking warned that the emergence of artificial intelligence (AI) could be the "worst event in the history of our civilization" unless society finds a way to control its development (Kharpal, 2017). Tesla's Elon Musk has also repeatedly warned that "AI would soon become just as smart as humans" and said that "when it does we should all be scared because humanity's very existence is at stake" (Shead, 2020). Advanced AI devices can think independently and adapt to environmental changes. They may become a real threat to humans in the future.

The challenges for AI in social innovations

To realize the leap-forward development from narrow or special artificial intelligence to general artificial intelligence is not only the inevitable trend of the next generation of artificial intelligence development, but also the challenge of international research and application fields (Hickert and Ding, 2018). According to the authors an important research direction of artificial intelligence is to learn from the research results of brain science and cognitive science, study new intelligent computing models and methods based on the mechanism and essence of intelligence, and realize intelligent systems with brain nerve information processing mechanism and human intelligent behavior and intelligence level. It aims at introducing human role or cognitive model into AI system, improving the performance of AI system, making AI a natural extension and expansion of human intelligence, and solving complex problems more efficiently through human-computer cooperation. Brain-like intelligence (BI) has become one of the core goals and challenges that AI will face in the future in the brain plans launched by the United States, the European Union, Japan and other countries and regions (Hickert and Ding, 2018).

7. Conclusions

Artificial intelligence industry will flourish. With the further maturity of AI technology and the increasing investment from government and industry, the cloud-based application of AI will be accelerated, and the scale of global AI industry will enter a period of rapid growth in the next decade. The international competition in the field of artificial intelligence will become increasingly fierce.

Artificial intelligence has drastically changed our lives. We should make good use of the AI and avoid its drawbacks. In order to achieve long-term development, artificial intelligence should live in harmony with human beings, society and nature. Therefore, on the one hand, we must adhere to the development of people-centered artificial intelligence, grasp the outstanding contradictions and difficulties in the field of people's livelihood, proceed from the need to create a better life for the people, and strengthen the in-depth application of artificial intelligence in the fields of education, medical and health, sports, housing, transportation, disability support and old-age care, and domestic service. On the other hand, no matter how artificial intelligence develops, it must be guaranteed that it will always be controlled by human beings and serves human beings without harming them. Only in this way can human beings accept AI more easily. Therefore, it is necessary to strengthen the research and prevention of potential risks in the development of artificial intelligence, safeguard the interests of the people and national security, establish and improve laws, regulations, systems and ethics to ensure the healthy development of artificial intelligence, and ensure the safety, reliability and controllability of artificial intelligence.

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