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DEVELOPMENT AND ETHICS OF ARTIFICIAL INTELLIGENCE

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DEVELOPMENT AND ETHICS OF ARTIFICIAL INTELLIGENCE AND ROBOTDEVELOPMENT AND ETHICS OF ARTIFICIAL INTELLIGENCE

In 20th century, scientific artificial intelligence technology, with a history of only 50 years, is affecting the world in its own unique way. It is considered as one of the three major scientific and technological achievements of this century. Applications of artificial intelligence technology include machine learning, expert systems, pattern recognition, natural language processing, artificial neural networks and robotics. The applicationof artificial intelligence has brought new opportunities to the fields of automatic driving and security inspection. The rapid development of artificial intelligence applications has brought many challenges as well.

This thesis briefly introduces the definition and development history of artificial intelligence. Then, it introduces the development and main features of the three representative schools of artificial intelligence, namely the symbolism school, the behaviorism school and the connectionism school. It discusses the Turing test and the analysis of strong AI and weak AI, and the methodology of traditional artificial intelligence school, and various ethical issues.

KEYWORDS:

AI, robot, ethics, human intelligence

CONTENTS

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ANN	Artificial Neural Network
API	Application Programming Interface
BP	Error Back Propagation
CNTK	Microsoft Cognitive Toolkit
CSAIL	Computer Science and Artificial Intelligence Laboratory
DNN	Deep Neural Networks
ECAI	European Conference on Artificial Intelligence
ECCAI	European Coordinating Committee for Artificial Intelligence
IEEE	Institute of Electrical and Electronics Engineers
IJCAI	International Joint Conference on Artificial Intelligence
MIT	Massachusetts Institute of Technology

1 INTRODUCTION

In March 2016, a man-machine battle in the world of chess games made people know the power of Artificial Intelligence (AI). Google's artificial intelligence AlphaGo finally defeated the Korean world champion Lee Sedol with the score of 4:1. AlphaGo is based on learning and artificial intelligence. It has powerful self-learning and evolutionary functions. In just a few months of learning and training, it is possible to cross a path that a talented player has trained for decades. Many people worry that when the machine has the same intelligence as humans, the super intelligence of this machine will bring destruction to mankind. Whatever the point of view, it is undeniable that has given the public a new understanding of "artificial intelligence". (BBC 2017)

For more than half a century, the research in the field of AI has greatly developed. It has attracted more and more attention from many disciplines and scholars with different backgrounds and has become a widely interdisciplinary subject. With the technological development, AI has been rapidly spread and developed, and it has promoted the development of other disciplines.

In recent years, modern computers have made great progress in both hardware and software, and research on AI has also played a role. Although artificial intelligence is facing many challenges in the development process, the challenges always coexist with opportunities, artificial intelligence research will surely into the new step to the develop national economy and improve people’s lives.

2 DEFINITION

Artificial intelligence as a term originates from John McCarthy's concept at the Dartmouth Summer Research Project in 1956. “Artificial” means created by human beings, and ability to be intelligent means the ability of the system to store knowledge and perform actions. It is composed of multi-dimensional indicators such as reasoning, memory, emotion and expression. John McCarthy summed up the highly creative scientific research he carried out on the machine to simulate human intelligence with the concept of "artificial intelligence", which attempts to make the behaviors that occur on artificially created same as human’s behavior is as self-conscious, so that the system can dominate its actions through human-like thinking.(Maekoff 2011)

From the perspective of disciplines, artificial intelligence has been affiliated with natural sciences since its inception. It is based on sciences such as mathematics, logic, statistics, engineering, computer science, and biology. However, with the deepening of research, it has become more and more integrated with humanities and social sciences and disciplines such as psychology, philosophy, and linguistics, and combines the essence of several disciplines.

Artificial intelligence, like many emerging disciplines, has not yet been exactly defined. A general definition is almost impossible, because intelligence seems to be a mixture of information processing and expression. Artificial intelligence as defined in dictionary, is a computer system that simulates intelligent activities of human beings. However, this cannot be used as a definition of artificial intelligence. So far, there is no suitable way to test the machine's functional parameters. The Turing Test can basically identify Artificial Intelligence, but it is not enough.

Some scholars are focusing on the development of artificial intelligence. The development is promoted by applied to many fields. For example, e-commerce, medical diagnosis, gaming, mathematics, and military planning and logistics. Several research areas fall under the general umbrella of AI, but are disciplines in their own right, robotics, natural language processing, computer vision, computational biology, and including e-commerce. Research is conducted in estimation theory, mobility mechanisms, multi-agent negotiation, natural language interfaces, machine learning, active computer vision, probabilistic language models for use in spoken language interfaces, and the modeling and integration of visual, haptic, auditory and motor information.

3 HISTORY OF ARTIFICIAL INTELLIGENCE

3.1 Before 1956

Since ancient times, humans have tried to replace some of the human brain labor with machines at that time in order to improve the ability to conquer nature. For example, in 850 AD, ancient Greece had myths and legends about making robots to help people work. (Hertzmann 2018)

As history progressed, by the end of the twelfth to the early thirteenth century, the Spanish theologian and logician Romen Luee tried to create a general-purpose logic machine that could solve various problems.

In the seventeenth century, French physicist and mathematician Blaise Pascal made the world's first mechanical adder that would be calculus and gained practical application. (Clarke 2015)

Then German mathematician and philosopher Leibniz developed and built a calculator for all four operations based on this adder. Then German mathematician and philosopher Gottfried Wilhelm Leibniz developed and built a calculator for all arithmetic based on this adder. (Look 2013)

In the 19th century, British mathematics and mechanics Charles Babbage focused on the research of Difference Engine and Analytical Engine. Although the conditions were not fully realized, his design were the highest achievement of artificial intelligence at that time. (Copeland 2006)

In 1936, the 24-year-old British mathematician Alan Mathison Turing presented the famous Turing machine in his paper. In 1945 he further discussed the idea of electronic digital computer. In 1950 he asked “Can Machines Think?” In the paper, the author puts forward the discussion that the machine can think. It can be said that these are the outstanding contributions of Turing for artificial intelligence. (Dowe 2016)

In 1938, the German young engineer Konrad Ernst Otto Zuse developed the floating point binary mechanical calculator with limited programmability, Z-1, which was modified. In 1945 he invented the Planka.kel programming language. (Zuse 2000)

In 1946, American physicist John William Mauchly and J. Presper Eckert designed ENIAC, the first general purpose electronic digital computer, as well as EDVAC, BINAC and UNIVAC I. There were also the creations of new fields of study, like American mathematician Norbert Wiener's Cybernetics, the American mathematician Claude Elwood Shannon's Information Theory. All of these scientists have contributed greatly to the theoretical and experimental for the AI. (Amending the ENIAC Story 2009)

3.2 1956-1961

A historic gathering at Dartmouth University in 1956 was considered to be the official birth of AI. Since then, several research groups have been formed in the United States with artificial intelligence as research goals, such as those of, Allen Newell and Herbert Alexander Simon, and their RAND Collaboration. These scientists were awarded the ACM's A.M. Turing Award in 1975 for their basic contributions to artificial intelligence and the psychology of human cognition.

In 1956, the psychology group of Newell and Simon created the earliest AI programs, the Logic Theory Machine. It would eventually prove 38 of the first 52 theorems in Whitehead and Russell's Principia Mathematica, and find new and more elegant proofs for some others. Newell and Simon also reveal that the thinking process of people in solving problems can be roughly classified into three stages:

(1) First coming up with a rough solution plan.

(2) Organizing the problem-solving process according to the axioms, theorems, and inference rules.

(3) Analyzing the method and purpose and correcting the problem solving plan.

This kind of thinking is not only solving mathematical problems, but also solving other problems. Based on this idea, they compiled a General Problem Solving that solved different types of topics in 1959. They also invented the Language Information Processing and the NSS chess machine. These work-related Newell's papers *The Chess Machine: An Example of Dealing with a Complex Task by Adaptation* and Simon's paper *A Theory of Emotional Behavior* were also great achievements in information processing research. Later, their students also did a lot of work, such as the EPAM model of human

oral learning and memory, and the early natural language program SAD-SAM. In addition, they also discussed the heuristic algorithm. (The Economist 2009; LAMBERT 1992)

The first successful self-learning, self-organizing, and adaptive Checker-playing program was developed by Arthur Lee Samuel in 1956, which is an influential work of the IBM team. This program can play a few steps forward to play chess like a good player. It can also learn the game. After analyzing about 175,000 different games, it can be inferred that all the recommended moves in the book have an accuracy of 48%. In 1959, this program defeated Samuel himself. In 1962, it defeated the American master checkers.

The program language LISP was invented by McCarthy in 1959, became the main language of artificial intelligence programming and is still widely used today.

In addition, the 1956 the American linguist Avram Noam Chomsky's research of grammar system. Also, in 1959 Oliver Gordon Selfridge wrote important early papers on neural networks and pattern recognition and machine learning, and his "Pandemonium" paper is generally recognized as a classic in artificial intelligence. Both have a beneficial impact on the study of artificial intelligence. These early results fully demonstrate that artificial intelligence is thriving as a new discipline. (Searle 1972; Markoff 2008)

3.3 After 1961

Since the 1960s, research activities on artificial intelligence have received increasing attention. In order to reveal the relevant principles of artificial intelligence, researchers have conducted in-depth research on topics such as problem solving, game, theorem proving, programming, machine vision, and natural language understanding. For decades, not only have research topics been expanded and deepened, but also the basic core issues common to these topics and their interrelationships with other disciplines have been gradually clarified. (Russell and Norvig 2003)

In 1965, John Alan Robinson proposed the principle of resolution, which promoted the development of the topic by the automated theorem.

Between 1968 and 1970, Terry Winograd crated an early natural language understanding computer program, SHRDLU. The user carries on a conversation with the

computer, moving objects, naming collections and querying the state of a simplified "blocks world".

In 1969 Roger Schank introduced the conceptual dependency theory for natural language understanding. In 1974, Marvin Minsky published his article "A Framework for Representing Knowledge." A frame is an artificial intelligence data structure used to divide knowledge into substructures by representing "stereotyped situations." Frames are the primary data structure used in frame language. (Rifkin 2016)

In 1977, the computer scientist Feigenbaum of Stanford University in the United States proposed Knowledge Engineering, as the principle and method of artificial intelligence, providing a way to solve problems that require expert knowledge. The proper use of the composition and interpretation of the acquisition, expression and reasoning process of expert knowledge is an important technical issue in the design of knowledge-based, which is leading to more researches and developments in expert systems and knowledge base systems.

Since the 1980s, breakthroughs have been made in the research of Artificial Neural Network. In 1982, the Hopfield neural network, a recurrent neural network, was invented by John Hopefield. The Hopfield network is a neural network that combines a storage system with a binary system. The Hopfield network also provides a model for simulating human memory. In 1985, Hopfield successfully solved the “Traveling salesman problem” problem by using this model.

In 1986, David Everett Rumelhart invented the method of Backpropagation, which is used in artificial neural networks to calculate a gradient that is needed in the calculation of the weights to be used in the network. Backpropagation solves the learning problem of multi-layer artificial neural network and becomes a widely used algorithm for neural network learning. Since then, a new research boom of artificial neural networks has been launched, and many new neural network models have been proposed, which are widely used in many fields such as pattern recognition, fault diagnosis, prediction and intelligent control.

In May 1997, the "Deep Blue" chess-playing computer developed by IBM, for the first time in the official competition, defeated the reigning world champion Garry Kasparov with a score of 3.5:2.5, causing a sensation in the world, which means the level of artificial intelligence can reach or exceed human intelligence in some areas.

The academic communication has greatly promoted the research of artificial intelligence. In 1969, International Joint Conference on Artificial Intelligence was established and held the first academic conference IJCAI-69, which will be held once every two years. In 1974, the European Conference on Artificial Intelligence was established, and the first conferences, ECAI, was held once every two years. In addition, many countries have their own artificial intelligence conferences and activities.

In recent years, artificial intelligence has made new progress in many aspects. Especially with the popularization and application of the Internet, the demand for artificial intelligence has become more and more urgent, and it has provided a new and broad stage for the research of artificial intelligence.

4 SCHOOLS OF ARTIFICIAL INTELLIGENCE

Due to different understandings of the nature of artificial intelligence, many different research paths of views have been developed. Different research paths have different research methods and different academic views, and form different research schools. The main research schools in the field of artificial intelligence are the schools of symbolism, connectionism and behaviorism.

4.1 Symbolism

Symbolism, also called as logicism or psychology, is based on the assumptions of physical symbols and the principle of finite rationality. The symbolism believes that the basic element of human cognition is symbol, and the cognitive process is the process of symbolic operation. At the same time, people can be regarded as a physical symbol system, and the computer is also a physical symbol system. Therefore, we can use computers to simulate human intelligent behavior that is, using computer symbolic operations to simulate human cognitive processes. It also believes that knowledge is a form of information and is the basis of intelligence. The core issues of artificial intelligence are knowledge representation, knowledge reasoning and knowledge application. Knowledge can be represented by symbols, and symbols can also be used for reasoning, thus making it possible to build knowledge-based artificial intelligence.

The so-called symbol is pattern, as long as it can be distinguished specific meaning. For example: different English letters are symbols. The basic task of the physical symbols is to compare symbols, identify the same symbols, and distinguish between different symbols.

One of the importance of symbolism is that it points out that it is not important what constitutes this physical symbol system. This assumption is completely neutral. A smart entity can handle symbols, which can be made up of proteins, mechanical motion, semiconductors, or other materials, such as the human nervous system. Computers have the ability to calculate symbolic processing. This ability inherently contains the ability to deduct reasoning. Therefore, by running the corresponding program to reflect s intelligent behavior based on logical thinking, the computer can be regarded as thinking.

The physical symbology hypothesis actually affirms the belief that computers can have human intelligence.

A large number of traditional artificial intelligence research is carried out under this school. Early artificial intelligence mainly studied the chess-playing, the machine proof of logic and mathematical theorem, and machine translation. Later developed expert systems and knowledge engineering are important application areas of artificial intelligence as many well-known expert systems have been developed, providing powerful tools for data analysis and processing, medical diagnosis, computer design, symbolic operations and theorem proving.

The representative result of symbolism is the mathematical theorem proving procedure "logical theorist" developed by Newell and Simon. From the perspective of symbolism, knowledge representation is the core of artificial intelligence. Cognition is the processing of symbols. Reasoning is the process of solving problems by using heuristic knowledge and heuristic search. The reasoning process can be used in some formal language description. (Simon, 1993)

4.2 Behaviorism

Behaviorism, also known as evolutionism or cybernetics, is an artificial intelligence school based on cybernetics and "action-perception" type control systems, which is a non-symbol processing method. “Behavior believes that intelligence does not require knowledge, does not require representation, does not require reasoning; artificial intelligence can evolve gradually like human intelligence (so called evolutionism); intelligent behavior can only interact with the surrounding environment in the real world." (Müller 2000)

In 1948, Norbert Wiener pointed out in “Cybernetics ": "The cybernetics is developed on the basis of self-control theory, statistical information theory and biology. The adaptive, self-organizing, self-repairing and learning functions of the machine are systematic, which are decided by input and output feedback behavior determines".(Müller 2000)

Scholars who have this view that human intelligence has evolved over a billion years on Earth. To make a real artificial intelligence, we must follow these evolutionary steps.

Therefore, they believe that the signal processing ability of simple animals such as insects should be studied and simulated and replicated in the context of a complex real world. AI should have those processing ablity to moving up the ladder of evolution. This solution not only creates practical artifacts, but also lays a solid foundation for the establishment of more advanced intelligence.

The behaviorism approach uses the concept of signals at the lowest stage. Scholars simulate the intelligent behavior and role of people in the control process, research on cybernetic such as self-optimization, self-adaptation, self-repair, self-stabilization, and self-organization and self-learning. Making some progress in the research of these cybernetic. In the 1980s, with the development of computer technology and bionics, a group of researchers, represented by Rodney Brooks, a scientist at MIT's CSAIL, introduced behaviorism perspectives into the study of artificial intelligence and gradually developed new research methods that differed from traditional. At the International Joint Conference on Artificial Intelligence (IJCAI) held in Sydney in 1991, Brooks proposed a challenging "no knowledge" and "no reasoning" intelligent system. He said: "The first thing to do is to understand the life system in a complex natural environment. The nature of survival and responsiveness is then possible to further explore human high-level intelligence issues." (Brooks 2001) He believes that intelligence is only expressed in the interaction with the environment. Instead of adopting a centralized model, it is necessary to have different behavior modules interact with the environment to generate complex behaviors. Therefore, the intelligent system should belong to the specific environment. It should have the senses such as the body and eyes. It should interact with the environment. It can only be the total behavior of the interaction of various components of the system and the interaction between the system and the environment. Brooks believes that since the ultimate goal of artificial intelligence is to replicate human intelligence, then it can start with the intelligence of replicating animals. His representative work is a 6-legged "machine insect" developed by Brooks. This kind of machine insect uses some relatively independent functional units to realize functions of avoidance, advancement and balance.

The basic ideas of behaviorism can be summarized as the following:

1) Formal expression and modeling of knowledge is one of the important obstacles of artificial intelligence.

2) Intelligence depends on perception and action, and should directly take advantage of the machine's role in the environment, taking the environment's response to the action as a prototype.

3) Intelligent behavior is embodied in the world and is expressed through interaction with the surrounding environment.

4) Artificial intelligence can evolve like human intelligence, develop and enhance in stages.

This behaviorism perspective opens up new avenues for human intelligence research. Although some people believe that the machine insects does not lead to advanced control behavior, the rise of the school indicates that cybernetics will influence the development of artificial intelligence.

4.3 Connectionism

Connectionism based on network connection is a method that has been studying in recent years. It is also a non-symbol processing method. Connectionism is also called bionics or physiology. The connectionist school mainly studies the nature and ability of non-procedural, information-processing methods that adapt to environmental changes, similar to human brain, and this school based on neural network and connection mechanisms and learning algorithms. Scholars who have this view believe that the basic element of cognition is not the symbol. The cognitive process should the connection of a large number of neurons. Therefore, research is carried out from brain neurons and their connection mechanisms to understand the structure of the brain and mechanism of information processing. It is hoped to reveal the mystery of human intelligence, thus realizing the simulation of human intelligence on the machine. The connectionist school attempts to simulate the structure of the brain and establish a distributed computing system, so that the system has the ability of self-learning, self-organization, and self-adaptation.

Connectionism is studying the nature and capabilities of non-procedural, practical, brain-working information processing. It is also called neural computing. Due to its rapid development in recent years, a large number of neural network, models, and algorithms have emerged. The neural network is an environment that provides a typical and practical network.

In 1940s, neurophysiologist Warren McCulloch and Walter Pitts tried to prove that the Turing machine program can be implemented in a finite network of formal neurons. They made the first mathematical model of a neural network.

In 1950s, Frank Rosenblatt designed the Perceptron. Trying to use artificial neural networks to simulate the perception and learning ability of animals and humans, form a branch of artificial intelligence, Pattern Recognition, and create a decision-making method of learning. However, due to the limitations of the computer level, many theoretical assumptions have not been realized.

In late 1960s, Seymour Papert and Marvin Minsky mathematically analyzed the principle of the perceptron and pointed out its limitations. This has brought the research of artificial neural networks into a trough, and many research team quickly disintegrated.

Since the 1980s, the limitations of classical Symbolism school have gradually become clearer. However, some scholars and their successors who launched the artificial neural network have made important breakthroughs after years of painstaking research, and the development of computer hardware has advanced by leaps and bounds. The realization of the network is possible. The neural network has risen rapidly and has achieved great success in sound recognition and image processing.

Information is stored in a distributed manner, and the information is processed with a parallel manner. Neural network has self-organizing and self-learning capabilities, is suitable for simulating human thinking, and can obtain an approximate solution quickly. It is these characteristics that make neural networks provide a new way for people to use machine to process information.

5 STRONG AI AND WEAK AI

Weak AI excels in a single aspect of artificial intelligence. For example, there is AI that can defeat the chess world champion, but it does not know how store data on the hard disk. Weak AI is not a smart machine that can really Reasoning and Problem-solving. These machines just look smart, but they don't really have intelligence, and they don't have autonomy. After all, it is only a human tool.

Strong AI refers to the AI that can be compared with human beings in all aspects. It can do the work that human beings can do. Creating strong AI is much harder than creating weak AI. “Intelligence” here refers to a broad ability to think, plan, solve problems, abstract thinking, understand complex ideas, learn quickly, and learn from experience. Such AI can self-conscious. It can think independently about problems and develop optimal solutions, with its own values and worldview system. Having the same instinct as human beings, such as survival and security needs.

Super AI is greater all AI. Oxford philosopher Nick Bostrom defines super AI as "a lot mo re intelligent than the smartest human brain in almost all areas, including scientific innovation, general knowledge and social skills."(Bostrom 1997) Super AI can be better than humans in all aspects, or it can be more than a hundred million times stronger than humans. When the development of AI exceeds humanity, it will exponentially erupt, and AI will greatly promote scientific progress. Nanotechnology and genetic engineering will be greatly improved with the help of AI. If human can achieve super AI, people who have passed away can even be resurrected.

6 TURING TEST

The Turing Test is a test of whether a machine exhibits an intelligence that is equivalent or indistinguishable from human beings.

Alan Turing is a well-known to be the father of computer science and artificial intelligence. Turing affirmed that the machine can think. He also gave a definition of intelligence from the perspective of behaviorism. So he invented the method that a human will have conversation with a machine. They will be separated and cannot see each other. Conversation is only text-conversation. A series of questions and answers, if for a long time, human cannot judge whether the other is a person or a computer based on these questions, then we can think that this computer has the same intelligence as the human-being.

It seems that there is no difficulty in answering the questions raised by the machine according to a certain range, and it can be achieved by programming a special program. However, if the questioner does not follow the usual criteria, the machine for preparing the answer is extremely difficult. For example:

Q: What is your name?

A: White.

Q: What is your name?

A: White.

Q: What is your name?

A: White.

The questioner repeated the same question at 3 times. The machine also answered the same 3 times. That results obviously in not human-like response.

If a real human answered, these answers would be,

Q: What is your name?

A: White.

Q: What is your name?

A: I just told you, it is White.

Q: What is your name?

A: What is wrong with you, I have told you 2 times.

The first one clearly feels that the respondent is extracting simple answers from the database. The second has the ability to analyze synthesis, and the respondent knows that the questioner is repeatedly asking the same question.

The Turing Test does not specify the scope of the questions and the criteria for questioning. If we want to make a machine that can pass the test, we must store all the human problems that can be thought of in the computer. Also the machine has to choose a reasonable answer.

The Turing test has had tremendous influence since its birth, not only with support but also with criticism. One of the most important criticisms was the Chinese Room experiment put forward by John Rogers Searle in 1980. The experimental process is as follows:

A person who knows nothing about Chinese in a closed room with only one little window. There is a Chinese-Chinese handbook in the room, indicating how to handle the received Chinese message and how to respond in Chinese accordingly. People outside the room constantly handed in questions written in Chinese to the room. The person in the room will follow the instructions in the handbook to find the appropriate Chinese characters, find the corresponding answer, and pass the answers with Chinese out of the room. Although people in the room can let people outside the room believe that the house can speak Chinese, he does not understand Chinese at all. Just as people in the room cannot understand Chinese without the handdbook. This result, according to Searle, suggests that no computer can ever understand Chinese or English, because, as the thought experiment suggests, being able to 'translate' Chinese into English does not entail 'understanding' either Chinese or English?

7 ARTIFICIAL INTELLIGENCE TECHNOLOGY APPLICATION

Microsoft has made major breakthroughs in deep learning speech and image recognition, and applied it to many Microsoft products, such as Skype translation, Cortana virtual assistant, who is serving 113 million users every day, and more than 12 billion questions have been answered. Microsoft builds infrastructure for AI services, such as building cloud-based artificial intelligence super-cloud computers. Providing AI learning tools for developers, such as CNTK. And API that provides some intelligent algorithms such as face recognition to simplify the developer's work.

Apple's AI technology has been implemented in many products, such as the introduction of DNN algorithm into speech recognition applications such as Siri, to improve the accuracy of speech recognition. And using deep learning algorithms in the Apple Store to identify if there is account piracy.

Facebook currently has two artificial intelligence labs for AI and machine learning research, which Provides image, voice, interaction and other features for Facebook services. Facebook is currently building artificial intelligence systems through research into virtual reality, augmented reality, and robotic software applications and hardware to achieve interact between artificial intelligence and human life such as, robotic customer service and AI security system.

7.1 Biometrics

Biometric identification refers to a method of comparing human biomarkers, such as fingerprints, faces, irises, to complete identity verification. The main feature of the biometric field is the need to model and calculate a large amount of data, and the parallel computing power and iterative optimization of AI technology can ensure the fast and accurate data processing. In the field of biometric identification, AI can complete the feature extraction of sample data to form training data, train the recognition model through training data and also complete the automatic comparison of biological information through learning.

7.2 Autopilot

The automatic driving system is a comprehensive system integrating environment sensing, decision-making and multi-level assisted driving functions. The entire workflow is completed through terminal collection, calculation and collaborative decision making. In the automatic driving, the work of AI includes the use of the pattern recognition system of machine learning to automatically identify the road condition for the automatic driving system as the basis; by using AI data analysis to complete the decision-making system autonomously.

7.3 Natural Language Processing

A natural language processing is a system that allows machines to understand human language. Based on machine learning algorithms, the general laws of linguistics can be mined from the data to help the machine understand human language.

7.4 Network optimization

The current network deployment is a very complicated problem. It is necessary to consider not only base stations of different standards but also access terminals of different specifications, and at the same time, in order to ensure the quality of service of users and the energy consumption of the communication system itself. Also a large number of parameters needs to be comprehensively deployed for base station transmit power, relay node position, number of antennas. Using neural network can handle complex multi-input data on the one hand, and some fuzzy parameter settings can be processed by membership function, on the other hand.

8 ETHICS OF ARTIFICIAL INTELLIGENCE

Every new application of technology will bring challenges to traditional ethics The development of artificial intelligence technology has brought many challenges in all aspects of society, and people are caught in the dilemma of moral judgment. For example, if AI will replaces human labor, many people can lose their jobs that they rely on. They will not have enough income to feed themselves and their families. AI scientists should keep in mind the ethical questions and consider the risks.

In EU, a serious of indivisible rights have been set up as international rights law by the EU Charter and the EU Treaties. These fundamental rights are legally obligatory in EU and suitable for embedding in AI system, which can inspire people how to develop and use AI system.

- Respect for human dignity.
- Freedom of the individual.
- Respect for democracy, justice and the rule of law.
- Equality, non-discrimination and solidarity.
- Citizens' rights.

According to the fundamental rights of EU treaties and Charter, the European Group on Ethics in Science and New Technologies created a set of 9 basic principles. The European Commission build further on these principles, which list four ethical principles from fundamental rights.

- The principle of respect for human autonomy.
- The principle of prevention of harm.
- The principle of fairness.
- The principle of explicability.

Those principles have to be respected in order to ensure that AI are developed and deployed.

8.1 Ethics of Autopilot

In May 2016, Tesla had the first accident in the United States to cause death due to autopilot. Tesla was on a road with a two-way lane, and the autopilot was on and able to identify any obstacles. At the time, there was a white left-turn truck in front of the Tesla, due to the light Strong, Tesla did not identify the white trailer trucks on the opposite side. Due to the misunderstanding of the information collected by the intelligent system, which maybe the glare that caused Tesla's vision--- The image recognition function was lost, passing directly under the white trailer, the windshield was broken, and the person inside died.

Today, there are indeed some people who can benefit from AI technologies. For example, an older person may learn to drive a car or use long-distance driving due to physical inconvenience. If there is an autopilot that does not need a driver. Autopilot can be very convenient service for people. Autopilot do not become tired and distracted, and can drive on a variety of road conditions such as highways, wilderness, and mountains. In addition to convenient people, autopilot can help us save the planet. Because autopilot are optimized for acceleration, braking, and shifting, they help improve fuel efficiency and reduce greenhouse gas emissions. In the future, driverless cars will help reduce 300 million tons of greenhouse gas emissions each year, which is equivalent to half of the aviation industry's carbon dioxide emissions. Autopilot can significantly reduce traffic congestion, so saving time for drivers around the world and people use all the new free time for working, and productivity will increase dramatically.

Also in ethics, the trolley problem need to be discussed. The problem is that a trolley moving toward, and 5 people playing on the tracks, they do note notice trolley is coming. A worker can control a switch and it can change direction of trolley to side track, but there is a single person on the side truck. The worker has 2 options: do nothing and 5 people die or using the switch and 1 person dies. At same time, the autopilot system will face similar problems. Regardless of the choice, terrible results will happen. The developers try to improve the algorithm, train the AI and prevent the tragedy from happening. Obviously, the training cannot cover all possible examples that may happen in the real world. (Thomson. 1985)

In the trolley problem, the principle of prevention of harm and the principle of human autonomy may in conflict. There is no perfect solution. The fundamental principle of

human means that AI system should be the ultimate goal of realizing the fundamental benefit of mankind.

8.2 Ethics of private privacy

As using of technologies such as data collection, machine learning and AI, personal data is became more valuable, which leads to frequently leak out the personal information. As the development of AI, the depth and breadth of personal data leaking are deepening, and the tension between AI technology and user privacy protection is becoming more serious. Hackers have more ways to obtain personal privacy data with lower costs and greater benefits, resulting in frequent data security incidents in recent years, and even formed a complete industrial chain.

Human face is a kind of personal privacy. Face recognition technology is applied to artificial neural networks, pattern recognition, and computer vision. The face recognition for identity recognition is constantly being applied. Human behavioral or physiological characteristics can be identified as biometrics as long as they are required: universality, uniqueness, stability, and collectability. Face recognition has a very broad prospect because it is simple and convenient to collect, and is more friendly than fingerprints and retinas, less interfered with users, and more easily accepted by users, so it can be authenticated quickly and effectively.

Face recognition can extract the geometric features of the face, and the recognition function can be realized by template matching. The face information of the person is recorded and stored by the face recognition. When someone need to find this person, person can be identified in the crowd of group. However, this may violate people's privacy. If privacy is revealed, it will bring stress to people or troubles in life and become an innocent victim of this technology. Technology companies have also been reported to infringe on user privacy. IBM has acquired about one million photos on Flickr, an image sharing application, to train its face recognition algorithm without user's consent. The huge amount of image data enables IBM's face recognition algorithm to recognize specific users more accurately.

In daily life, whether text messages, telephone or e-mail, many people will receive spam, and most of victims who have never left a personal information to the harassment

companies, which has brought great negative impact on personal work and life. The loss of property caused by personal information disclosure is the most common case.

8.3 Ethics of Robot

In the future, there are sweeping robots, chat robots, entertainment robots, nursing robots, etc., and there is bound to be a new type of social relationship, namely human-robot relationship. It is possible to imagine that the future is likely to be a world where people and robots coexist. Even your colleagues may be robots. As the development of AI technology, more and more work can be done by some AI products. While artificial intelligence brings convenience to human life, it also has a huge impact on employment.

Robots have done so many things for humans, so can robots have human rights? When robots have strong AI like human ability and self- conscious, can robots have rights when they take care of children and the elderly, explore minerals at the sea, assist doctors in surgery, and fulfill their obligations to care for human beings. (Bossmann. 2016)

Robots can be used to fight in military combat. Robots can be autonomous and ruthless weapons with more effective destruction capacity. AI weapons are more dangerous than human-operated weapons, and many counties have begun to develop AI in combat. For example the US Navy announced they plan to develop autonomous drone weapons. These drones can automatically search and eradicate targets without any rest. Stephen Hawking and Max Tegmark signed “Future of life” petition to ban AI weapons. These are so powerful weapons they may cause terrible consequences if criminals control them. (Musgrave Z& Roberts 2015).

8.4 Algorithmic bias

Algorithms are the core of artificial intelligence, and their results of execution directly affect the effect of decision-making. The algorithm is very objective mathematics, but there are still various kinds of prejudice and discrimination as human beings. For example, an image recognition software previously labeled African as chimpanzees. In March 2016, Microsoft's chat robot Tay, which was launched on Twitter in the United States, it became a bad girl with Sexism and racial discrimination in the process of interacting with people. If the algorithm is applied to crimes, credit loans, employment

assessments and other personal interests, discrimination will inevitably endanger individual rights. But this prejudice does not come from the machine itself, which from the root of human culture that computers absorb in learning human experience. Prejudiced AI system can lead to a variety of problems, such as decision-making based on intelligent algorithms may violate human moral or even laws. (Vincent 2016)

AI cannot be trusted to be fair and neutral, because it is created by human beings and can be wrong. AI used to identify people in Google's Photo service, AI usually missed the mark on racial sensitivity or was used to predict potential criminals and showed bias against African people. In fact, no company is willing to develop a racist AI system, but if the content of machine learning itself is biased, then the AI used to complete intelligent decision-making and judgment will inevitably be affected by this bias. (Vincent 2016)

On August 14, 2013, a case of intelligent sentencing using COMPAS system by American courts triggered discussion in American society. Eric Loomis, who is African American, was arrested by police for stealing abandoned cars. Loomis was eventually convicted and sentenced to six years. Loomis appealed that the sentence was obviously too heavy and that the ruling was based on the COMPAS, possibly sentence considered gender and race, so it constituted discrimination. The case led to extensive discussion and analysis of COMPAS system. According to ProPublica, a non-profit organization, COMPAS systematically discriminates against blacks, whites are more mistakenly assessed as low crime risk, while blacks are twice as likely to be mistakenly assessed as high crime risk than whites.

9 CONCLUSION

The software or hardware generated by artificial intelligence technology has human intelligence and even self-awareness due to the embedded intelligent algorithm, which leads to a series of changes in the complex ethical relationship with human beings. Even subverting the ethical relationship of human society itself.

AI research has developed more than half a century. On the way of exploration, scientists continue to innovate and move forward along different paths. Incorrect goals of artificial intelligence development will also lead to the studying of into a dead end similar to "perpetual motion." It should be recognized that AI is a tool for human beings to transform the world and extend their intelligence. It is not expected to create artificial intelligence systems that exceed human intelligence.

In the future, we need to further consider the ethical problems caused by the development of artificial intelligence, strive to avoid negative influences, ensure that technology that transcends human intelligence in some aspects enters human society safely and helps humans meet development needs.

In the future, we need to embed the laws and ethics of human society into the artificial intelligence system. The implementation of ethical principles in the development of artificial intelligence systems requires cooperation between governments, academic organizations, and research and development institutions. For the development of artificial intelligence, developers need to write some basic ethical guidelines, formulate artificial intelligence algorithm, and government need to establish an artificial intelligence ethics censorship system. For the decision-making of AI algorithms, it is necessary to improve the existing laws and regulations, especially the damage of personal property caused by algorithm, and clarify the legal subject and responsibility. There is also a need to ensure that users have the right to know and provide the necessary explanations. The law should also be improved as soon as possible to prevent possible risks for the loss of property, life safety and responsibility, such as autopilot and service robots. Through education and media, ordinary people know the risks and hopes that artificial intelligence technology may bring.

The complexity and professionalism of AI system put forward higher requirements for industrial policy and related legislation. Therefore, all sectors of society should be

involved in this process as far as possible to explore feasible countermeasures for AI risk. People should balance the benefit between government, public agencies, social groups, industry and other groups that may be affected by AI, focusing on the specific problems caused by technological development. Human should prudently promote the technological innovation of AI, ensure that technology does not endanger social security, avoiding the impediment to the development of technology and industry caused by the premature intervention of governmental power in the field of AI. respond to its ethical risks with an open and tolerant attitude, and strive to create a favorable environment for the development and innovation of AI. The fairness, transparency and rationality of the system will promote the healthy and efficiency development of AI technology and its application.

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