

Artificial Intelligence Technology Challenges Patent Laws

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Abstract—The artificial intelligence revolution has brought unprecedented challenges to today's ethical standards, legal rules, social order and public management systems. In terms of Patent law, the main challenge is the patent eligibility of the artificial intelligence invention. Computer technology is the most important technology in the field of artificial intelligence. However, since the 2014 Alice case, the US courts and USPTO have tended to deem computer-related inventions that directed to abstract ideas that cannot meet the requirement of patent eligibility. In order to increase the possibility of patent entitled of artificial intelligence related inventions, patent applicants should focus their construction of the claims to manifest what technical problems the invention are solving or identify the specific improvements that the claims are making.

Keywords- *Artificial Intelligence; Computer technology; Abstract Idea; Patent Eligibility*

I. INTRODUCTION

The emergence of the artificial intelligence revolution has brought unprecedented challenges to today's ethical standards, legal rules, social order and public management systems. It not only conflicts with the existing legal order, but also highlights the defects of the supply of legal system products, and even subverts the legal cognition that we have formed. In terms of Patent law, the main challenge is the patent eligibility of the artificial intelligence invention.

II. ARTIFICIAL INTELLIGENCE REVOLUTION

A. Artificial Intelligence

Artificial intelligence is the ability of machines to execute functions that generally are associated with human intelligence. Psychological activities performed by artificial intelligence techniques include cognitive and analytical activities. They include problem solving, perception patterns, understanding language, answering questions, proving theorems, and learning from experience.

Machine learning is a core part of artificial intelligence. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions. Classification determines the category an object belongs to and regression deals with obtaining a set of numerical input or output examples, thereby discovering functions enabling the generation of suitable outputs from respective inputs. Mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science often referred to as computational learning theory. Machine learning is used to make predictions to improve patient care, avoid credit card fraud, manage financial portfolios, etc.

Deep learning is a specific approach used for building and training neural networks, which are considered highly promising decision-making nodes. An algorithm is considered to be deep if the input data is passed through a series of non-linearities or nonlinear transformations before it becomes output. In contrast, most modern machine learning algorithms are considered "shallow" because the input can only go only a few levels of subroutine calling. Deep learning makes training the neural network easier and faster, and it can yield a better result that advances the field of artificial intelligence.

B. The Development of Artificial Intelligence

Artificial intelligence was founded as an academic discipline in 1956. The Dartmouth Conference of 1956 proposed that "every aspect of learning or any other feature of intelligence can be so precisely described that a machine can be made to simulate it." The Conference was the moment that artificial intelligence gained its name, its mission, its first success and its major players, and is widely recognized as the birth of artificial intelligence. The years after the Dartmouth conference 1956-1974 were an era of discovery, of sprinting across new ground, and is considered the golden years of artificial intelligence. There were many successful programs and new directions during this period. Among the most influential were these: reasoning as search, natural language, micro-worlds, robotics. In the 1970s, artificial intelligence was criticized and financially frustrated. artificial intelligence researchers failed to realize the difficulties they faced. artificial intelligence experienced the first winter, and in the years since has experienced several waves of optimism, followed by disappointment and the loss of funding (known as an "The Second artificial intelligence winter"), followed by new approaches, success and renewed funding.

In the twenty-first century, artificial intelligence technology advanced gradually following concurrent advances in computer power, Big data, and theoretical understanding; and artificial intelligence techniques have become an essential part of the technology industry, helping to solve many challenging problems in computer science, software engineering and operations research. In December 2016, The Guardian declared the year 2016 as "the year artificial intelligence came of age." And reports that "Over the course of 2016, artificial intelligence made the leap from 'science fiction concept' to 'almost meaningless buzzword' with alarming speed," Artificial intelligence has become increasingly proficient in performing intricate human tasks.

Nowadays, artificial intelligence is beginning to play a key role in helping people achieve their goals. Artificial intelligence has brought concrete improvements to the operation of the enterprise. It also demonstrates the ability to

enrich our culture and add joy to our daily lives. Research and innovation are indispensable for promoting the contribution of artificial intelligence technology in our global society.

III. ANALYSIS ON THE TREND OF ARTIFICIAL INTELLIGENCE PATENT

This study analyzed the patent trends in different fields of artificial intelligence sector using patent data mining tools in Questel-Orbit . Questel-Orbit includes Fampat, Pluspat, Fulltext's unique database as a data source, with high quality and deep processing features, can be arranged according to functional requirements. The ORBIT system includes patent data for 107 countries and organizations, full-text patent data for 23 countries and organizations, and design patent data for 50 countries and organizations. Therefore, using Questel-Orbit as a data source ensures data sufficiency and reliability. According to the classification of artificial intelligence in the emerging technology industry research company Venture Scanner, combined with the results of the search test of keywords in the Questel-Orbit Patent Index, the study ended with TI=("artificial intelligence*" OR "Depth learning*"OR "Machine Learning*" OR "Neural network *"OR "Natural language processing*" OR "Speech Recognition*" OR "Computer vision*" OR "Gesture control*"OR "smart robot*" OR "Video recognition*"OR "Voice translation*" OR "Image Recognition*") is the retrieval expression; the time span is 2004-2018, the retrieval time is April , 2018, and a total of 14,042 patent families are retrieved. In this study, 14,042 patent families were used as the data source, and the record was set to “ full record ” , so that each title covered the patent number, title, patentee, abstract, IPC(International Patent classification) code and other information.

A. Top Technology Participant

In this section, we discuss the distribution of Artificial intelligence patent applications by applicant. As shown in Table 1. the top 20 companies are: IBM, Microsoft, Qualcomm , NEC, Sony, Google, Siemens, Fujitsu, Samsung, NTT Hewlett-Packard, Yahoo, Toshiba , D-wave, Hitachi, SAP, Canon, Xerox, GE, Mitsubishi Electric. Most of them are American companies and Japanese companies.

Rank	Applicant name	Country
1	IBM	USA
2	Microsoft	USA
3	Qualcomm	USA
4	NEC	Japan
5	Sony	Japan
6	Google	USA
7	Siemens	Germany

8	Fujitsu	Japan
9	Samsung	Korea
10	NTT	Japan
11	Hewlett-Packard	USA
12	Yahoo	USA
13	Toshiba	Japan
14	D-wave	Canada
15	Hitachi	Japan
16	SAP	USA
17	Canon	Japan
18	Xerox	USA
19	GE	USA
20	Mitsubishi Electric	Japan

TABLE I. TOP TECHNOLOGY PARTICIPANT

B. Key Technology Overview

This study analyzes the IPC codes of related patents in the field of artificial intelligence in the past 15 years. The frequency codes with high frequency indicate that the corresponding technology categories are hotspots in the field of artificial intelligence. Figure 1 shows the artificial intelligence related patents from 2004 to 2018 as the data source. Those key technology are:

Computer technology (4914) , It methods for management (1607), Control (1583), Digital communication (975) , Measurement (830) , Telecommunications (672) , Medical technology (485) , Handling (434) , Furniture, games (430), Electrical machinery, apparatus, energy (389), Transport (346) , Audio-visual technology (320), Other special machines (273), Civil engineering (163) , Other consumer goods (135), Thermal processes and apparatus (134) , Machine tools (115), Analysis of biological materials (102), Chemical engineering (102), Engines, pumps, turbines (79) , Optics (78) , Environmental technology (73), Mechanical elements (61), Materials, metallurgy (60) , Biotechnology (54), Basic communication processes (49), Food chemistry (47) , Semiconductors (38), Textile and paper machines (32), Macro-molecular chemistry, polymers (27), Basic materials chemistry (25) , Pharmaceuticals (19), Surface technology, coating (15) , Organic fine chemistry (11) , Micro-structure and nano-technology (10).

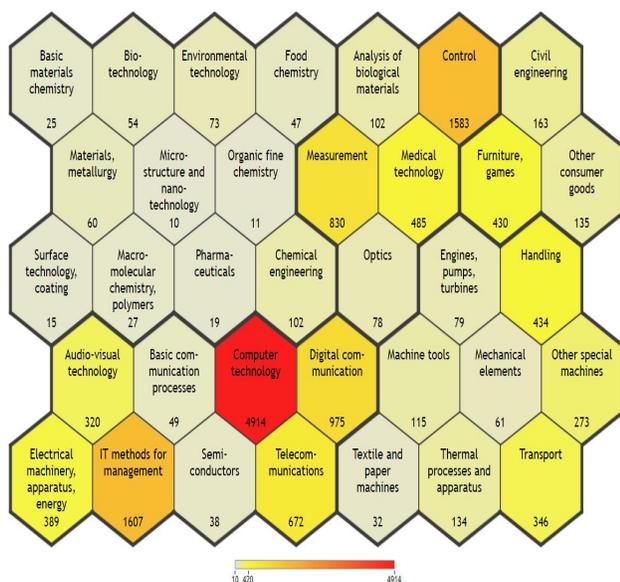


Figure 1. Key Technology Overview

IV. THE PATENT ELIGIBILITY OF THE ARTIFICIAL INTELLIGENCE

The patent system protects inventions. It is designed to encourage innovation in our society. It achieves this by providing the inventors with a monopoly on their inventions within the validity period of the invention patent, which allows the patent owner to prevent others from using the invention without his or her authorization. Artificial intelligence poses a challenge to the identification of the patent eligibility.

A. Patent Eligibility of Artificial Intelligence Inventions

From above context, it can be seen that in the realm of artificial intelligence technology, the number of patents related to computer-related inventions ranks first. Many of the computer-related inventions were held by NPE (non-patent entities). They purchased the patents not for implementation, but for prosecuting potential infringers to obtain huge compensation and Many big companies suffered. In order to limit NPE abuse of this right to appeal, the USPTO has raised the threshold for reviewing computer-related inventions. At present, the implicit requirements for judging patent eligibility may be inconsistent with the nature of artificial intelligence technology. This potential conflict is disturbing because, due to the inherent nature of the technology, if the artificial intelligence invention fails to actually meet the requirements of the patent review, these inventions will inevitably be excluded from patent protection. Artificial intelligence technology cannot be adequately protected under current patent review rules.

For artificial intelligence inventions, the most ominous decision may occur in the case of Alice Corp. v. CLS Bank International(2014). The Alice case a decision of the United States Supreme Court about patent eligibility. The case

involves a patent for a computerized method of financial transaction systems. When only one party is financial, this method can reduce the “settlement risk” exchange agreement to fulfill its obligations. The method proposes to use a computer system as a third-party intermediary to facilitate financial obligations between the parties. The US Supreme Court ruled that the two-step test established by Mayo governed all subject matter of patent eligibility. In particular, for the background of abstract concepts, the Supreme Court established the following two-step framework for computerized invention patent eligibility.

The Alice decision was considered as a huge setback for the application of patent eligibility subject matter rule to computerized invention. It was a broad, categorical exclusion of certain inventions that were deemed “directed to” an abstract idea, natural phenomenon, or law of nature.

B. Technical Characteristics of Artificial Intelligence

Inventions in the field of artificial intelligence include methods for implementing mental steps using computers and devices designed to automate mental steps. Section 101 does not state whether the methods and equipment for implementing the mental steps are eligible for patent. The Supreme Court of the United States held that patents cannot protect mental processes, abstract intellectual concepts, and natural phenomena.

Artificial intelligence technology may be heading in an opposite direction from the inclinations associated with patent eligibility and the mental steps doctrine should be taken with great care in the area of artificial intelligence inventions. For example, inventions applying complex algorithms should not be directly identified as mental steps, especially if cannot be implemented in real life, or humans cannot achieve similar effects. If there is enough time, a sufficient number of pencils and a large enough stack of paper, humans can theoretically replicate some of the claimed artificial intelligence methods. However, in many cases, humans cannot complete their work at the right cost or with the necessary accuracy in a reasonable amount of time, and cannot replace the work of intelligent computer systems. In these cases, it may be erroneous to conclude that the computer system is merely performing a mental step or its equivalent.

C. Surviving in patent examination

On a global scale, the United States has been a pioneer in protecting computer-related invention patents, but the United States has been conservative since 2014 Alice case. In contrast, other countries and regions such as the European Union and China tend to be active in protecting computer-related invention patents. The CNIPA (China National Intellectual Property Administration) Decision to Amend the Guidelines for Patent Examination to stimulate the incentives for computer-related innovation. However, the US market is crucial to the development of artificial intelligence enterprises. It is necessary to discuss how artificial intelligence technology can be entitled patent in the United States.

In the U.S. examination practice, a claim is considered to be patent eligible only when it includes elements substantively different from the non-statutory elements, which demonstrates higher requirements for subject matter. This means that specific technical characteristics and technical contributions are important in judging the patent eligibility of artificial intelligence inventions. The US courts that determine a inventions in the field of artificial intelligence that meet the patent eligibility that point out how the patents at issue specifically described the invention's technical contribution. Therefore, the inventors have two very important skills in writing claims to increase the entitled possibilities of the artificial intelligence technology.

1) *Rooted in Technology*

The patent applicant should be concerned with what the claims are solving. Focus on what the invention has been doing that was not previously done before, even if it is on a generic computer. Do not attempt to make overly broad claims or establish overly broad interpretations of the claims. Instead, the patent applicant should place special emphasis on raising the court's attention to this specific technological problem that the claims are solving.

2) *Improvements in Computer Technology*

The patent applicant should focus their claims to identify the improvement the claims make. In doing so, they should proffer enough facts to prove that this artificial intelligence invention can make non-abstract improvements to existing computer technology. The patent applicant should point to the specific improvements that the software claims are making. Just because claims of artificial intelligence invention may not involve physical components, they may still be subject matter eligible.

V. CONCLUSIONS

The emergence of the artificial intelligence revolution has brought unprecedented challenges to today's ethical standards, legal rules, social order and public management systems. The patent system protects inventions. At present, the implicit requirements for judging patent eligibility may be inconsistent with the nature of artificial intelligence technology and it cannot be adequately protected under current patent review rules. In order to increase the possibility of patents entitled of artificial intelligence related inventions, patent applicants should should focus their construction of the claims to manifest what technical problems the invention are solving and identify the specific improvements that the claims are making.

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