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Artificial intelligence: the implications for patents

By Rainer K Kuhnen, Kuhnen & Wacker

Artificial intelligence (AI) is one of the dominant topics of our time, although it has been around for quite a while. The term was initially coined by John McCarthy, an American computer scientist, at a conference in 1956, who said that "AI is the science and engineering of making intelligent machines".

However, other than in science fiction films, until recently the term 'AI' only occasionally entered the limelight, for example:

- the success of IBM's Deep Blue over the human Chess World Champion in 1997;
- IBM's Watsons victory in a quiz show in 2011; and
- Google's AlphaGo computer program that beat the best human Go player in 2017.

As more and more powerful smart devices are used, AI applications have become commonplace in everyday life. For example, in the form of language assistance systems or the ability to identify and assign faces to people in their own digital images, and 'smart' assistants in mobile phones that try to provide their users with information suited to the current situation by making suggestions or offering help by means of recognised regularities.

AI is now omnipresent in the media, business and science alike, but it seems that the meaning of the term 'artificial intelligence' nevertheless remains ambiguous depending who is using it. Hence, before asking what the implications of AI are for the patent world, it is necessary to clarify what AI actually involves.

What is AI?

AI is a field of research in computer science that simulates human intelligence with machines, especially computer systems. AI research has yielded various mathematical concepts that – implemented by computer – can be used for various applications that range from robotic process automation to actual robotics.

AI systems can be divided into two major categories:

- weak AI, which is also known as 'applied AI', is an AI system that is designed and trained for a specific task – virtual personal assistants (eg, Siri from Apple) are a form of weak AI; and
- strong AI, which is also known as 'general AI', is an AI system with generalised human cognitive abilities, that when confronted with an unknown task has enough intelligence to find a solution.

All systems that we call "AI" today fall into the category of weak AI and can partially imitate human cognitive processes (eg, recognise images, speech or text). Strong AI, on the other hand, is not limited to one field of application (ie, universal intelligence). However, thus far, there is no strong AI in existence.

Therefore, when AI is discussed in connection with patents, it is usually the collective term for various AI concepts or technologies (eg, expert systems, (artificial) neural networks, machine learning (ML) and agents) rather than the vision of general AI (eg, machines that can equal human ability).

After years of slow progress, the wide availability of powerful computers that can perform computationally intensive learning and training practices has been given the development of AI a boost. Simultaneously, the amount of data collected by smart devices in all

areas of technology and society has increased enormously. As a result, the need for automated methods for evaluating such data has, in turn, increased significantly.

In recent years, AI methods have been increasingly used in image processing to recognise objects (eg, in robotics, autonomous vehicles or medical diagnostics), while AI systems using natural language processing has made virtual assistant systems such as Siri or Alexa possible.

These developments are also reflected in patent statistics. At the European Patent Office (EPO), the proportion of computer-implemented inventions in the area of AI-related inventions rose rapidly between 1998 and 2014, especially in the automotive (up from 36% to 63%) and medical technology (up from 31% to 49%) sectors.

The EPO recently addressed this increasing importance with an update of its Examination Guidelines, introducing a new section on AI and ML, which points to some of the problems involved in obtaining patents for AI-related inventions.

Obtaining patents for inventions applying AI

European patent law does not define what an 'invention' is. Instead, it provides for a non-exclusive list of what is not regarded an invention. Though this list does not include AI methods, it refers to mathematical methods and computer programs, which are not regarded as patent-eligible subject matter if claimed 'as such'. 'As such' means that the claimed mathematical method or computer program is devoid of any technical character (ie, there is no technical solution to a technical problem by technical means).

Technical character of AI-related inventions

According to the new guidelines (Section G-II, 3.3.1), AI and ML are based on computational models and algorithms for classification, clustering, regression and dimensionality reduction, such as neural networks, genetic algorithms, support vector machines, k-means, kernel regression and discriminant analysis. Such computational models and algorithms are *per se* of an abstract mathematical nature, irrespective of whether they can be trained based on training data.

Although this characterisation of AI and ML seems to suggest a *per se* exclusion from patentability, this is true only as long as the AI-related inventions are claimed abstractly without any application in a field of technology (ie, without technical character). However, in many cases it is possible to claim a technical application of the abstract AI or ML concept – examples of which include:

- use of a neural network in a heart-monitoring apparatus for the purpose of identifying irregular heartbeats; and
- classification of digital images, videos, audio or speech signals based on low-level features (eg, edges or pixel attributes for images).

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Ultimately, AI and ML methods – although they may be based on abstract mathematical solutions – are implemented in software that runs on computers (ie, computer-implemented processes). Hence, in many cases, AI-related inventions can be claimed as computer implemented inventions (CII), which the guidelines describe as 'programs for computer[s]' (Section G-II, 3.6): "Claims directed to a computer-implemented method, a computer-readable storage medium or a device cannot be objected to under Art. 52(2) and (3) as any method involving the use of technical means (e.g. a computer) and any technical means itself (e.g. a computer or a computer-readable storage medium) have technical character and thus represent inventions in the sense of Art. 52(1) (T 258/03, T 424/03, G 3/08)."

Hence, in practice, it often seems possible to claim an AI invention as a computer-implemented method to overcome the hurdle of technical character and hence exclusion from

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patentability. If such claim language is not desired, the application of the AI method in a field of technology must be included in a claim to pass the eligibility hurdle.

Technical contribution of AI-related inventions for assessment of inventive step

Although the first hurdle (technical character) may be readily overcome in many cases of AI and ML applications by using a CII claim format, the requirements of novelty and inventive step must also be fulfilled. In cases of mixed-type inventions, the EPO poses a second hurdle.

According to the guidelines (G-VII, 5.4), CIIs often have a mix of technical and non-technical features in a claim. However, the positive assessment of an inventive step requires a non-obvious technical solution to a technical problem (ie, a technical contribution to the prior art).

Accordingly, the guidelines further read that for "assessing the inventive step of such a mixed-type invention, all those features which contribute to the technical character of the invention are taken into account. These also include the features which, when taken in isolation, are non-technical, but do, in the context of the invention, contribute to producing a technical effect serving a technical purpose, thereby contributing to the technical character of the invention. However, features which do not contribute to the technical character of the invention cannot support the presence of an inventive step (T 641/00). Such a situation may arise, for instance, if a feature contributes only to the solution of a non-technical problem, e.g. a problem in a field excluded from patentability".

Although this approach is widely used by the EPO, it suffers from the lack of a legal definition for 'technicality'. Moreover, as computer systems can only process digital data (ie, zeros and ones in the form of two distinctive voltage levels), no skilled person would understand a feature of a CII claim to be non-technical, even if the content of the data may be non-technical or used for a non-technical purpose.

Hence, in practice, this approach often leads to a rather arbitrary separation of technical and (supposedly) non-technical features by the EPO Examining Division. Moreover, the objective problem solved by the invention is often arbitrarily formulated as a non-technical problem, while also a technical problem could be formulated.

To avoid a lack of technical contribution, applicants should not use overly abstract or marketing terminology in claiming AI and ML inventions, and instead direct their claims to computer-implemented methods with at least one technical application and related technical effects. Examples of claims recently granted by the EPO in the area of AI may be found in EP 3 117 274, EP 2 850 467 and EP 3 121 810.

Inventions rendered by AI

So far there is no strong AI or general AI, but once an AI technology has quasi-mechanised human thinking, it is capable of creativity. However, this raises the question of the consciousness of the AI and would open up far-reaching legal and ethical problems. For example, during a recent AI conference at the German Patent and Trademark Office – the

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largest national patent office in Europe – the question arose of whether an AI system could be an inventor.

As European patent law does not require human contribution to the state of the art, it might be conceivable that AI systems could 'create' inventions that are patentable just by getting issued with a specific task. An example would be a robot chemist that was built by researchers at Glasgow University and which uses AI to discover new molecules.

However, even the strongest AI could not currently apply for a patent because it is not a legal subject. So far, AI systems and methods are ultimately just another tool that inventors use in their work. Inventions may be generated with the help of AI, but only human beings (eg, the programmer, developer or implementer) can become inventors.

AI in patent offices

In future, it will eventually be possible for the patent examination to be conducted equally and automatically by strong AI systems. Even today, the weak AI systems for text recognition and machine translation are a tool to assist the examiner in the search of the rapidly growing state of the art. The step towards an AI-supported assessment of inventive step is probably only a matter of time. It might be that today's examiners are examining AI inventions that will one day lead to their abolition. As a patent attorney, one would rather not imagine a future in which such strong AI systems examine patents. Fortunately, such strong AI is still science fiction for Hollywood films rather than a reality in a foreseeable future.

Enforcing AI-related patents

To date, there is no substantial case law on patent infringement of AI-related patents. However, it is foreseeable that AI-related patents may have problems with enforcement, as reverse engineering of AI systems is generally difficult. Hence, it is often not possible to provide evidence of use of a patented AI method for making up an infringement suit.

One striking example in the enforcement of AI patents can be found in the field of artificial neural networks (ANNs), which are used in deep learning systems and might reside in the reproducibility of the results. As the weighing of nodes in ANNs is decisive for the result but depends on the data used for the training, even the same ANN layer structure will not yield the same results if the training data is not the same. Hence, the data must be part of the claim in order to allow the assessment of an infringement. However, the training data is often kept secret as know-how or subject to data protection.

A further question may arise in case of an infringement by another AI system. In such instance, it might be questionable if the creator of the infringing AI system acted culpably or at least negligently. However, this is a prerequisite for the compensation of damages in Germany

Comment

AI should be viewed as a science, like nuclear physics, rather than a certain technology. Recent research in this field has yielded various abstract mathematical concepts that have many technical applications in today's world of smart devices and the Internet of Things.

The EPO patent system seems to be ready for the current, new innovations in AI; and patent protection appears to be available for many AI-related inventions. Hence, even though AI methods are generally based on abstract mathematical solutions which are excluded from patentability 'as such', AI-related inventions may be readily patent-eligible subject-matter if directed to CIIs that have an application in a field of technology. Further, when drafting AI-related applications, it is recommendable to include in the specification as much information as possible about the technical application, technical implementation and technical effects.

Problems regarding the right to the patent or inventorship if AI systems can create inventions

are not yet an issue, as machines are not legal subjects. However, strong AI systems that can create all kinds of invention will eventually raise the fundamental socio-political question of whether a non-human creation should be rewarded with a patent.

With respect to enforcement, evidencing an infringing act seems a big challenge. Since it is often not possible to determine exactly how the AI methods work, it is difficult to show that the infringing product used the same method. In some respects, the situation is similar to that found in the field of pharmaceutical patents.

Patent laws across the world were established even before computers existed and it took the EPO 20 years of case-law development to find a workable and systematic approach to software-related applications. It remains to be seen whether this approach proves suitable for the rapid and challenging development of AI super-software in today's smart world. *iam*

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