Protection of inventions in AI and digitalisation

Maiwald Patentanwalts- und Rechtsanwaltsgesellschaft mbH
Christian Schäflein and Fabian Kiendl

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Building IP value in the 21st century

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Protection of inventions in AI and digitalisation

By **Christian Schäflein** and **Fabian Kiendl**, Maiwald Patentanwalts- und Rechtsanwaltsgesellschaft mbH

What we call human intelligence, as we know it today, is the result of a process that has occurred over hundreds of thousands of years – and it has many facets. Humans are particularly good at detecting logical patterns, extracting a needle of relevant information from a haystack of irrelevant information, and rapidly classifying situations in order to take appropriate actions.

In addition, (most) humans gradually become better at performing certain tasks by themselves, by learning from past experience or previous knowledge (such as that contained in textbooks). Specifically, humans can learn in a generalised manner. That is, after learning from a finite number of examples, they are able to use the knowledge gained to address similar problems, even though these particular problems were not included in the finite number of examples. This power of generalisation is a prerequisite for the steady and dependable performance of intelligent tasks.

A well-known example of this is learning how to drive a vehicle. At the beginning of the learning process, perhaps the hardest part is processing the huge amount of information pouring in via the eyes and ears, and rapidly determining the relevant information required to decide what to do next. However, the learner driver improves at these tasks at an amazing pace. Usually, the driver is able to obtain a licence after spending only a few scores of hours behind the wheel and covering, at most, about 600 miles. Once licensed, the driver is deemed fit to handle any unexpected situation that may occur on a journey lasting for many decades and the equivalent of several laps around the world. Moreover, during this time, many of the rules regulating traffic may change and the driver must adapt to such changes. The same applies to train drivers, boat captains and airline pilots who have, primarily for this reason, not yet become redundant, despite their modes of transportation becoming mobile data centres at an ever-increasing pace.

There is a plethora of different artificial intelligence (AI) methods, but they all strive to harness this power of generalisation. Although the desire to put fully automated vehicles onto our roads is certainly a major reason for the extensive research and development in this field, there are many more potential industrial usages, such as security surveillance, automated quality checks during manufacturing and mass screening of medical samples.

Who does what?

It certainly cannot be expected that a buyer of a fully automated vehicle will put it through driving classes before actually using it. Rather, the training of the AI inside the vehicle will be performed by the manufacturer of the vehicle or by the supplier of the AI control unit. All these players benefit from the existence of the fully automated vehicle by making money. Thus, if the existence of the fully automated vehicle is the result of using a certain AI-based device or method, a patent on this device or method should compel all players to pay royalties. Otherwise, part of the effort that has gone into the development may be wasted from the perspective of the developer, who will not fully benefit.

Whether the completed patent will cover all players is determined during the patent drafting process. When the basic structure of the 'claims tree' is developed, the key question is 'who does

what?' Every player who benefits from the basic idea behind the patent may be targeted with at least one independent patent claim that covers what this player will need to do to obtain his or her share of the benefits. In addition, every product that embodies part of the effort and has a separate saleable value may be covered with an independent claim.

It is highly likely that the result of this analysis will indicate that there are several methods and products, so that it may be advisable to draft several independent claims. Even if all of these claims are united by some common idea at the time of patent drafting, there is a risk that the patent examiner will find relevant prior art (ie, evidence of what is already known) that anticipates this common idea or at least renders it obvious. If this happens, the different independent claims may be deemed to relate to non-unitary separate inventions, meaning that the search or examination will cover only the invention that is mentioned first in the claims. To pursue the other inventions further will cost money, in the form of further search fees and/or in the form of one or more divisional applications spawned from the original application. Thus, it may be worthwhile to determine which of the different aspects of the invention is most important commercially and to mention this first in the claims.

In the example of the fully automated vehicle, the key method may be an AI-based image processing method that boosts the accuracy of a subsequent semantic segmentation of the image into objects, thereby increasing the probability that the vehicle will choose the correct action in every traffic situation. This is the smallest unit, which may apply to other use cases. Further independent claims may relate to the use cases of this method, such as controlling an automated vehicle, raising an alarm if something suspicious happens within the field of view of a security camera, or screening the quality of manufactured products. If the training is somehow tailored to the key method in any way (ie, it is not just standard-issue training), then one or more independent claims may be directed to training methods.

Further product claims may relate to hardware aspects of the invention. For example, if the key method itself, or its training, is hardware-accelerated or otherwise advantageously implemented on specific hardware, then this specific hardware may be part of a product claim. For example, a claim may be directed to a hardware module that is specifically adapted to the concrete use case and further comprises the specific hardware.

It is important that the term 'product' is not necessarily limited to tangible products. Products may also be downloadable. While it is a well-established practice that the software implementation of a method may be claimed in the form of a computer program or a non-transitory storage medium with the computer program, a new type of non-tangible product emerges when claiming AI methods.

The training for an AI method, or for a module that implements this method, is usually an onerous task. A sufficiently large set of training data is a prerequisite for any training; in the automated vehicle example, the data comprise many thousands of images captured during the test drives of the vehicle. If the training is supervised (ie, if the method or module is rated by comparing it with some known ground truth), then the set of training data will have to be annotated (labelled) with this ground truth. Very often, this labelling must be done manually and is therefore expensive. Moreover, the data is only the prerequisite for training. The training itself may take weeks to perform on powerful graphics processing units, which again are costly. Finally, the effort of the labelling and training is condensed into a set of parameters (ie, numbers) that represent the results of the training. Anyone who obtains this set of parameters can immediately use the method or module without requiring the training data, labelling or training. Thus, the set of parameters is an asset and a product that may be easily 'shipped' across borders. Therefore, where there is a patent

"It may be worthwhile to determine which of the different aspects of the invention is most important commercially and to mention this first in the claims"

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Christian Schäflein's international clients rely on his expertise in handling disputes across the full spectrum of IP law worldwide. He manages patent and utility model prosecutions on behalf of clients, conducts opposition and invalidity proceedings and prepares freedom-to-operate opinions in the fields of sensor systems, data processing, aircraft construction, medical devices and imaging. As head of the digitalisation and data security group at Maiwald, Dr Schäflein is deeply knowledgable in the areas of artificial intelligence, Internet of Things, data security and autonomous driving. His professional competence in looking after the IP interests of internationally operating corporations derives from, among other things, his detailed knowledge of US patent law.

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Fabian Kiendl was already gathering experience in the world of computer networks at a time when this was still frowned upon. In other words, he was a 'digital native' long before the term was coined. His expertise is very much in demand in all patenting matters relating to machine learning, security, networks and blockchain, as well as software and digitalisation in general. He also prepares patent applications from the fields of physical measurement techniques, energy technologies and signal processing, in particular from the field of science, in which he completed his training in IP protection.

claim directed to something that improves an aspect of the training, a further claim may be directed to a parameter set that has been obtained using the training with the improved aspect.

Do not inadvertently lose sight of broader ideas

Because of the power of generalisation, much of the 'magic' in an AI-based invention is likely to be caused by the presence of AI. However, this does not necessarily rule out the possibility that broader ideas or concepts, which are useful even without the use of AI, may be new and inventive.

For example, an improved method for object detection may involve de-noising or other pre-processing that enhances the quality of images, followed by a semantic segmentation of the images into objects by an AI module. Here, the result of the pre-processing is advantageous on its own, so there may be an independent claim directed to this pre-processing as well.

Further, an AI module may realise a functionality that is claimable as such in a more generic manner, without mentioning AI. An example is the indirect measurement of one or more desired quantities by evaluating certain features in images. The basic idea may be to extract all occurrences of specific features from the images and then process the set of occurrences in a new and inventive manner to arrive at the desired quantities. It may not matter so much which method is used to extract the occurrences. This certainly works well with AI, but also with other kinds of computer vision, or even with manual marking of the occurrences by mouse clicks. All that matters is that the desired quantities are made available once the set of occurrences has been obtained.

Care must be taken when using digitalisation buzzwords such as 'blockchain' or 'cloud'. The attention attracted by these buzzwords does not necessarily imply that they need to be included in the independent claim. It may be worthwhile dissecting the technical meaning of the buzzword into smaller components and checking which of these components are essential.

For example, in most inventions where the buzzword 'blockchain' occurs, the goal is not to create a new cryptocurrency. Rather, in many applications, the blockchain is used merely as a write-once, read-many memory. If this is the case, one may write 'write-once, read-many memory' in the independent claim, and move 'blockchain' to a dependent claim.

As always, while the scope of the claim should cover the '100% solution' that will be marketed, it should not be restricted to this solution. Ideally, the scope of the independent claims should also cover cheaper solutions that deliver, for example, 30% of the performance at 10% of the cost.

Anticipate common objections

Like the use of computers, the use of AI has become standard. The mere presence of AI or other computing-related features in a claim may not render the claim inventive. This is particularly true in the case of patent claims lodged with the European Patent Office (EPO) and other offices that adopt the problem-solution approach to assess inventive step. A differing feature may render the claim inventive only if it has a concrete technical effect in a technical system. In other words, something should happen besides merely pushing bits back and forth.

In one recently published example (DE 10 2017 212 839 A1), the invention consists of a monitoring module that is designed to keep a self-learning AI module focused on its assigned task. It is known that humans sometimes get distracted from their work and shift to other unrelated things because of associations formed in their minds. For example, when encountering the name of a city, this may trigger an association with that city's football team. The same thing may happen if the parameters that characterise the behaviour of an AI module are not set in stone after training the module, but the module is allowed to self-learn and tweak its parameters further to continuously improve its operations and remain up to date. The monitoring module checks the output of the AI module according to pre-determined conditions and, if the conditions are not met, the output is discarded and is not passed on to the technical system. That is, if the AI module gets distracted from its assigned task and this is visible in the output of the module, then the module's output will be ignored, metaphorically placing it in 'time-out', akin to a child who has misbehaved. Then, the self-learning AI module will realise that the module's output is being ignored and will bring the AI module back on track.

So, what is a technical effect here? Why is it a technical problem if the AI module 'thinks' of something else, particularly if it is still able to perform its normal function?

The issue is that even if the AI module still performs its normal function, 'thinking' of something else as well consumes computing power and electricity. If the electricity comes from a battery, the end user will suffer as a result of reduced battery performance. For example, if the object recognition system of a fully automated electric vehicle suddenly starts to play chess against itself, regardless of whether the vehicle is moving, the end user will soon notice that the range of the car is progressively degrading. He or she may suspect a battery defect and purchase a replacement for this most expensive part of the whole car, only to find that the problem persists. Such a problem is avoided through the monitoring module.

Although this example may be considered extreme, it illustrates the following key observation: whether discussing an invention in the field of AI or another digitalisation technology, advantageous technical effects need to be achieved, and it may be worthwhile considering disclosing them in the description of the patent application. When moving on from drafting the claims tree to drafting the description, it may be prudent to go through the claims one by one to identify at least one technical advantage for the features in each claim. This may prove beneficial during prosecution and reduce problems later. When responding to office actions, it is convenient if the problem-solution argumentation is readily available in the description and does not have to be reverse engineered perhaps years after the original application was drafted. Also, if the asserted advantages are disclosed in the description, the patent office is much more likely to give credence to statements regarding the technical effect of certain claim features.

If the subject matter is complex and mathematical, it may be advisable to clarify the description using real-world examples (eg, with

this feature, in this situation, the vehicle will stop; without this feature, the vehicle will roll into the water). However, it is worth being aware of spacing such examples too far apart; if the examiner considers that the subject matter of the invention is non-technical, it can be an uphill battle to reset this impression.

Back up

A final piece of advice is that in relation to applying for patents in Europe, it is advisable not to consider only the European Patent applications. If an AI-heavy or computing-heavy patent application meets resistance before the EPO, one or more parallel national application in countries that have not closed the national route to obtaining a patent via the Patent Cooperation Treaty may be worth their weight in gold.

Comment

Even though AI and digitalisation are fairly new and partially uncharted fields in patenting, there is no need to refrain from entering these fields. Rather, because the 'publish or perish' pressure from the peer community is higher in these emerging fields of science, it may be impractical to keep the newest developments secret for a long time. In this situation, having a patent application pending may provide peace of mind. *iam*

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