REDDIE & GROSE

Patent, Design & Trade Mark Attorneys

AI in an IP World

What, when, how, where?

2021 Edition

From the Editor

Our Artificial Intelligence (AI) newsletter is a collection of insights into how patents can protect AI related inventions and one insight into what AI can do for the intellectual property world.

Fundamentally, AI is based on mathematical algorithms which can be tricky to patent. The same is however true of video compression for which there are many thousands of granted patents. Patents can be, and are, granted for inventions which address the mechanics of how an AI operates (core AI) and for inventions which use available AI platforms to deliver a solution in diverse fields such as telecommunications, transportation, life and medical sciences, financial transactions and data security (AI related inventions). In this edition, Chris Smith provides a primer on patenting AI in Europe, Connor Crickmore reviews some medical imaging related patents in a field where many patents for AI related inventions are being granted and Lizzie Alexander considers patents and AI in the music industry.

As AI becomes increasingly integrated in technologies we depend on in our everyday lives, it is important that the patent system incentivises individuals and companies to invest in research and development of new AI techniques and applications. The patent system needs to be fit for purpose as far as both core AI and AI related inventions are concerned. AI continues to have a high media profile but general public interest often centres on ethical questions such as should an AI be named as an inventor, are AIs inherently biased or who owns the massive data sets required to train an AI. AIPPI, an international body for IP protection, resolved in 2020 "In order to foster innovation, inventions made using AI should not be excluded from patent protection per se, regardless of whether or not there is sufficient contribution by a natural person to be named as an inventor and provided that there is a natural or a legal person named as an applicant". The preliminary opinion of the EPO board of appeal on the DABUS case (EP patent applications which named an AI as inventor discussed in more detail in Mark Bentall's insight) points to a pragmatic way forwards but is yet to be tested in law.

Patent Offices around the world are holding consultations with their AI and IP communities to ensure the patent system remains fit for purpose and the complexity of the issues discussed by the IP community is advancing in step with the maturation of AI field. In this issue, Rob Wiseman reports on a recent UK consultation. This year, AIPPI sought views from the international patent community on inventiveness and sufficiency of disclosure in AI inventions addressing whether use of AI has an impact on the inventive step threshold, whether the concept of "skilled person" needs to be adapted and whether the framework for assessing sufficiency of disclosure is still fit for purpose for both core AI inventions and AI assisted inventions. These and other ongoing discussions and consultations will continue to shape changes in patent law and its application with respect to AI inventions. Patent Offices continue to review how computer implemented inventions, including AI inventions, are handled and to provide additional guidance for both patent examiners and patent applicants in handling AI patent applications.

We have seen, and continue to see, a rapid increase in the number of patent applications for AI inventions being filed with patent offices around the world. Whilst this will mean an increase in the number of cases that are rejected, such as the UK High Court case decision reviewed by Mark Bentall, it is important to remember large numbers of AI patent applications are granted. The UKIPO reported at a CIPA computer implemented inventions webinar in May 2021 that, whilst there are some differences in the grant rate for AI inventions compared to the overall grant rate for different patent offices around the world, for the majority of countries any difference is small.

Our experiences suggest that AI patent applications are easier to progress in China, Japan and Korea. The US Patent Office is currently viewing AI related applications very favourably and the number of AI related patent applications filed and granted by the European Patent Office is definitely on

the increase. As with any other computer implemented invention, many, but not all, AI inventions are patentable. The outcome of any AI based patent application will depend on the details of the invention as well as how different it is to devices and methods that have gone before.

At Reddie and Grose we have a team of attorneys with a wealth of experience in protecting computer implemented inventions, including inventions which concern and exploit artificial intelligence. If you would like help protecting your innovations in this, or any other, technical field then please get in touch. We would also be interested to hear your views on any of the subjects discussed or any AI and IP related matter.

Short biographies of those attorneys and assistants whose insights are included in this newsletter can be found in the meet the team section. Biographies of our other experienced attorneys and assistants can be found on our website here.

Julie Richardson • Editor

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The articles in this magazine are for general information only. Its content is not a statement of the law on any subject and does not constitute advice. Please contact Reddie & Grose LLP for advice before taking any action in reliance on it.

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(Artificially) Intelligent Patent Searching?

As anyone who has performed a patent prior art search, a freedom to operate search, or indeed a patent related search for any other reason will confirm, finding relevant patent documents is not as easy a task as it may initially appear. Legalese, different terminology used in different fields of technology, and documents in different languages all conspire against the humble patent searcher. And whilst a number of tools exist to aid patent examiners and other searchers, most notably the extensive patent classification systems (the CPC has over 250,000 categories!), any further help will no doubt be welcomed.

As well as easing the burden of those actually doing the searching, increasing the ability of searchers to find relevant documents will also help both patentees and actors in the marketplace without patents of their own.

A more robust search during the patent application process will mean that a patentee can be more assured that the resulting patent is valid and valuable, whilst improved freedom to operate searches can give greater confidence to a manufacturer or importer before they enter a market that they are not infringing any third party rights.

A 2020 study into the feasibility of using AI to assist patent searches was carried out by Cardiff University and commissioned by the UKIPO. The objectives of the study were to evaluate the viability of different AI technologies for patent prior art searching, test different approaches to identify the most effective algorithms, and to fully evaluate an optimal solution. Areas of AI technology that were reviewed included natural language processing, supervised and unsupervised machine learning, and semantic knowledge, and a number of key challenges were identified, such as legal wording, long sentences and the technical nature of patent claims.

While overall the study concluded that it was not then feasible to provide a fully automated patent searching solution, it nevertheless identified areas where the use of AI could aid a human when performing a patent search. As the report puts it, in the proof-of-concept approach developed, "the user keeps the role of the key decision maker, whereas the AI provides intelligent decision support". Such areas where the use of AI was found to be of assistance included ranking documents returned by a search by relevance and in classifying patent documents. On the other hand, no AI technique was found to be effective at processing, or "reading", a patent and generating a search query. Ultimately, the specialist expertise and experience of a human patent examiner was still required to generate a search term to initiate the search process, even if AI could help interpret the results.

It would seem that patent examiners at the UKIPO and other patent offices around the world are not yet replaceable but that they would increasingly benefit from an integration of AI search tools into the patent examination process. Who knows, maybe one day we'll have AI patent examiners performing searches for AI patents for inventions invented by AI...

Author: Andy Attfield

Can AI be designated as an inventor?

AI inventions can be patentable and have to meet the same technical criteria as patent applications in other fields: that is they need to be novel, inventive and capable of industrial application. As well as these technical considerations, patent law imposes other constraints on entitlement to a patent. One of these other constraints is that, in most countries, a patent application must name the devisor of the invention, that is a patent application must name one or more inventors.

In January 2020 the European Patent Office published its decision refusing two European patent applications in which an AI system, named DABUS, was designated as inventor. The applications failed before any assessment of technical contribution because the legal framework of the European patent convention requires that the inventor must be natural person, or in other words a human.

The decision of the European Patent Office made clear "The [European Patent Convention] does not provide for non-persons, i.e. neither natural nor legal persons, as applicant, inventor or in any other role in the patent grant proceedings" and also commented that various national courts have issued decisions to the same effect and that it appeared to be an internationally applicable standard that an inventor must be a natural person.

In other words, the whole legal framework of the European Patent Convention is based on the premise that the inventor designated in a European patent must be a natural person. A computer cannot be designated as an inventor. cannot be designated as an inventor.

This is not particularly surprising given that the patent system was developed to reward humans by providing a time-limited monopoly for an invention in exchange for a public disclosure of how their invention works. Indeed some patent systems have been around for hundreds of years which, of course, predates computers and AI technology in particular. It remains to be seen if or when patent systems will be adapted to this and other technology in the future.

However, recognition of AI as an inventor would require significant change to current patent systems and so seems unlikely in the near future.

The group behind the two European patent applications refused by the European Patent Office openly acknowledge on their website that they "seek intellectual property rights for the autonomous output of artificial intelligence". And although the applications have been refused, they have certainly succeeded in raising public awareness of the issue and AI in general.

The decision was open to appeal but without a fundamental change in the law, any appeal to have DABUS, the AI, listed as the inventor on the patent application seems certain to fail.

The case will be decided at an oral hearing scheduled for December 2021. In its preliminary view, the Board of Appeal indicate "In the preliminary view of the [European Patent Office Board of Appeal], under the [European Patent Convention] the inventor designated for the purpose of a patent application must be a person having legal capacity. …Legal capacity means the ability, according to a source of law, to the subject of rights and duties. Whether this legal capacity exists is governed not by the [European Patent Convention] but by national law".

More importantly, the Board of Appeal suggested a way for inventions made by AI to patented without falling foul of the inventorship requirements when it shared its view "A decision dismissing the appeal … would not mean that under the [European Patent Convention] an application is to be rejected where the applicant refuses to indicate a natural person as inventor because in his opinion the invention was made without any causal human contribution. …Such a decision would mean only that the applicant, while remaining free to explain in the specification of the patent application how a claimed technical teaching was made, would have no right to indicate a machine as inventor in the [patent application] form".

The oral hearing will be public and anyone can attend.

For the time being, in order to be certain to avoid refusal at the formalities stage, European patent applicants will need to ensure that a natural person or in other words a human is always designated as an inventor on any European Patent application they file. As an alternative, when an AI is deemed the devisor of the invention, it seems likely that a refusal to name an inventor on the application form coupled with a statement of how the AI devised the invention will be sufficient to move the examination from formal requirements to thorough examination of the technical merit of the case.

Interestingly, each of the Japanese, Korean, People's Republic of China, United States of America and European Patent Offices have followed a similar approach not to allow an AI system to be designated as inventor. These five patent offices are responsible for 80% of the world's patent applications.

In September 2021, a US court affirmed the USPTO view that AI cannot be cannot be an inventor under the US patent act and in a separate case in the UK, in similar reasoning to that of the European Patent Office, the UK High Court dismissed an appeal against a UK IPO decision to refuse a patent application listing AI as an inventor because "DABUS is not, and cannot be, an inventor within the meaning of the 1977 Act, simply because DABUS is not a person".

Thus, it is clear that a change of law will be required if AI is to be recognised as an inventor in Europe or the UK.

Other jurisdictions, however, have adopted a different approach. For example, the South African Patent Office granted a patent, ZA202103242B, for the DABUS invention in July 2021 which lists the inventor as "DABUS, The invention was autonomously generated by an artificial intelligence". It is notable however that patent applications in South Africa are not subject to substantive examination.

Finally, the Australian Federal Court has held that the DABUS system can be named as an inventor on a patent application. However, the Australian Commissioner of Patents has decided to appeal the decision, as set out here, and so it remains to be seen whether the decision in Australia will stand.

Author: Mark Bentall

Spot-ify the difference – Patents and AI in the Music Industry?

AI is increasingly used in all areas of businesses to give companies an edge over their competitors, and the music industry is no exception. One example of such a use over the past few decades is how people have used AI to write music. This involves feeding an AI large amounts of data from music and the AI learning what musical characteristics and patterns a listener will enjoy. AI has even been able to create music to fit a specific genre.
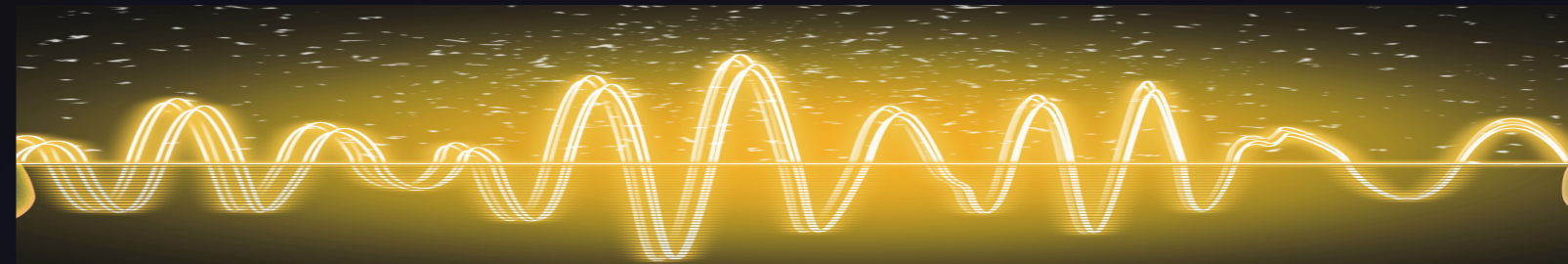
Most uses in the music industry are more behind the scenes. For example, Spotify, the streaming provider, is a keen user of AI, leveraging its power to improve its services and to create a loyal consumer base. The company uses AI to market music specifically for each listener, and create playlists based on what they think the listener would enjoy based on their previous listening history. This means that the longer a customer uses their service, the more fine-tuned the suggestions provided by Spotify are. Being able to provide such a personalised experience provides a big incentive for users to stay with Spotify's platform instead of turning to another service provider.

Not only does this improve the experience of the listener, but it can also improve the music industry for artists using the platform, whose music would not otherwise become as well known. Indeed, according to the BPI, which represents the recorded music industry, in 2005 the top 10 artists were responsible for 13% of all sales, whereas in 2020 the top 10 artists accounted for only 5%. No doubt the ability of Spotify's algorithms to expose listeners to smaller artists they would otherwise not encounter has aided this democratisation of the music industry (though that's not to say that the issue of how much royalties such streaming services pay to artists has been settled). It is no surprise, therefore, that Spotify are continuously developing ways to utilise AI across all areas of its services. For example, a patent application filed in 2019 is directed to the observation of a user's emotions so that music that reflects their emotions can be automatically played, and another recently published patent application is for the use of AI for determining plagiarism in music. In this latter patent application an AI is trained using computer formatted 'lead sheets' (a lead sheet contains the essential elements of a song). A test lead sheet for a new song is passed through the trained plagiarism detector and similarity measurements of portions of the new song to the training dataset are indicated. From this, an assessment can be made whether the music is likely to infringe another musician's copyright.

Indeed, there have recently been a number of high profile cases related to copyright infringement of music, such as the US case on the Blurred Lines trial which concluded in 2018. Experts and lawyers are normally relied upon to give opinions on whether a particular song-based copyright is infringed. It would seem that Spotify have detected a gap in the market which they are trying to capitalise on. Unsurprisingly, given that AI research is often an expensive process, they are turning to the patent system to try to protect their technology and their investment.

A look at the research area of Spotify's website gives an insight into the amount of research that is being carried out, large amounts of which is based on AI technologies such as machine learning. Examples range from music creation to understanding voice commands, and illustrate just how vast the uses of AI in the music industry are, and how it can be used to improve customer experience. Reflecting the large amount of research that Spotify are carrying out is their increasing number of patent applications. A search on TotalPatent One shows that they have filed a total of 195 patents in Europe, with 2020 being the highest number yet.

However, despite AI's increasing use in almost all areas of technology, it can be more challenging to gain patent protection for an AI related invention. This is because AI is based on computational models. Computational models are a type of mathematical method and mathematical methods 'as such' are excluded from patentability under Article 52 of the European Patent Convention. This means that patenting core AI technology by itself can be difficult. Nevertheless, there are a number of ways that AI can be protected, such as by focussing on how an AI interacts with or controls real world objects. The number of AI related European patent applications is rising steeply and, after a thorough examination by the European Patent Office, many of these will become granted patents.

Author: Lizzie Alexander

High Court considers patentability of AI technology in the UK

Artificial Intelligence (AI) continues to be in the news in the Intellectual Property world.

In a development in the UK, a decision to refuse an AI patent application was heard at appeal by the UK High Court. Interestingly, the appellant was unrepresented at the High Court hearing and the judgement was remotely handed down on 22 January 2021.

Background

The UK IPO originally refused the patent application on the basis that the application was excluded from patentability under section 1(2) of the UK patents act as being a computer program as such. Broadly speaking, the application relates to a structured array of data that is said to enable the evolution of AI.

In more detail, the specification explains that for AI to evolve without human intervention, the structure of the AI must be designed in a way that allows the AI to pass on who it is and/or what it knows with as much ease as possible using a "genome" that contains the genetic information of the AI. The specification also explains that for the AI genome to be used in machines, three components are required, namely:

- The genome itself – structured similar in nature to the structure of a human genome;
- An Artificial Intelligence Genome Organizer containing information about the genome; and
- An Artificial Intelligence Genome Controller which is a program used for the automation of genome activity.

Unfortunately, the specification does not provide much more specific detail beyond this, and there was a lack of specific examples as to how the AI evolves so that it can perform better than previous generations or versions of AI.

The High Court Decision

The Court followed the same legal test as the UK-IPO in determining whether an invention is excluded from patentability under section 1(2).

The (Aerotel/Macrossan) test is outlined here, and in summary the test has 4 steps which are to:

1. Construe the claim;
2. Identify the actual contribution;
3. Ask whether it falls solely within excluded subject matter; and
4. Check whether the actual or alleged contribution is technical in nature.

Having determined that the contribution of the claimed invention was a particular way of structuring and organising data that may allow for the production and evolution of future AI code, the judge went on to agree with the UK IPO that the contribution was not technical in nature.

The AT&T signposts

So why was this considered not to be technical in nature? The judge referred to the AT&T signposts which, if met, point to a technical contribution.

Firstly, judge noted that the specification does not describe in any detail how the way of structuring and organising data leads directly to the creation of physical systems outside a computer. Rather, it merely suggests that replicating the structure of computer code in the same way that the building blocks of biological life are organised should lead to the same results in computer systems as observed in nature. The judge commented that this is a theoretical effect and there is no direct external technical effect outside the computer, so that the first signpost was not met.

Secondly, the judge commented that the second signpost points to a technical effect when the contribution is made at the level of architecture of the computer or where the effect is produced irrespective of the data being processed or the applications being run. However, in the present case, the organisation and structuring of the claimed AI code did not operate at an architecture level, irrespective of the data being processed or the applications being run. Thus, the second signpost was not met.

Thirdly, the judge noted that the third signpost says that a technical effect can be found when the invention results in the computer being made to operate in a new way. However, the judge noted that in the present case, there was no evidence that a computer system was being made to operate in a new way, so that the third signpost was not met.

The fourth signpost was not considered to be relevant to the present case. However the fifth signpost, where a technical problem is solved by a technical solution, rather being circumvented by a non-technical workaround was considered. Unfortunately for the appellant, the judge commented that there was no evidence that the problem of making AI evolutionary (nor any other problem) had actually been solved using the system described in the specification.

It is also interesting to note that in the decision, the judge added the following comment in relation to "alleged technical contribution".

Mr Birss added the words "or alleged contribution" in his formulation of the second step. That will do at the application stage—where the Office must generally perforce accept what the inventor says is his contribution. It cannot actually be conclusive, however. If an inventor claims a computer when programmed with his new program, it will not assist him if he alleges wrongly that he has invented the computer itself, even if he specifies all the detailed elements of a computer in his claim. In the end the test must be what contribution has actually been made, not what the inventor says he has made.

So does this mean that AI inventions are no longer patentable in the UK?

In short, the answer is no.

Rather, the High Court has confirmed that the UK IPO correctly applied the legal test as to whether the claimed invention was excluded from patentability. However, under the right circumstances, AI inventions are patentable in the UK and other countries as well.

Takeaway points

So what can we learn from this case?

Firstly, in a communication from the UK-IPO during early prosecution of the application, the examiner was of the view the application provided very little specific technical detail upon which to base a search and invited the applicant to withdraw the application and to request a refund of the search fee. So in essence, the UK IPO had serious concerns at an early stage that the specification did not disclose the invention in sufficient detail to allow the skilled person to reproduce the invention.

Therefore, it is always worth considering whether specific examples, such as specific data types can be included in the patent specification to illustrate how these are used by the AI to achieve the claimed benefits.

Further, it is also worth considering if evidence can be provided in the specification which shows that the alleged technical contribution does indeed result in an actual technical contribution when implemented on a computer. The evidence may be in the form of specific examples and technical data, applied to specific use cases, which show how the claimed AI invention results in an actual technical contribution when running on a computer. Alternatively or in addition, it is worth explaining in the specification how the AI invention has been developed to take into account the underlying technical operation of the computer system on which it is run. This may help in showing the presence of an actual technical contribution.

Author: Mark Bentall

Government responds to the AI IP call for views

We [reported](#) in September 2020 that the UK Intellectual Property Office (UKIPO) set out a call for views on Artificial Intelligence (AI) to understand the implications AI might have for Intellectual Property (IP) policy. The UKIPO set out questions relating to each of: patents, copyright, designs, trade marks, and trade secrets. In the government's words, the aim of the call for views was to understand the relationship between AI and IP. It did not seek to consider the impact of concepts such as AI superintelligence, or an AI as a legal entity. The call for views indicated a willingness to listen, and it was hoped that this would be beneficial for patentees, as well as the AI industry as a whole.

We at Reddie & Grose had the opportunity to discuss the UKIPO's call for views, and in particular the UKIPO's questions relating to patents, with industry leaders which provided a good insight into the industry's view on the UKIPO's approach to AI, the impact the patent system may have on AI moving forward, and how it may be improved.

While some questions brought about differing views, a consistent topic of agreement is on the IPO's exclusions to patentability, and in particular how the IPO approaches the rapidly evolving field of AI while applying sections of the Patents Act prepared before 1977. It seems there is a strong appetite for a change in approach, particularly relating to patentable subject-matter, in order to acknowledge and keep up with the significance of computer implemented inventions and especially those related to AI. The current interpretation of the exclusions can make it difficult to obtain patent protection for some AI based inventions, thereby de-incentivising innovation and indeed research and development (R&D) spending in this sector.

This is particularly the case in relation to advancements in AI itself.

In March 2021, the government provided the outcome of the consultation and set out its response to the call for views here.

The call for views received 92 responses. This is positive in that it demonstrates significant interest and engagement from the technology sector, but the responses (discussed more below) demonstrate a desire for change. These responses came from various sources including individual IP attorneys, trade bodies, industry associations, tech sectors, creative industries and other sectors.

While the UKIPO's questions related to patents, copyright, designs, trade marks, and trade secrets, it was generally felt that the law relating to the latter three areas of intellectual property is adequate to address challenges of AI at present, but should be kept under review. In relation to copyright, the main area of focus was the importance of putting human creators first, and in particular, it was stated by some that works created solely by AI should not be protected by copyright at all. This piece, however, will largely focus on the views on the patents-related questions. The views can helpfully be split into four themes set out in turn below.

1. Aims of the patent system

The UKIPO asked, what role can/does the patent system play in encouraging the development and use of AI technologies?

The majority of responses were positive, suggesting that the patent system strongly encourages work in the field, but highlighted that there is scope for improvement. It can be difficult to protect investment without intellectual property (IP), and in particular, patents. Investment is also often difficult to find without governmental R&D benefits, which can require patents to obtain.

In 2018 in the AI sector deal policy paper, the UK government set out an aim of raising total R&D investment to 2.4% of GDP by 2027 and 3% over the longer term with the AI sector playing a growing role in meeting this ambition with a potential contribution of £200 billion or 10% of UK GDP by 2030. It is hard to imagine that such an increase will be achievable without IP incentives allowing innovators to protect their inventions.

This economic argument is strong in favour of the

patent system being more favourable to AI. In an evidently growing field of technology, incentivising innovation will directly increase spending and thereby create many good jobs with high earnings in the UK. However, while adjusting the patent system to look more favourably on AI inventions, it is equally important to ensure that a reasonable scope of protection is granted to an applicant. Providing a full term of protection with a scope that is broader than is warranted may hinder innovation and discourage innovators.

The government acknowledges the economic importance. Under "next steps", the government states that they will: "Commission an economic study to enhance our understanding of the role the IP framework plays in incentivising investment in AI alongside other factors. This will draw together the international evidence. Additionally, engage with other government departments to gather emerging data and understanding of the drivers of the AI sector in the UK context. This will provide an evidence base on which to judge whether there is a rationale for further intervention in the area".

2. AI as an inventor

This has been a hot topic of late, particularly with the High Court's decision on the "DABUS" case concerning ownership and inventorship of an invention created by a "Creativity Machine" (a particular type of connectionist AI).

There is often a lack of distinction between AI general intelligence and AI narrow intelligence, the latter being the type of AI currently in use. It is important to frame discussion in the context of what contribution a human makes in the inventive process. What should be assessed is whether a machine can make an equivalent contribution. Generally, there was a consensus that AI itself should not own intellectual property rights. But there were differing opinions on whether works or inventions created by AI should be protected. In particular, there was a division in opinion whether it was possible for AI to devise an invention without human involvement. It was generally agreed, however, that without the existence of an AI general intelligence, current AI systems cannot be considered independent agents seeking patent rights. For that reason, most respondents did not feel there was a moral case for recognising AI as an inventor. A few respondents did caution that it may be more honest or transparent to recognise AI systems as inventors in order to prevent people taking false credit for contribution to an invention, merely because they own or control the AI system.

Arguments were made that providing patent protection for AI generated inventions would encourage innovation, as those who build, own and use AI would be able to protect their investments in research and development.

When asked: should patent law allow AI to be identified as the sole or joint inventor?, it was acknowledged by some respondents that the definition of "inventor" in patent law should be clarified, with a suggested definition given as "a person by whom the arrangements necessary for devising an invention are undertaken". On a similar note, the UK Patents Act does not define "invention". Fundamentally, therefore, how do we distinguish what is or isn't an invention? There is a general feeling that an "invention" must be derived by a human mind, but this fundamental definition of invention may need clarification and there is the potential for litigation on this point.

The government acknowledges the view that the current approach to inventorship criteria potentially has a detrimental impact on innovation, including transparency in the innovation process. They recognise that AI systems have an increasing impact on the innovation process and "want to ensure the intellectual property systems support and incentivise AI generated innovation". To that end, the government aims to consult later on in 2021 on a range of possible policy options, including potential legislative change.

3. Conditions for Grant of a Patent

Patent Exclusions

The exclusions of the UK Patents Act (UKPA) section 1(2)(a) and (c) (patentable inventions) were a main concern for many respondents. Whilst it does depend on the type of AI innovation, it is generally felt that the UK patent system needs to be brought in line with modern technology, allowing it to become more fair to AI inventions. Interestingly, this view was expressed across all categories of respondents, who argued there is less incentive to innovate without access to patent rights.

Most notably, this applies to core AI development. Strong opinions were submitted that, fundamentally, evolution of the AI technology itself has to be patentable. These improvements to AI itself are rare and difficult, and will be very widely used.

Inventors of these must therefore be rewarded for their efforts. This is a very different question to inventions made using AI and must be distinguished as such.

Developed case law makes it such that patenting improvements to AI is difficult in the UK. Improvements to AI algorithms are often considered excluded mathematical methods as such, as it is considered that there is no purpose or specific technical problem being solved and the computer system itself is not being improved. Classification is not considered a technical process, and that is essentially at the core of the technology. The issue, potentially, is that there is no acknowledgement that improving AI itself is actually a "problem". A number of responses reflected that a patent limited to the specific technical application of core AI innovation is not a satisfactory solution to the problem. Notably, some respondents explained that it is hard to predict the outcome of UKIPO decisions on exclusions, leading to uncertainty and negative implications for business.

In their "next steps", the government positively intends to: "publish enhanced IPO guidelines on patent exclusion practice for AI inventions and engage AI interested sectors, including SMEs, and the patent attorney profession to enhance understanding of UK patent exclusion practice and AI inventions. The IPO will review its patent practice in preparation for the guidelines and establish any difference in outcome for AI patent applications filed at the IPO and the European Patent Office (EPO)". It is hoped that this will bring clarity to the patent exclusions while potentially amending the system to be more favourable towards AI.

Inventive Step

The UKIPO posed the questions: **Does or will AI challenge the level of inventive step required to obtain a patent?** If yes, can this challenge be accommodated by current patent law, and should we extend the concept of "the person skilled in the art" to "the machine trained in the art"?

A change in the state of AI technology may dramatically change the state of what is considered obvious and alter the application of novelty and inventive step to such inventions and perhaps more broadly. There is a lot that may be considered "obvious" to an AI that would not be considered obvious to a human.

A large proportion of the responses believed that the person skilled in the art has a range of tools available to them and AI may indeed be one of these tools. This means that it may not be necessary to extend the concept to the machine trained in the art.

It is possible that AI will erode the question of what is obvious as it develops. AI will relatively shortly become available to everyone. Everything (or at least a lot) will potentially seem obvious as AI will be very effective at solving problems given to it. This will increasingly become the case as AI becomes a commodity. It may be asked, therefore, why should one be granted a patent for using AI which is widely available?

Of the respondents who believe AI is a tool available to the skilled person, some believed that the level of inventive step required would change as AI tools improve and more modifications are considered obvious.

Clearly, the idea that more and more inventions will be considered obvious due to AI advancements is not beneficial to any party. Thus, there must be established a benchmark of how the inventive step of AI inventions is assessed. This may include keeping a detailed record of the available AI at any time. Doing so alludes to the concept of a "machine trained in the art" and being able to establish the capabilities of an AI machine at any given priority date. However, a definition of such a machine may in practice be impossible and one questions the practicality of doing so. It may be prudent to introduce a separate assessment of inventive step for AI inventions. Whilst this may seem a drastic step, the number of AI inventions is growing phenomenally, and the change in technology must be recognised.

The patent system will need to be kept under close review as AI technology develops, particularly if we begin to see the emergence of AI general intelligence.

4. Infringement

The Patent infringement is a tortious act. Therefore, there is a broader legal question that is, who is liable generally when AI commits a tortious act? For example, when an AI breaches a contract. This is not an issue that should be considered only in the vacuum of patent infringement, and is likely something that will be clarified through case law in the coming years.

The general opinion of respondents is that legal persons should be liable when an AI infringes a patent and not the AI itself. However, which legal person should be liable would depend on the facts of each case. It may range from the legal person who performs the infringing act through the AI or makes the necessary arrangements for performing the infringing act, to the owner or developer of the AI.

The majority of respondents felt there would be problems proving patent infringement by AI. Proving patent infringement is difficult because AI is often run as a "black box".

If an AI is indeed capable of infringing patents, it may de-incentivise businesses creating and using AI, so clarification of who will be liable and when will be important.

Some degree of certainty may exist in that limitations of liability may be written into contracts, and accidental infringement already exists for employees, where some parallels may be drawn.

With respect to patent infringement by AI, the government responded as follows: "The current practice of 'legal persons' being liable for infringement appears to be in keeping with most respondents' views. Many of the problems proving patent infringement by AI already exist when trying to prove patent infringement with other technologies.

We consider that in respect of "AI patents" the courts have appropriate flexibility to make decisions based on the facts of the case. And that claimants are able to use court processes to support their actions. Therefore, we do not currently intend to intervene in this area".

Under "next steps", the government states that they will aim to ensure that any measures implemented: encourage innovation in AI technology and promote its use for the public good; preserve the central role of intellectual property in promoting human creativity and innovation; are based on the best available economic evidence.

Positive next steps have been set out and we look forward to seeing these steps put into action over the next year or two. This call for views opened a channel for discussion which will potentially bring about significant change benefitting all parties.

Author: Robert Wiseman

Will I be successful in obtaining a patent?

With Artificial Intelligence becoming increasingly relevant to our daily lives, many inventors are looking to gain patent protection for their technology. There are extra considerations to bear in mind when seeking patent protection for an AI invention in Europe as purely mathematical are excluded from patentability. However AI patent applications can be, and are being, granted at the European Patent Office.

Historical Grant Rates

AI related patent applications have been filed as far back as the 1980s, with numbers exploding in recent years. To investigate the success rate of AI related applications we looked at the Cooperative Patent Classification (CPC) codes assigned to past AI related applications. All European and UK patent applications are classified by subject using CPC codes, and it is usual for a patent application to be assigned to two or sometimes three CPC codes. The majority of AI related applications were classified as at least one of:

G06N 3/xx – Computer systems based on biological models
G06N 5/xx – Knowledge-based models
G06N 7/xx – Specific mathematical models
G06N 20/xx – Machine Learning

At the time of writing there were 11,581 European applications assigned to at least one of these four CPC codes. Out of these applications 2,040 (18%) have been granted by the EPO, 2,936 (25%) had ceased before reaching grant, and 6,605 (57%) remained pending.

It would be misleading to view the success rate of AI related patents as 18% though, as many of these applications have only been filed in the past year or two. A European patent application usually takes three to five years to progress from filing to grant (or refusal), and therefore many of the 6,605 pending applications will be granted in coming years.

This lag between filing and grant is perhaps best demonstrated by the graph below, which shows the number of AI related European patent applications filed and the number of patent applications granted through time. Whilst the rate of filing shows a dramatic increase since 2015, the grant rate is only just starting to show a similar increase. Based on the expected lag between filing and grant, and the recent uptake in grant rate (increasing from 156 in 2018, to 268 in 2019, and to 433 in 2020), it seems more than likely that the grant rate will continue to increase in the future.
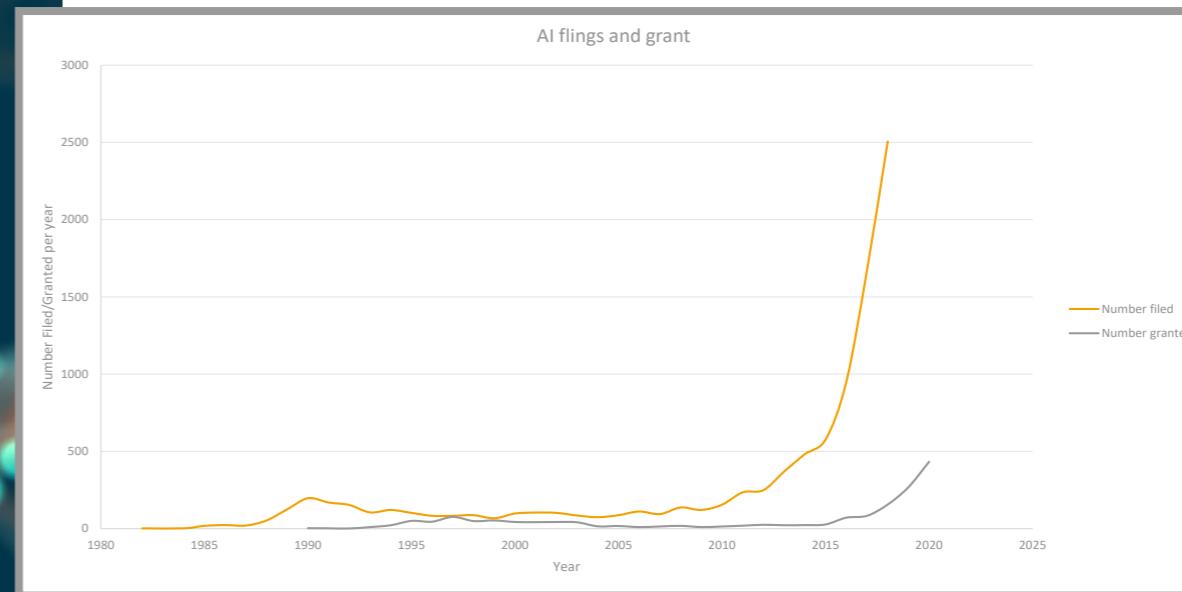

Figure 1: Number of European patent applications filed/granted per year in the four listed AI CPC classification codes.

The situation at the UKIPO appears to be broadly similar, with 1,041 AI related UK patent applications filed, of which 316 (30%) have been granted, 260 (25%) have ceased before being granted, and 465 (45%) remain pending.

Examples of Granted European Patents

The applicants in our data set having the most granted AI related EP patents include many of the big names you would expect, such as Google, Hitachi, Microsoft, Mitsubishi, Fujitsu, Qualcomm and Samsung, to name a few. Siemens had the most granted EP AI patents, with 112 in total. A small selection of granted Siemens patents are discussed below, to provide examples of the types of subject matter that can lead to a granted patent.
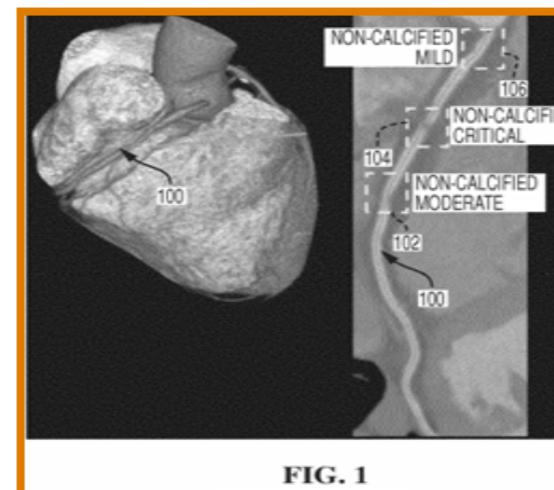

EP3261024B1 relates to use of neural networks in medical imaging, and figure 1 of the patent is reproduced above. Claim 1 can be approximated as:

> **"a method for vascular disease detection using a recurrent neural network, comprising:**
>
> **extracting a plurality of 2D cross-section image patches at a plurality of sampling points along a centreline of a vessel of interest in a 3D computed tomography angiography image;**
>
> **detecting vascular abnormalities in the vessel of interest by encoding each of the 2D cross-section image patches into a feature vector using a trained convolutional neural network, CNN; and classifying each of the plurality of sampling points based on the feature vectors using a trained bi-directional recurrent neural network, RNN."**

In this case, the application of the neural networks to the field of medical image analysis helped ensure that the claims passed the European Patent Office's technical character test and were not deemed simply abstract algorithms which would not be patentable. The combination of both a convolutional neural network and a trained bi-directional recurrent neural network was sufficient to persuade the examiner of an inventive step.

FIG 1
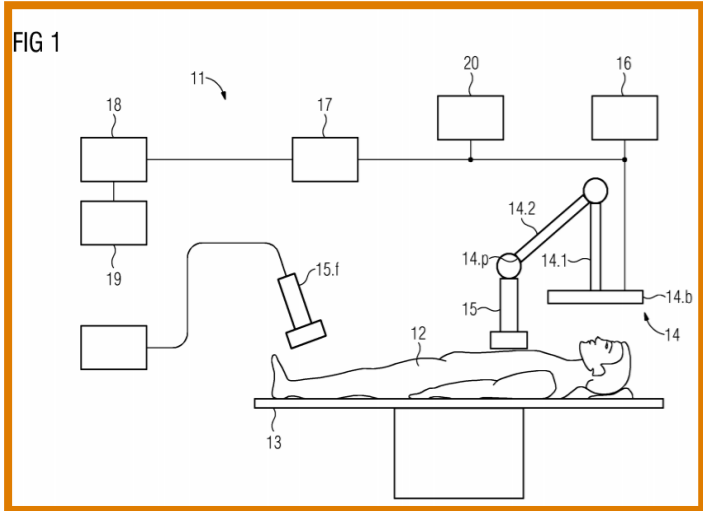
EP3409230B1 demonstrates some of the problems of classification based searches. It relates to a method for moving a robotic arm during an ultrasound procedure and uses a trained artificial neural network to determine a motion dataset for directing motion of a robot arm to conduct an ultrasound examination. You might expect that training the artificial neural network or using it to determine the motion dataset would be a key feature. In fact, the application includes very little in the way of training details or detail of the artificial neural network. The feature which was judged novel and inventive was that the motion sequence (for the robot arm) is projected onto the surface of the patient's body by means of a projector. Whilst the patent demonstrates the type of application that AI is being used for, it is not an example of a patent which hinges on AI.

FIG. 7B

EP3367329B1 is more interesting from an AI perspective. It relates to a method of removing noise from a medical image and, amongst other features, requires:

"denoising computer tomography (CT) image data by applying a deep-learnt multiscale network of filters decomposing the CT image data into sparse image representations at multiple scales, the deep-learnt multiscale network of filters comprising a cascade of trained sparse denoising autoencoders, wherein lower levels of the deep-learnt multiscale network apply learnt filters to image data recursively downsampled from the CT image data and resulting denoised image data at each scale is upsampled back to full resolution and summed to obtain a final denoised image CT data set; and the inputs to the sparse denoising autoencoders are a concatenation of CT pixel data and metadata of the CT system."

Claims relating to image processing are typically seen as being technical in character at the EPO, and the granted claim included scanning and displaying steps to link the AI features to a particular technical field. The CT pixel data and metadata (such as scan settings including dose or x-ray source voltage) are provided as an input to the autoencoders during their training and are at the heart of the deep learning which is credited with allowing the network to adapt to different scan parameters. In this case, the AI related aspect of the application is core to the granted patent.
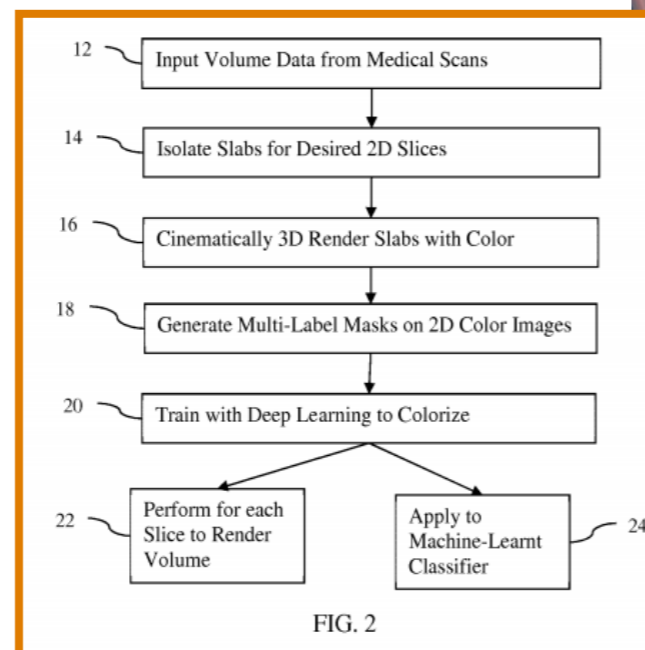
As well as methods using AI to solve particular problems, a method of training an AI may also be protected.

Also in the field of medical imaging, the broadest claim of EP3296962B1 relates to training a deep machine-learnt classifier and requires:

"A method for training (20) a deep machine-learnt classifier for colorizing a two-dimensional medical image, the method comprising:

loading (12) to a memory data representing volumes of multiple patients, the volumes comprising scalar values distributed in three dimensions from medical scanning of the patients;

isolating (14) slabs each representing multiple slices in each of the volumes;

three-dimensional color rendering (16) the scalar values of the slabs to two-dimensional color images with cinematic rendering (16);

training (20), from the two-dimensional color images, a deep machine-learnt classifier with deep machine learning and colorizing the two-dimensional medical image."

This training related application was granted with minor amendments only six months after examination commenced (albeit three years after filing).

FIG. 2
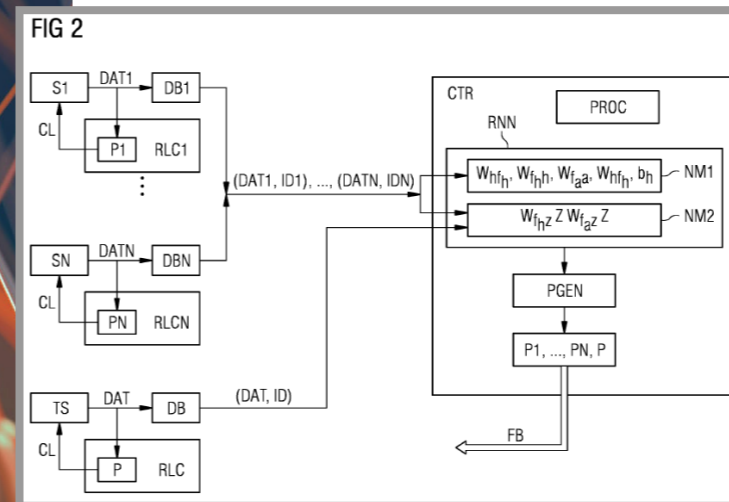
A last example shows that an AI based control method applied to a non-specific system can be patentable where an improvement to the functioning of a computer is achieved. EP3117274B1 relates to a way of controlling a system which allows more rapid learning of control strategies. Gas or wind turbines are given as examples where the invention may be used but the patent protection is not application specific. Rather, it concerns the interplay of pre-training a neural network with operational data from several similar systems with training specific to operational data from the system to be controlled. Claim 1 of EP3117274B1 can be simplified and paraphrased as:

A method for controlling a target system based operational data of a number of source systems, comprising:

a) receiving operational data of the source systems

b) training by means of a neural network a neural model on the basis of the received operational data, where a first neural model component is trained on properties shared by the source systems and a second neural model component is trained on properties varying between the source systems,

c) receiving operational data of the target system,

d) further training the trained neural model on the basis of the operational data of the target system, where a further training of the second neural model component is given preference over a further training of the first neural model component, and

e) controlling the target system by means of the further trained neural network.

The European Patent Office was persuaded that the application should be granted because features b) and d) provided the technical effect of avoiding unnecessary training on well-fitted models, therefore reducing the computation load during training of the neural network.

Summary

As demonstrated by the examples above, European patent protection can be obtained for various aspects of AI related technology. Moreover, we expect to see more AI patent applications getting granted in the future as this technology continues to develop.

Author: Connor Crickmore

A PRIMER ON PATENTING AI IN EUROPE

Artificial intelligence is increasingly an important tool in industry. Not just in computer science but in almost all fields of industry. And where an AI innovation provides a benefit to users, many would like to protect it with a patent.

The European Patent Office (EPO) recognises this. In 2017 the EPO published a study on the 'Fourth Industrial Revolution' that identified AI as a key enabling technology. As we reported previously, the EPO has held a conference discussing the patentability of AI. And the EPO has recently announced that their Berlin branch is to become a centre of expertise in AI. So it is worth looking at how AI inventions can be patented in Europe.

The EPO views AI as a subset of mathematical methods. This is significant because European patent law prohibits patenting subject-matter that relates to mathematical methods as such. In particular, any features of the claim that relate only to mathematical methods and do not contribute to the 'technical character' of the invention are not counted for the assessment of inventive step. This means that patent applications related to AI face an additional obstacle compared with inventions in other fields.

But in many cases we can show that an AI claim feature contributes to technical character. There are two ways to do this. The first way is when the AI is applied to a field of technology. The AI claim features contribute to technical character if they result in a technical effect in that field of technology. The other way is when the AI claim features themselves contribute to technical character.

Application to a field of technology

If the AI has an effect on how some other technology functions, then the use of AI can still be counted when assessing a claim's inventive step . For example, if AI is used as part of a system for controlling a process and the output of the process is affected by the use of AI, then the use of AI can be counted in assessing the inventive step of the system. Essentially the AI has to have some real-world effect in a particular field of technology.

One common application for an AI is in classification of data, such as digital images, videos, audio or speech signals based on low-level features (e.g. edges or pixel attributes for images). This is generally considered a technical field in which the AI can make a technical contribution. Classification of arbitrary data records by an AI can also be patentable, provided the claim defines some technical use being made of the data records.

But, even if an AI claim feature is included in the assessment of inventive step, it does not help get a patent if the AI claim feature would be obvious. A claim including AI features that are all entirely standard may be hard to get granted unless there is a compelling reason why a standard AI process would not be used in that technical field. Patenting the basic use an 'off-the-shelf' AI tool is difficult in Europe.

There may be more hope if a claim's AI features are particularly adapted to the technical field. For example, a claim specifying a particular configuration of a neural network that provides unexpected benefits for the technical field of application may be patentable. A claim specifying application-specific training data to define the AI's function may also be patentable.

One example of a granted European patent involving the application of AI to a technical field is EP3073098B1, in which the granted independent claims specify the use of a neural network to control fan blade flutter in a gas turbine engine and that "the neural network is trained using a baseline expected deterioration profile validated and updated by serial number specific in-flight aircraft mission data from the engine".

A mere mention in the claim of the use of a neural network would probably not have been enough to persuade the EPO to grant this patent. By including application-specific details of the neural network's training, the EPO was persuaded that this use of AI was non-obvious.

Specific technical implementation

The other way to show that an AI claim feature contributes to technical character is where the AI claim feature is particularly adapted in its design, motivated by technical considerations of the internal functioning of the computer on which it operates. The AI claim feature contributes to technical character because it results in an efficient hardware implementation.

The EPO is unlikely to accept that an AI contributes to technical character if it is an algorithm that does not consider the internal function of the computer on which it operates. This is the case even if the algorithm is new and particularly efficient and might bring technical advantages such as a reduced number of operations when performed using a computer.

The granted claims in EP3446260B1 are an example of how an AI can contribute to technical character by considering the internal functioning of the computer. The independent claims relate to training a recurrent neural network on a plurality of training sequences using backpropagation through time. In particular, the training includes "determining a training policy for processing the training sequence, wherein the training policy defines when to store in a memory of the one or more computers forward propagation information during forward propagation of the training sequence, the training policy being such as to balance a trade-off between caching of forward propagation information and re-computation of forward propagation information during backpropagation".

The EPO accepted that these AI steps are motivated by the internal functioning of the computer that performs them. They result in an efficient hardware implementation because, according to the patent, memory is more efficiently utilised and less memory is needed.

How can applicants increase their chances of patenting AI in Europe?

Patenting AI is possible in Europe. But there are obstacles. Fortunately, there are things that an applicant can do when drafting a patent application that will increase their chances of getting a European patent.

If the AI invention is 'merely' an improved algorithm then the EPO is unlikely to consider the AI features in assessing inventive step unless the AI is applied in a

technical field. Applicants can improve their chances of obtaining commercially useful protection in Europe if the application includes embodiments in which the AI is applied to some of the most commercially important technical fields. These might include computer vision, image processing, speech recognition, control systems, and robotics. If the EPO examiner cannot be persuaded of the technical contribution of the AI by itself, then the claims can be limited to one or more of these fields and useful protection is still obtained. If an applicant thinks that their AI invention is designed through consideration of the internal functioning of the computer on which it operates then it is helpful to give details of this in the application as filed. An explanation in the application as filed gives weight to any arguments on this with the EPO. But it is still worth including details of embodiments applying the AI to a technical field. This is a precaution in case the EPO examiner is not convinced that the AI makes a technical contribution by itself. In such cases the applicant can limit the claims to an application and still get protection in a commercially important field.

If the invention is the application of AI to a different technical field, then an applicant can improve its chances by including some description of how the AI is to be adapted to the technical field. A basic application of a standard AI might be considered obvious. In the turbine example above, a description of the turbine-specific training data helped persuade the EPO examiner that the invention was not an obvious implementation of an 'off-the-shelf' AI.

Author: Christopher Smith

HERE TO HELP

At Reddie & Grose, our AI & IoT technology sector team are dedicated to digitial innovation in all of its aspects. Our patent and design attorneys have extensive experience of advising research and development departments and a deep understanding of the key issues in an often complex legal and business environment. We help businesses in their due diligence and analysis of whether they are free to launch their products. We protect their innovations by preparing and prosecuting patent applications – building portfolios of rights to protect their commercial interests. We are also skilled in assisting clients to enforce their patents and designs, filing oppositions and cancellation/ revocation proceedings against third party rights, helping to defend our clients' position in infringement proceedings and defending clients' rights in oppositions and cancellation proceedings brought by third parties.

Our support of multinational clients is more than just managing their global patent portfolio and defending crown jewel IP rights. We understand that every stage of a product's development offers a unique challenge and our experience of working in established and emerging markets enables us to think beyond the law and devise patent strategies tailored to the commercial objectives of our clients.

In our support of start-ups and SMEs we have the commercial expertise to protect their innovation, ensure that their businesses are attractive to investors, ready for an IPO or perfectly placed to bring the next blockbuster to market.

We pride ourselves on listening to our clients and offering expert and pragmatic advice that is tailored to our clients' needs. Avoiding a 'one size fits all' approach has allowed us to build up many valued long-lasting client relationships.

We would be delighted to provide you with further information about our services and to organise a free initial consultation.

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