

The impact of AI in the patent world: An interview with Martin Müller, Chairman of a Technical Board of Appeal at the EPO*

1. WHICH IS YOUR POSITION AT THE EPO? WHAT IS IT THAT YOU ARE WORKING WITH?

– I work as a chairman of a Technical Board of Appeal. The Technical Boards of Appeal at the EPO, of which there are about 25, deal with appeals against decisions of the Examining Divisions and the Opposition Divisions of the EPO. The individual boards are responsible for different technical fields, in such a way that the members with a technical background are allocated to boards within their technical competence. My board, board 3.5.06, deals with matters of computer science, in particular computer systems, operating systems, computer security, image-based pattern recognition, and what is sometimes called “core artificial intelligence”. The latter includes generic methods used in artificial intelligence contexts, including neural networks, genetic programming and knowledge representation.

2. IT SOUNDS LIKE AN EXCITING FIELD. AI RELATED INVENTIONS ARE A HOT TOPIC. IT MUST BE VERY NICE WORKING WITH THESE ISSUES ON AN EVERYDAY BASIS.

– Yes, it is an interesting field indeed and very dynamic one, as everyone knows. To work in this field is both a challenge and a privilege. I follow the technical developments and the legal discussions with a keen interest, and I am happy to contribute a little. One has to realize though that evolutions reach the Boards of Appeal with a delay of a few years. Once the Examining or Opposition Division has decided, five or more years may have passed since filing. With that said, an increasing number of appeals relating to artificial intelligence, in particular based on neural networks, are coming in. On the other hand, it is worth noting that “artificial intelligence”, machine learning in particular, has been the state of the art in some fields since decades: pattern or speech recognition are prime examples. This means that some of the considerations applied in examining these cases are not as new as one might assume. And finally, inventions related to applied artificial intelligence are spread over a wide range

of technical fields and, therefore, boards. So there is, as often, some room for different perspectives on this matter.

3. IN YOUR OPINION, WHICH ARE THE BIGGEST CHALLENGES TODAY WITH REGARDS TO AI AND THE PATENT SYSTEM? IS IT A MATTER OF PATENTABILITY OR INFRINGEMENT? HOW ARE RIGHTS ENFORCED?

– Up front I need to say that the Boards of Appeal only deal with matters relating to the patent grant procedure, so I cannot say much about infringement or enforcement. Secondly, it is difficult to distinguish, in clear technical terms, “artificial intelligence” from software technology in general. I believe that, by and large, AI invention face the same types of challenges as other software-related inventions, and I tend to believe that this is the case in the grant procedure as well as after grant, e.g. in infringement. There may be differences in degree, however. Certain problems may be more virulent or more difficult to deal with in the context of AI inventions, due to their



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linguistics, cognitive science and compiler technology. He joined the EPO as an examiner in 1998, where he worked mostly in the fields of pattern recognition and video games, and was appointed Member of the Boards of Appeal in 2010. In 2019 he became chairman of Technical Board of Appeal 3.5.06, one of the boards dealing with computing technology and artificial intelligence, and Member of the Enlarged Board of Appeal. Martin is an author and regular presenter on various patent-related issues.

* The interview was conducted in collaboration with former editor Estefania Migueles.

size and complexity, e.g. when it comes to large neural networks.

Regarding patentability, a central question always is, at the EPO, what is or is not a technical contribution, what is considered to be “technology” and therefore for what kinds of things patents are granted at all. This question is receiving renewed attention in the context of artificial intelligence, which is largely based on computer programs and mathematical methods, two examples of what the patent law defines as “non-inventions”. In practice though, I believe this is not the most controversial issue. The criteria for addressing this question have been developed and applied by the Boards of Appeal since more than two decades, and they appear to be rather robust and are widely accepted. The desire expressed by applicants that certain types of artificial intelligence should not be excluded from patentability, however, requires a workable definition of AI as opposed to computer programs and mathematical methods, which are excluded from patentability, and this is a tricky question indeed.

I do see a problem where sufficiency of disclosure is concerned, essentially the requirement on the patent applicant or proprietor to explain that and why the invention does what it is supposed to do. Arguing this point is, I believe, the most important challenge for patent applicants and proprietors. Notably, this problem is not limited to patent law. Academic research also has the problem of ensuring that research results are repeatable as published, in general, but notably in the field of “artificial intelligence”.

4. IS THE QUESTION OF SUFFICIENCY ALSO A PROBLEM FOR OTHER SOFTWARE OR COMPUTER IMPLEMENTED INVENTIONS? DO YOU THINK THE LEVEL OF DIFFICULTY IS DIFFERENT FOR AI INVENTIONS?

– It is a problem for computer-implemented inventions in general. In this field, applicants often make very ambitious statements about what their invention allegedly achieves, and an important part of the examination procedure is to have applicants limit their claims to a scope for which they can make assertions that they can prove or otherwise justify.

That said, AI inventions do have their peculiarities: Large neural networks trained on huge amounts of data have an enormous number of parameters and even developers often do not quite understand, and admit that they do not, why things work as they do. This is often referred to as the “black box” property of neural networks or other probabilistic models. It is also important to note that certain AI solutions scale very badly. This makes it challenging to decide what is the right scope of protection, i.e. how broad can a patent claim be, given a specific, working AI solution. These two issues go to the very heart of what is sometimes called the “patent bargain”, i.e. the contract between the patent proprietor and the society

according to which the proprietor gets a time-limited monopoly in exchange for the disclosure of a technical teaching. A question that arises is, what is that teaching and is it properly disclosed? Sometimes inventors have trouble answering that question because, as mentioned, an invention may do something very interesting and useful but in a way which is ill understood.

From this perspective, AI inventions may indeed be more difficult to handle than “conventional” computer-implemented inventions.

5. SOME YEARS AGO, THERE WAS A LOT OF DISCUSSION ON WHETHER AI CAN BE AN INVENTOR OR NOT. IS THIS AN INTERESTING QUESTION OR COULD IT NOT BE DESCRIBED IN THE APPLICATION THAT THE INVENTOR IS A HUMAN BEING INSTEAD? DO YOU THINK THE QUESTION OF WHO IS THE INVENTOR IS A CENTRAL ONE? AND WOULD YOU LIKE TO COMMENT ON THE DABUS CASES AND SHARE YOUR TAKE ON THAT?

– No, I do not think that this is a particularly interesting question, at least not in practice and certainly not today. It is an intriguing philosophical question and it might become more relevant in the future.

I am not convinced that machines, even those using “AI”, have progressed so far today that they can make inventions truly autonomously, nor do I expect this to happen in the near future; “Artificial General Intelligence” is not imminent. Of course, machines are used in the innovation process, for example in drug design or in material science, and their use enables very relevant, even central, contributions there. But I do not think that makes it necessary to consider the machine as the inventor. Also, there is no need to reward a machine “inventor”.

In general, I do not see a pressing need to regulate the issue of machine inventorship.

6. IS THIS BECAUSE YOU THINK THE TECHNOLOGY IS NOT THERE YET, OR BECAUSE THE DISCUSSION IS OBSOLETE, TAKING INTO CONSIDERATION THE LEGAL STATUS OF AI?

– I do not think the discussion is entirely obsolete, but I am convinced that we are not there yet. But even if we were there, I think there are more interesting questions than whether it should be possible to name a machine as an inventor.

One such question might be: At which point should developers or operators of an AI tool *no longer* be considered inventors because they have contributed too little to

the invention? To answer that question, we have to think about what it means to “make an invention” and at which point an invention has actually been made. A follow-up question would be: What other person, if any, should be considered the “inventor” for the purposes of patent law? The German Federal Court of Justice (BGH), in its DABUS decision, has recently made interesting remarks on this point.

Apart from the DABUS cases, the European Patent Office has, as far as I know, never dealt with the question of how an invention was made but has always limited examination to the substance of the invention. This is probably true for most patent offices, although the situation is slightly different in the U.S. where it is relevant for patent validity and enforcement of a patent whether the “true inventors” are named. But in general, applicants do not disclose details on how their inventions are made.

Imagine we had a machine that, at the press of a button, could produce an invention, let us say, even write a patent application for it and explain its advantageous effects in writing. At that point, one might want to say that no individual person deserves a reward as an individual inventor. And one would have to answer – and possibly regulate – the question whether a patent for the invention should be granted at all and to whom.

The mentioned machine would probably be very expensive. For illustration, single training runs of large language models are reported to cost tens of millions of dollars, training ChatGPT was even estimated to cost some 100 million dollars. Therefore, it is likely that only very large companies could afford to own, and thus exploit, such machines. An interesting question might then become whether society wants to reward the company for all the inventions made automatically. This may appear unfair, or it may still be accepted in view of the company’s high investments. Of course, it is already the case that certain types of inventions, for instance in the pharma industry, require very high investments which are available only to companies of a certain size and which nonetheless need and deserve protection. Anyway, whether the products of an “invention machine” should be patented or remain in the public domain is a regulatory question that might become relevant at some point. At the same time, I do not think this question depends on whether the machine is the sole inventor or “only” used to make a significant contribution.

I would like to add one more thought: I believe it would be impractical for any regulation to require that applicants always disclose – i.e. describe and prove – how their inventions were made.

7. LET US TALK ABOUT THE SIDE EFFECTS OF AI, SUCH AS AI APPLICATIONS IN THE OFFICE; HOW MUCH IS THERE IN YOUR EVERYDAY WORK? HOW MUCH DO YOU EXPECT THERE TO BE IN THE FUTURE? AND DO YOU THINK THE PATENT SYSTEM WILL BECOME A PURE REGISTRATION SYSTEM SINCE THE EXAMINATION WILL BE MADE BY AI?

– At the moment, mostly standard AI-based tools are in general use in the Boards of Appeal. Most notably in text processing, especially for automated translation and for grammar and spell checking. Otherwise, the only AI-based tool officially in use at the Boards of Appeal is an “AI-powered conversational agent” (based on large language models like ChatGPT) which provides a uniform access to the various available legal sources, including the EPC, the Guidelines for Examination, and the jurisprudence of the Boards of Appeal. This tool was developed by the EPO itself and is called the Legal Interactive Platform. Fascinating as it is, I believe that the tool is still of limited utility for my work. And it cannot, certainly as yet, replace a proper database search, in particular for tasks which require answers to be exhaustive. We have also started to consider what other AI-based tools we might want to use and to assess to what extent we might profit from them.

On the other hand, examiners at the European Patent Office are already using several other AI tools, and more are being developed, in particular by the competent department within the EPO itself. For a few years already, the Office has been using AI tools for pre-classification of documents and for the allocation of patent applications to the competent examiners. Last summer, a search tool was launched which suggests possibly relevant prior art to the examiner. The Legal Interactive Platform has been released only this summer. Several other projects into AI tools are under way in – or are being explored by – the mentioned development department within the EPO.

I do not expect that fully automated searches will be available any time soon. The language used in patents to describe inventions is not particularly well-harmonized and at times differs a lot from the language used in the technical literature. I concede that this might be different between fields. But also, the search for relevant prior art goes beyond a mere text-manipulation exercise, as it requires the determination of meaning, an amount of reasoning, logic, even arithmetic, i.e. competences which (current) LLMs lack. In other words, the ultimate selection of relevant prior art for a patent application requires an understanding of the patent application and the prior art which cannot – certainly not yet – be replaced by any statistical model or neural network. Even if in some fields or for some narrow tasks it might be doable, it seems questionable to me whether a dedicated AI-based tool can compete in terms of cost and flexibility with a human examiner. But I am prepared to be surprised and stand corrected in view of the stunningly quick developments

in this field. Even less than fully automated search tools, I expect any time soon an automated AI-based tool capable of producing useful examining reports comprising an assessment of, for example, the inventive step of a patent claim over a piece of prior art. In particular, I do not see that LLMs in their current form are capable of providing this service.

However, search tools will become better, generative AI will significantly support the access to large bodies of texts, the generation – or improvement – of certain texts, and I am sure that, if properly integrated, “AI” will be able to help automating certain well-defined, formal tasks.

8. WHAT OTHER TOPICS DO YOU FIND INTERESTING RESEARCHING IN THE FIELD OF PATENT LAW?

I find fascinating the striving for harmonized jurisdiction in patent law, for example with regard to the question of patent claim construction. The use of language in patent law is peculiar, because the claims, once granted, operate like a legal norm, but they are not issued by a legislative body. Rather, they are formulated by the patent applicant and proprietor in a dialogue with a patent office or a court. As a result, the claim language is less standardised and less homogeneous than the language used elsewhere in the law. I believe this is one reason why claim interpretation is complicated.

Also, the claim language is scrutinized from different perspectives. The question a claim is confronted with in grant or validity proceedings is different from that asked in infringement proceedings. An office, for that matter, tries to make sure that only valid claims are granted or maintained. In doing that, it will give the claims a wide interpretation and, accordingly, consider more prior art to fall within their scope. An infringement court, on the other hand must determine whether an allegedly infringing object actually falls within the scope of the claims of the patent, and might interpret a claim more narrowly than (or simply differently from) its literal wording, taking account of what has actually been invented or described as such. This is not the whole story, of course, but there is a tension here. I find this tension between the offices and national courts, and also between the national courts themselves, interesting and intriguing, and worth further research.

9. WHAT YOU ARE DISCUSSING NOW BRINGS US TO THE UNITARY PATENT AND THE UNIFIED PATENT COURT. DO YOU THINK THE ROLE OF THE EPO CHANGED AFTER THE INTRODUCTION OF THE UNITARY PATENT IN THE LANDSCAPE OF THE EUROPEAN PATENT SYSTEM? AND RELATED TO THAT, WHAT ARE YOUR EXPECTATIONS FOR THE UNIFIED PATENT COURT?

The role of the EPO has obviously changed insofar as it now grants patents which are under the jurisdiction of the UPC. And there is now a degree of “competition” between the EPO and the UPC regarding *inter partes* proceedings which could be handled by the Opposition Divisions of the EPO or by the UPC. On the other hand, the EPC retains its power to refuse a patent and to revoke of a patent with no judicial remedy other than an appeal to the Boards of Appeal. When it comes to jurisprudence, the decisions of the UPC, especially its Court of Appeal, have no immediate impact on the jurisprudence of the Boards of Appeal. However, the decisions of the UPC on any of the controversial issues will be thoroughly read and their reasoning will be considered. If they are persuasive, and to the extent applicable, such decisions will have influence on the decision-making of Boards of Appeal as well. The relation will be similar to that between the Boards of Appeal and the national courts. Neither is formally bound by a decision of the other, but each other’s decisions are considered depending on their persuasive power. Moreover, the Boards of Appeal have been in close contact with national judges on patent law matters through regular meetings, and today this dialogue obviously includes the UPC. This dialogue will continue to be very interesting.

That said, the UPC has only started in June 2023, and not many decisions by the Court of Appeal have been issued yet. At the same time, the UPC Court of Appeal has quite a lot on its plate. Hence, if one hopes that it is going to contribute to harmonization on controversial issues, one must give it a bit of time. It is unlikely that the UPC can solve all controversial issues in a couple of years.

10. CHANGING THE TOPIC TO MORE CAREER-RELATED QUESTIONS; NOWADAYS THERE ARE RATHER FEW PHD CANDIDATES IN PATENT LAW FROM THE LEGAL FIELD AND STUDENTS ARE HESITANT TO ENTER THE FIELD BECAUSE THEY FEEL THAT THEY NEED TO HAVE TECHNICAL COMPETENCE. YOU MIGHT BE IN CONTACT WITH MANY LAWYERS THAT WORK IN PATENT LAW. WHAT DO YOU THINK IS THE BEST PROFILE FOR A LAWYER WHO WANTS TO WORK IN PATENT LAW? IS A TECHNICAL EDUCATION NECESSARY IN EUROPE? ARE LAWYERS ABLE TO UNDERSTAND PATENT LAW?

The answer is yes and no at the same time. Of course, there is no reason why lawyers cannot “understand patent law”. They do, but not every lawyer will thrive in patent law. Just as not every engineer will thrive in a legal profession. Patent law comprises an interesting mixture of law and technology. This is one of the reasons why I find it attractive. Lawyers might struggle with the technology, and people with a technical background might struggle with concepts of the law. For any lawyer considering patent law as a career option, I would insist that they be interested in technology. It is decisive in many cases to delve into the technology at stake and to understand it more than only superficially. Some lawyers have a second, technical degree. This is not required. The interest in technology can be nurtured in many ways; by practical hobbies as well as by studying technical literature for instance. At any rate, in patent courts, people with a legal background and people with a technical background are working together. It is necessary to understand each other’s concerns and it may require intensive debate to achieve a common understanding. One has to like that kind of dialogue to thrive in the field.

11. WHERE DO ENGINEERS AND LAWYERS BEHAVE DIFFERENTLY WHEN WORKING AS JUDGES IN THE EPO? IS THERE A GENERAL DICHOTOMY?

I do not think there is a “general dichotomy”. People are very different even within a field, but a few tendencies come to mind.

One statement often heard is that engineers and scientists on the one hand, and lawyers on the other hand look at the world differently. The former ask factual questions: what is right or wrong, or what is the case and what is not the case. The latter ask normative questions: what the law says the case should be. As a tendency, this is probably true, but reality is more complex than that. Every scientist knows, even within their field of expertise, that not all questions can be answered with yes or no, and every lawyer knows that there are matters of technical fact that

influence a judgment. But I do think that engineers and lawyers may have different reflexes, in general and in patent prosecution.

Technically qualified judges may have a stronger preference than legally qualified ones to decide a case on its technical merits than on procedural questions. Also, technically qualified judges may be less inclined to believe the parties’ allegations on technical facts without checking the facts themselves. I have the impression that technical qualified judges tend more to enter into a debate with the parties and to wish to convince them about the technical facts rather than merely hearing and questioning the parties before deciding.

Other distinctions come to mind, for instance based on stereotypes such as the engineering “nerd” who may be less well trained and less interested in verbal expression. Similar stereotypes exist for legally qualified judges. In the Boards of Appeal however, colleagues have been exposed to the respective other domain’s style, approach, needs and aversions, so that the stereotypes do not fit well anymore.

12. HOW DO ENGINEERS FIND THEIR WAY INTO PATENT LAW? HOW DID YOU FIND YOUR WAY INTO THE PATENT SYSTEM?

I think it depends on the technical field. Engineers or scientists working in mechanical engineering or pharma, for example, are exposed to patents at an early stage of their careers.

This was not the case in computer science when I studied it. Patents have a shorter and controversial history in computer science in comparison with other fields of technology. There has always been a debate about whether there should be patents for software inventions at all, under which circumstances and with what limitations. When I studied, in the 1990s, there was little knowledge about or interest in patents in the field. At the time, it was not widely known, nor generally accepted, that computer science was, in patent law terms, a field of technology in which one could make “technical” inventions, and obtain patents, or that computer scientists would be qualified to work as examiners, patent attorneys or technically qualified patent judges. Some were fervently opposed to the idea of any “software patents”, for instance the free software community or the open software community, which had the vision that all “software should be free”, i.e. open for anyone to study and use. This debate, eventually culminated in 2005 when the European Parliament rejected a proposed directive on computer-implemented inventions.

Under these circumstances, it was unlikely that I would choose patent law. Why did I do it anyway? First, I like to work on the borders between fields, and I love to be able to communicate with experts from different professions. I have already enjoyed doing that in university, when I tried to translate between the more theoretical-minded com-



puter scientists and those with a more traditional engineering attitude, or when I tried explaining my research to non-scientists. I like the interface position, and the necessary discussions and debate. Also, I never had the urge of becoming a software developer, but I like to study science, and many other things, to understand phenomena, to associate, to debate, but also to move on to the next interesting question. Secondly, when it comes to the EPO, I like that it is an international organisation and I have colleagues from all over Europe. During my career, I also developed a particular liking for international law, maybe because it is less well defined than national law and thus tends to be more open to fundamental considerations.

13. IN SWEDEN THE PATENT ATTORNEY OFFICES HAVE A HARD TIME RECRUITING ENGINEERS, BECAUSE ENGINEERS ARE NOT AWARE OF THE EXISTENCE OF THE PATENT SYSTEM. THEY CURRENTLY DO NOT HAVE CORRESPONDING COURSES AT THE UNIVERSITY. IS IT THE SAME IN GERMANY?

This is an interesting question. Today the job market for anyone with an academic computer science background or an interest and competence in that field is very competitive, to say the least. Everyone is looking for these people. I guess, the same applies, to varying degrees, to the other fields of science and engineering. Hence, these people have several options, of which patent law is only one. This is one issue. Another issue is awareness. I believe that many engineers focus on their primary profession – there is so much to see already there – that they may not be

aware that patent law is an option for them at all, or what this means in practice. As an anecdotal remark, the University of Karlsruhe (now Karlsruhe Institute of Technology), where I studied, already then had a centre for legal studies within the computer science department but, at the time, most of my fellow students did not even realise that it existed. That said, I do not recall how important intellectual property was in that group. Anyway, today it has become a lot more visible. Amongst others, this department employs a former presiding judge of the German Federal Court of Justice (BGH) to teach patent law. So, I think that the awareness about IP in computer science has gone up. Still, within that field, questions of copyright appear to receive wider attention, for instance in the context of generative AI, than patent law.

Finally, I already mentioned the stereotype that engineers are not necessarily the ones that want to talk a lot. It is not true in general, but there is probably a tendency. Engineers will typically prefer spending time tinkering with a bicycle or a programming a computer and might not be interested in writing articles or engaging in controversial discussions. What you want to find is people with a background in science and engineering who have those interests, and that could indeed be a challenge.