

OPINION

AI and Computer Programs in UK Patent Law: A Messy Mix

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☞ Artificial intelligence; Computers; Excluded subject matter; Inventions; Neural networks; Patentability; Software; Statutory interpretation

Abstract

*The legal position in the United Kingdom (UK) has unfortunately reached the unsatisfactory stage where judges who are not technologically trained are, in effect, defining technology in their interpretation of statutes. The decision of the UK Court of Appeal in the patent case of *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Limited*¹ dealt with Artificial Intelligence (AI) technology but unfortunately, the Court appeared unaware of its own misunderstanding of the complex technology and proceeded to give its judgment based on misconceptions of the technologies. This article does not argue for or against the policy of whether AI technological techniques ought to be afforded patent protection—this is a much larger multifactorial policy question beyond the scope of this article. The aim of this article is to argue that a better judicial*

understanding of computer technology, especially of AI, is urgently needed, and a clearer legal definition of “a program for a computer” is long overdue.

Excluded Matter—Program for a Computer

The UK’s national laws providing protection for patents are contained in the Patents Act 1977 (as amended) (UKPA) and the Copyright Designs and Patents Act 1988. The UKPA was enacted to ratify the European Patent Convention (EPC) in the UK. Section 1(2) of the Patents Act 1977, which ratifies art.52 of the EPC, sets out certain things that are excluded from being a patentable invention for the purposes of the Act. Specifically, it provides that “a program for a computer” is not a patentable invention, but with the added proviso “only to the extent that a patent or application for a patent relates to that thing as such” (the Computer Program Exclusion).

The Court of Appeal noted that the meaning of “program for a computer” in the UKPA is a question of law,² the UK statute, however, does not define what is a “program for a computer”. The courts have struggled much with this over the years, so much so that Lewison LJ in *HTC Europe Co. Ltd v Apple Inc*³ lamented that:

“It is, to me at least, regrettable that because these apparently simple words have no clear meaning both our courts and the Technical Boards of Appeal at the EPO have stopped even trying to understand them. However we are so far down that road that “returning were as tedious as go o’er”. Instead we are now engaged on a search for a “technical contribution” or a “technical effect”. Instead of arguing about what the legislation means, we argue about what the gloss means. We do not even know whether these substitute phrases mean the same thing.”

Indeed, the Court of Appeal in *EPL CA Case* attempted to understand and interpret what is a “program for a computer” and in the process gave those words a meaning not found in computer science understanding.

Facts and Procedural History

Emotional Perception AI Ltd (“EPAIL”) sought a patent for a system using an Artificial Neural Network (“ANN”) to provide improved media file recommendations. The invention can be implemented using hardware or software. Key to the system is the training of the ANN, which analyses the physical properties of the file using pairwise comparisons of training files, coupled with using semantic space qualities. In these pairwise comparisons, the distance in property space between the output property vectors of the ANN is converged using the techniques of weights and biases at each layer of the ANN. This is done

¹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825.

² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [59].

³ *HTC Europe Co. Ltd v Apple Inc* [2013] EWCA Civ 451 at [143].

so that the trained ANN can identify files clustered close together in property space because they will in fact have similar semantic characteristics and this can be used by the ANN to be effective at recommending media files with similar characterisations based on human emotions and perception such as happy, sad, relaxing and so on, without relying on and irrespective of manual genre labelling.⁴

The patent application was rejected by the UK Intellectual Property Office⁵ (the IPO Decision). The Hearing Officer held that EPAIL's ANN fell within the Computer Program Exclusion and was thus not patentable.⁶

EPAIL appealed the decision to the High Court of England & Wales. The High Court allowed the appeal in *Emotional Perception AI Ltd v Comptroller-General of Patents, Designs and Trade Marks*.⁷

Sir Anthony Mann sitting in the High Court considered whether the ANN was a “program for a computer”. He grappled with the concepts of a “hardware ANN”,⁸ a physical device containing the components of an ANN, and a “software ANN” that emulates the function of a hardware ANN in software⁹ that were first dealt with in the IPO Decision. The Comptroller had conceded that in the case of a hardware ANN that “there is no program to which the exclusion applies and if the application had been confined to a hardware ANN it would not have been excluded”.¹⁰ The judge went on to comment that “I am not myself minded to consider the correctness of the concession”.¹¹

Sir Anthony noted that the concession was not accompanied by reasons, but he presumed “it is because the hardware is not implementing a series of instructions pre-ordained by a human. It is operating according to something that it has learned itself”.¹² From here, since this concession was made regarding a hardware ANN, he went on to conclude that the same should apply to a software ANN as:

“[i]t is not implementing code given to it by a human. The structure, in terms of the emulation of uneducated nodes and layers, may well be the result of programming, but that is just the equivalent of the hardware ANN. The actual operation of those nodes and layers inter se is not given to those elements by a human. It is created by the ANN itself.”¹³

Sir Anthony therefore concluded that the Computer Program Exclusion did not apply to the software ANN. The judge further noted that even if the Computer Program Exclusion had applied, the ANN had a technical effect: the output of the system was a file that constituted a superior recommendation, that is, “[i]t is not just any old file; it is a file identified as being semantically similar by the application of technical criteria which the system has worked out for itself”.¹⁴ He went on to justify his conclusion by arguing it is “qualitatively similar” to the effect in the case of *Re Protecting Kids The World Over (PKTWO) Ltd*.¹⁵

Court of Appeal Approach

The Comptroller appealed the decision of the High Court to the Court of Appeal, on four grounds.¹⁶

- i. Ground 1: the Judge erred in holding that the exclusion from patent protection for “a program for a computer ... as such” was not engaged;
- ii. Ground 2: the Judge was wrong to rely on Appellant's concession that a hardware ANN was a computer but it was a computer with no program, or words to that effect;
- iii. Ground 3: the Judge was wrong to exclude the consideration of the mathematical model exclusion; and
- iv. Ground 4: the Judge was wrong to hold that the claimed invention involves a substantive technical contribution.

Birss gave the judgment of the Court with Arnold LJ and Nicola Davies LJ concurring. The Court of Appeal applied the four-stage approach laid down in *Aerotel Ltd v Telco Holdings Ltd*¹⁷ (*Aerotel* framework) for determining questions of exclusions from patentability:¹⁸

- (1) Properly construe the claim.
- (2) Identify the actual contribution (although at the application stage this might have to be the alleged contribution).
- (3) Ask whether it falls solely within the excluded matter.
- (4) If the third step has not covered it, check whether the actual or alleged contribution is actually technical.

⁴ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [2], [38] and [20]–[26].

⁵ *Emotional Perception AI Ltd* BL O/542/22.

⁶ *Emotional Perception AI Ltd* BL O/542/22 at [83].

⁷ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd v Comptroller-General of Patents, Designs and Trade Marks* [2023] EWHC 2948 (Ch).

⁸ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [14]–[18].

⁹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [18].

¹⁰ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [43].

¹¹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [43].

¹² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [54].

¹³ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [54].

¹⁴ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2023] EWHC 2948 (Ch) at [76].

¹⁵ *Re Protecting Kids The World Over (PKTWO) Ltd* [2011] EWHC 2710 (Pat).

¹⁶ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [54].

¹⁷ *Aerotel Ltd v Telco Holdings Ltd* [2007] RPC 7.

¹⁸ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [31], discussing *Aerotel Ltd v Telco Holdings Ltd* [2007] RPC 7.

Lord Justice Birss summarised that the purpose of this approach was to “work out if the claimed invention makes a contribution which is technical in nature”, but he also stressed that the “contribution” is not the same as and is separate from the “inventive step”, and also the mere fact that computers are involved does not automatically result in a contribution that is technical.¹⁹

The Court of Appeal noted the structured approach of the “five signposts” laid down in *AT&T Knowledge Ventures/Cvon Innovations v Comptroller General of Patents*,²⁰ which both the IPO Decision and the High Court used to address whether the invention makes a technical contribution to the art (*AT&T* signposts). One of the *AT&T* signpost was slightly rephrased in *HTC Europe Co. Ltd v Apple Inc.*²¹ The *AT&T* signposts are:²²

- i. whether the claimed technical effect has a technical effect on a process which is carried on outside the computer;
- ii. whether the claimed technical effect operates at the level of the architecture of the computer; that is to say whether the effect is produced irrespective of the data being processed or the applications being run;
- iii. whether the claimed technical effect results in the computer being made to operate in a new way;
- iv. whether the claimed technical effect “made the computer a better computer in the sense of running more efficiently and effectively as a computer”;²³ and
- v. whether the perceived problem is overcome by the claimed invention as opposed to merely being circumvented.²⁴

After elucidating the IPO Decision and the High Court judgement on the *Aerotel* stages and the *AT&T* signposts, Birss LJ then systematically dealt with the Comptroller’s grounds of appeal. First, the court considered that Comptroller’s first two grounds of appeal could be conveniently dealt with by asking “the first question”, which Birss LJ framed as what a computer program is and whether there is a computer program in an ANN.²⁵ If there is, then Ground 4 would need to be addressed,

and finally, Ground 3, the mathematical method exclusion in the UKPA would need to be considered only if the Comptroller has lost on Grounds 1 and 2.²⁶

This article will only focus on Grounds 1 and 2 as that is where the fundamental misconceptions first arose. The Court of Appeal found the EPAIL ANN to be a computer program and hence fell into the exception. Consideration of the *AT&T* signposts was swiftly dismissed as not assisting the respondent, EPAIL.²⁷

The First Question—What is a Computer Program?

Using this question of what is a computer program, the Court of Appeal engaged the Comptroller’s first and second grounds of appeal and considered the third stage of the *Aerotel* framework. Lord Justice Birss made it clear that an ANN is unlike what he calls a “conventional computer”, which is “a computer of the normal sort most people are familiar with”.²⁸

He began by outlining the Comptroller’s submission, which was that “an ANN is a computer, albeit of a relatively unfamiliar kind”²⁹ with weights and biases that need to be “configured appropriately, and it is that set of weights which forms the program of this kind of computer”.³⁰ The Comptroller also contended that its view on this accords with the definitions that were quoted by Sir Anthony in the High Court.³¹ The four definitions were:³²

- “a set of instructions that makes a computer do a particular thing”; [Cambridge Dictionary]
- “a set of instructions for a computer to perform some task”; [Collins English Dictionary]
- “a set of instructions stored inside a computer that allows the user to do a particular thing ...” [Macmillan Dictionary]
- “(computer science) a sequence of instructions that a computer can interpret and execute”; [The Free Dictionary]

The Court of Appeal noted that the meaning of “program for a computer” in the UKPA was intended to correspond to art.52 of the EPC but neither party had submitted any preparatory material for the EPC or the UKPA to give guidance to the meaning of the term.³³ Also noted was the difficulty the court in *Aerotel* expressed in finding any useful guidance on this exclusion and on the

¹⁹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [32].

²⁰ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [34], referring to *AT&T Knowledge Ventures/Cvon Innovations v Comptroller General of Patents* [2009] EWHC 343 (Pat).

²¹ *HTC Europe Co. Ltd v Apple Inc* [2013] EWCA Civ 451 at [150]–[151].

²² *HTC Europe Co. Ltd v Apple Inc* [2013] EWCA Civ 451 at [148]–[151]; *AT&T Knowledge Ventures* at [40].

²³ *HTC Europe Co Ltd v Apple Inc* [2013] EWCA Civ 451 at [150]–[151].

²⁴ *AT&T Knowledge Ventures/Cvon Innovations v Comptroller General of Patents* [2009] EWHC 343 at [40].

²⁵ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [55].

²⁶ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [55].

²⁷ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [82].

²⁸ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [56].

²⁹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [56].

³⁰ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [57].

³¹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [57].

³² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [57].

³³ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [59].

underlying purposes for the exclusion to assist in interpretation.³⁴ Importantly, the court also noted that art.27 of the TRIPS Treaty (Trade-Related Aspects of Intellectual Property Rights Agreement) provides that patents should be granted to “all fields of technology” but neither party led any arguments on this.³⁵

The judgment also raised the point that there was no submission on the doctrine that a statute is “always speaking”.³⁶ This doctrine speaks to the distinction between and reference. That is, “the meaning of a statutory expression does not change whereas the class of things which it covers may do so”.³⁷ In short, the approach of the Court of Appeal can be summed up as:³⁸

“Something which did not exist when an Act was passed and therefore could not have been identified as being within the Act at the time, may still be covered by that Act today once its meaning has been understood.”

Essentially, the court started from the position that the meaning of the statutory term had not changed over the years, but the scope of what that term covered could have changed and consequently, something that did not exist previously could be covered by that definition.³⁹ However, as will be seen below, this is not factually the case when it comes to current AI technologies.

Invented Definitions

Beginning from para.61 of the judgment, with respect, it appears that Birss LJ was simply inventing his own definitions and understanding of technology. He stated that he would “hold that a computer is a machine which processes information”⁴⁰ without any reference to any supporting materials. With respect, processing information is only but one of the functions and capabilities of a computer, it cannot therefore become a definition of the thing itself. It is akin to asserting that a human being can be defined as a creature with two legs, instead of merely characterising having two legs as one of the traits of the species. Further, what is meant by the words “to process” and what is meant by “information”? To be factually correct, some computers do not process information at all. A simple clock or a watch that just tells the time can be constructed using a “computer” or circuits and software that does not process any information at all. The software and hardware can just run by itself without any input of information and there is no processing of information.

In reality, a circuit board such as a motherboard is critical to a computer, without the circuit board, a computer cannot run. A circuit board is typically made

of conductive materials, such as copper, with layers that are etched with microscopic channels carrying electrical signals between the different components of the computer, such as the storage and the memory, enabling them to communicate with each other. However, these circuit boards have become smaller and smaller and now there are small computer chips that can be installed inside appliances such as washing machines. These kinds of computer chips inside washing machines control the functioning of the washing machine. It may process user-inputted information such as to start a spin or a wash cycle, but that is not its primary function—its primary function is to control the functioning or the cycles of the washing machine. Should we now also define a computer as a machine which controls functions?

Following from his definition of computer, Birss LJ then again asserted that a “computer program” is the same thing as a “program for a computer”,⁴¹ again without reference to any supporting materials. This may be acceptable generally, but can be problematic as the word “for” in the term has to do some work. It has to be *for* a computer. What if it is a program *for* a computer chip or a circuit board, like in the watch or washing machine examples above? Would Birss LJ consider programs for these a “program for a computer”?

The Court of Appeal found the dictionary definitions helpful and held that a computer program “is a set of instructions for a computer to do something” which is incredibly broad and does not speak to the specificity of the dictionary definitions. In fact, “to do something” is as broad as it can get with no specific correlation, directly or indirectly, required between the set of instructions and the “something”, whereas the dictionary definitions pretty much reflect the narrow if-then hard-coded software reality with the limitation of to do a *particular* thing.

Putting his definitions together, Birss LJ held that:⁴²

a computer is a machine which does something, and that thing it does is to process information in a particular way. The program is the set of instructions which cause the machine to process the information in that particular way, rather than in another way.

With respect, Birss LJ has completely invented his own definition that is not in line with the dictionary definitions. Further, he has also not understood the respondent’s argument about computer programs in terms of their serial logical “if-then” type operations.⁴³

From the dictionary definition of to “do a particular thing”, it grew to the court’s own definition of to do something, and now, to “process information in a particular way”.

³⁴ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [59].

³⁵ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [59].

³⁶ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [60].

³⁷ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [60].

³⁸ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [60].

³⁹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [60].

⁴⁰ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [61].

⁴¹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [61].

⁴² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [61].

⁴³ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [58].

Note that the Cambridge Dictionary and Macmillan Dictionary definitions above both used the qualifier “to do a particular thing” but Birss LJ changed this to “to process information in a particular way”, which broadens the meaning considerably. To do a particular thing is not the same as to process in a particular way. For example, to do a particular thing might be if the user clicks on this pictorial button on a word processor, the highlighted text will be bolded. Press it again, the text will be un-bolded. That is the particular thing to which the dictionary definitions refer—it has to be a particular thing, not something, not anything. Particular way is much too broad and traditional programs are not capable of processing information in a particular way, which refers to not just a way, but includes a methodology and not a particular specific thing, which is precise and confined. This is what the respondent was referring to by their serial logical “if-then” type operations, which the Court of Appeal unfortunately did not comprehend and is evidenced by the very definition they adopted. By inventing an overly broad definition of what a computer program is, the Court of Appeal has, with respect, misconceived what a computer program is, even in light of what a computer program was when the term was coined and what it is today in the computer science field. Hence, the doctrine of the statute always speaking that was being relied on simply does not hold.

A note of caution that whilst dictionary definitions might be helpful, they are overly general. A computer scientist would also add to the definition that the set of instructions must be in a computer language. Certainly, in the 1980s, students of computer science were taught that before one can write a computer program, one should write an algorithm, which is essentially the steps or set of instructions in English or a language humans understand, and then to accurately transpose the algorithm into a computer program in a computer language. The reason for this is that the logic sequences required for the program to execute and function accurately is first best understood in human languages and also, errors can be spotted more easily than in computer language.⁴⁴ In this regard, the definition in *Gale’s Application*⁴⁵ and Aerotel cited by Birss LJ of a program being a set of instructions⁴⁶ or a sequence of instructions⁴⁷ are equally loose and technically imprecise and unhelpful.

The respondent had attempted to introduce several qualifications to the definition, but the court soundly rejected all of them. The first two were requiring the involvement of a human programmer but this was considered by the court as being without precedent;⁴⁸ and requiring the problem intended to be solved to be tractable or intractable was also rejected for being irrelevant

because both “conventional computers and ANNs can (aim to) solve problems which are difficult for humans to solve unaided”.⁴⁹

The third qualification raised was significant but yet, the summary dismissal by the court demonstrates its lack of understanding of computer programming and computer science and the invention at hand. The respondent had stressed the fact that the particular values for the weights and biases are produced by a training process in which the machine learns for itself, but Birss LJ simply said “I do not see how that can be relevant either”.⁵⁰ With respect, this is another example of Birss LJ simply not comprehending the respondent’s argument concerning the serial logical “if-then” type operations of traditional programming. Up until recently, computer programs could only run on or execute many lines of *pre-written* computer programming code, which, as the dictionary definitions had defined as: to do “a particular thing”. This *is* in actual fact the limitation of computer programming without AI. It cannot train itself.

To give a simple analogy, a traditional computer program for a lift or elevator will move the elevator to the floor number which is pressed. So, if a user pressed the number “7”, the computer inside the lift will take the lift to the seventh floor. It is *not* programmed to randomly take the lift anywhere else every time the “7” button is pressed—that is, *if* number 7 is pressed, *then* take the lift to Level 7. It is possible to write many lines of code for the lift to move to a different floor other than the seventh floor, such as, in accordance with the minutes or hours of a day as a function to determine which floor the lift will move to, but it is *still* a if-then type of traditional programming. An example might be, if the number 7 is pressed, then move the lift to the level closest to the number reflecting the hour of the day, so, if the “7” button is pressed at 1 o’clock, this would result in the lift moving to Level 1; if the “7” button is pressed at 2 o’clock, the lift will move to Level 2 and so on. It may appear random to the unsuspecting, but it is *still* pre-defined and hard-coded and it is *still* if-then type of traditional programming.⁵¹

A program using AI techniques however, is different. It is possible for an AI lift, let’s call it that, to simply to take the lift to any floor it wishes, that is, autonomous, not pre-determined. This AI lift would be most unhelpful for any building as users would be “surfing” any number of floors before the users can reach their desired destinations, but it might do well in an adventure or amusement park. Coming back to the dictionary definition, an AI lift would not fall within the Cambridge and Macmillan Dictionaries’ definitions as the AI techniques used is not making the lift computer “do a

⁴⁴ This is from the author’s own experiences as a computer science student in the 1980s.

⁴⁵ *Gale’s Application* [1991] RPC 305.

⁴⁶ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [63].

⁴⁷ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [62].

⁴⁸ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [64].

⁴⁹ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [65].

⁵⁰ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [66].

⁵¹ Hannah YeeFen Lim, *Autonomous Vehicles and the Law: Technology, Algorithms and Ethics* (United Kingdom: Edward Elgar Publishing, 2018), Ch.4.

particular” thing like move to Level 7 because the AI lift is not following instructions from the “set of instructions” but rather, it is autonomous.

Thus, what actually transpired is that the Court of Appeal came up with invented definitions and using the invented definitions, swiftly concluded that the AI techniques to which the respondent rightfully raised, was irrelevant. The next section will expound the nature of the weights and biases, and how, in this regard, the court also mis-stepped in its determinations.

Significance of AI—Weights and Biases

The Court of Appeal agreed with the Comptroller that the weights and biases of an ANN are a computer program because they fall within the definition it had adopted and “are a set of instructions for a computer to do something”.⁵² As already discussed above, from the dictionary definition of “do a particular thing”, it grew to the court’s own definition to “process information in a particular way” and “for a computer to do something”. It is unfortunate that “to do something” is so broad and does not reflect the reality of computer programs, nor the dictionary definitions, which pretty much stuck to the narrow if-then hard-coded software reality with the limitation of to do a *particular* thing—recall the normal lift versus the AI lift.

Further, this conclusion that the weights and biases are computer programs is quite an astounding one given that the weights and biases are nothing more than a number.⁵³ It is difficult to see how a number by itself can suddenly become a set of instructions. Even if there are a set of numbers, that does not equate to a set of instructions, especially when the numbers (weights and biases) continue to change as training continues. With respect, this conclusion fails to consider that mathematics and a number by itself are *not* self-executing.

ANNs are a form of deep learning, in turn a form of machine learning.⁵⁴ Fundamentally, machine learning is mathematics: “statistical learning based on probability theorems”.⁵⁵ As discussed in the IPO Decision:

[the EPAIL ANN] is an abstract model which takes a numerical input, applies a series of mathematical operations (applying weights, biases and an activation function), and outputs a numerical result at successive layers.⁵⁶

A mathematical function or a number cannot *inherently* process data or information, nor is it a set of instructions. If one wholly embodies these functions and numbers in software, it might create a computer program, but by themselves, the weights and biases, being numbers only cannot be said to be a computer program.

Moreover, the weights and biases numbers are derived not from a pre-determined or pre-written computer program line of code, nor are they manually adjusted by EPAIL, but they are adjustable and self-adjusting,⁵⁷ with self-adjusting being the most crucial point here as we recall the AI lift. It again, with respect, reflects the lack of understanding by the court of AI technologies.

To understand how these weights and biases function and how they self-adjust, which leads them to produce autonomous results or outputs, take another simple of an autonomous vehicle (AV). If in the training of an AV, the AV is given a set of data where a human driver stops the vehicle 1000 times. In order to find a pattern as to why the human driver stopped the vehicle, the pattern that the algorithm might find is that in 800 of those times where the human driver stopped the vehicle, there was a traffic light and the traffic light was red. So, if the computer program and the datasets are well designed, the AV might “learn” a rule from having found the pattern; the rule being that, if there is a red traffic light, then the brakes should be applied.⁵⁸ Applying the brakes when the traffic lights are red can then be assigned a number, but as the training continues, the number will continue to change.

The distinctive feature of AI systems is its need for datasets for training so as to be able to function as desired. Even the best computer program written for an AI system can foul up severely if the dataset is poor. The dataset can be poor in a number of ways, including simply wrong data, such as a dataset filled with drivers speeding through red traffic lights, or insufficient data.⁵⁹

Traditional hard-coded computer programs do not need data, nor do they need to be trained, and they will function as coded, errors or bugs included. They do not require training for them to function as desired—they need to be properly logically coded to function as desired.⁶⁰

One type of AI technique commonly employed is supervised machine learning, where training data is labelled with an expected or desired output.⁶¹ EPAIL’s ANN utilises supervised learning.⁶² The output of the AI system is compared against the expected or desired output, and the AI system’s parameters are adjusted accordingly, often autonomously and iteratively.⁶³ ANNs have been

⁵² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [68].

⁵³ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [9] and [66].

⁵⁴ HYF Lim, *Autonomous Vehicles and the Law* (2018) at p.89.

⁵⁵ HYF Lim, *Autonomous Vehicles and the Law* (2018) at p.94.

⁵⁶ *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* BL O/542/22 at [63].

⁵⁷ HYF Lim, *Autonomous Vehicles and the Law* (2018) Ch.4.

⁵⁸ HYF Lim, *Autonomous Vehicles and the Law* (2018) at p.86.

⁵⁹ HYF Lim, *Autonomous Vehicles and the Law* (2018) Ch.4, especially at p.85.

⁶⁰ HYF Lim, *Autonomous Vehicles and the Law* (2018) Ch.4.

⁶¹ HYF Lim, *Autonomous Vehicles and the Law* (2018) at p.87.

⁶² *Comptroller-General of Patents, Designs and Trade Marks v Emotional Perception AI Ltd* [2024] EWCA Civ 825 at [12].

⁶³ HYF Lim, *Autonomous Vehicles and the Law* (2018) at p.87.

employed in surgical research as their ability to propagate backwards throughout the entire system to automatically and autonomously adjust the weights to reduce the error or error-correction is helpful in medical screening, but the major problem for healthcare is the black box nature of such off-the-shelf ANNs.⁶⁴

The point being made here is that AI techniques, with the use of massive amounts of datasets, and the mandatory use of mathematics and statistics do not sit well with the traditional conceptions of computer programs as defined in dictionaries.

Where To From Here?

The frustration from the judiciary has been clear over the years. In *HTC Europe Co Ltd v Apple Inc*, Lewison LJ was scathing of the approach that courts are left to take:⁶⁵

“So the upshot is that we now ignore the words “computer program ... as such” and instead concentrate on whether there is a technical contribution. It is, if I may say so, a singularly unhelpful test because the interaction between hardware and software in a computer is inherently “technical” in the ordinary sense of the word. If I buy a software package that malfunctions the software house will often offer me “technical support”. But that is clearly not enough for the software to qualify as making a “technical contribution”. In *Symbian* this court declined to provide a definition of the right kind of technical effect; but instead provided a recommended reading list.”

Similarly, Sherman, in a study in 2011 noted that ‘the legal position is ambiguous and lacking in certainty ... simply because the relevant patent jurisprudence has not been developed beyond the introduction of statutory exclusions’.⁶⁶ He went on to elaborate that a 2001 UK government report concluded that the law in this area was unclear.⁶⁷

While a better judicial understanding of ANNs (and AI in general) is achievable, it is acknowledged that defining “program for a computer” may be more difficult. The uncertain nature of law in this field is “an inevitable consequence of the fact that law has to pass judgment over complex and rapidly changing technologies”.⁶⁸ However, as the European Patent Office’s own Enlarged Board of Appeal put it:⁶⁹

“Where jurisprudence enters new legal territory, caution is required to avoid making statements that will prove untenable in the very next case to arise. Yet it cannot be ruled out that repeated amendments will be necessary in the course of time if legal solutions that the Boards initially deem correct prove to be mistaken in new situations and cease to be convincing jurisprudence.”

This can be applied to the legislature in the UK. The legislature is far better equipped to define new technology than judges, and even if it requires several iterations to perfect it, it is better to attempt, than not attempt, which led the judiciary to invent its own definitions that belong in the world of science fiction.

⁶⁴ Velanovich and Walczak et al. “Artificial Neural Networks in Surgical Research” (2020) 220(6) *The American Journal of Surgery* 1532 at 1532.

⁶⁵ *HTC Europe Co Ltd v Apple Inc* [2013] EWCA Civ 451 at [147].

⁶⁶ Brad Sherman, “Computer Programs As Excluded Patentable Subject Matter”, Annex II to *Experts’ Study on Exclusions from Patentable Subject Matter and Exceptions and Limitations to the Rights* (2011) WIPO Doc SCP/15/3 at p.3.

⁶⁷ Brad Sherman, “Computer Programs As Excluded Patentable Subject Matter” at pp.3–4.

⁶⁸ Brad Sherman, “Computer Programs As Excluded Patentable Subject Matter” at p.3.

⁶⁹ Opinion (G-3/08) of the Enlarged Board of Appeal, (2011) 10 OJ EPO at [7.3.4].