ARTIFICIAL NEURAL NETWORKS, COMPUTER PROGRAMS AND PATENTABILITY

Court of Appeal Case No. CA-2024-000036 of 19 July 2024

Comptroller General of Patents vs Emotional Perception AI Limited "EPAI"

1. Executive Summary

1.1 On 19th July 2024, the UK Court of Appeal handed down its decision in **CA-2024-000036.** This was in the matter of the UK Comptroller General's appeal against Sir Anthony Mann's decision in **[2023] EWHC 2948 (Ch)**[1], relating to the exclusions to patentability of Artificial Neural Networks "ANNs" under section 1 of the UK Patents Act 1977 (as amended) "UKPA". The appeal was upheld, vacating Sir Anthony Mann's decision both on the presence of technical contribution and the nature of programs for computers ("computer programs"), especially in the context of the inherent patentability of ANNs and their underlying nature.

1.2 EPAI has sought *leave to appeal* to the **Supreme Court** of the United Kingdom *inter alia* for reasons that there are significant points of law of general public interest to address, including what amounts to a "*technical contribution*" particularly in computer-implemented inventions "CIIs," and also whether the requirements of **Art.27(1) TRIPS** been appropriately considered. These issues have not previously been considered by the Supreme Court. There is also a notable and concerning divergence, prohibited by operation of **s.130(7) UKPA**, between the assessment of patentability by the UK Courts relative to the now apparently settled position of the European Patent Office "EPO" and the provisions of Art.52(1) and (2) EPC, as reflected by its Enlarged Board of Appeal "**EBA**" in **G1/19**. This is also front and centre.

1.3 This decision represents a step backwards from a position supporting ANN innovation, placing the UK in a less favourable position relative to the USA and arguably also the EPO and elsewhere. Yet another change in the UK Patent Office Guidelines can therefore be expected in the extremely near future. Depending on any further appeal, this matter may be far from settled.

1.4 This significant decision, rightly or wrongly, held or provides:

1.4.1 A definition[61] of what amounts to a ***computer*** and what is a ***computer program***. See actual definitions reproduced in 3.1 below.

1.4.2 A statement that, within the context of recommendation, semantic qualities [related to the output] are a matter of ***aesthetic***, i.e., they are "*subjective and cognitive*" in nature and, consequently, therefore make no overall technical contribution[79].

1.4.3 A conclusion that the claimed invention failed for ***lack of technical contribution***[84] irrespective of whether the matter was considered under the computer program or mathematical method exclusions of section 1(2)(a) or (c) of the UK Patents Act, respectively.

1.4.4 A position statement that the provision of a recommendation message is the ***presentation of information***[75] (excluded under section 1(2)(d) of the Act), with the sending of such being unpatentable subject-matter unless it involves a technical contribution [as in the nature of a warning message conveyed/output in ***Protecting Kids the World Over [2011] EWHC 2720 (Pat)***.]

1.4.5 That ***ANNs are computers***[68],[80], and that the aggregated weights and biases of its synaptic neural nodes "neurons", obtained from ANN training, are excluded for reasons of being a program for a computer[68].

1.4.6 That ***ANN training***[74] is "subsidiary and irrelevant" with respect to the assessment of contribution under questions (3) and (4) of ***Aerotel Ltd v Telco Holding Ltd [2007] RPC 7***.

1.4.7 That the issue was considered under established UK case law[30].[35] and especially the decision in *Aerotel*, generally leaving to one side the approach of the EPO and *G1/19* stating that a "full consideration of the law on how to apply these provisions… is not necessary for the purposes of this appeal."

1.4.8 A suggestion that Art.27(1) TRIPS[59] was not argued by at least EPAI.

2. The Claimed Invention and Some Context

2.1 EPAI's invention related to an electronic file recommendation system and method, such as used to identify a semantically relevant musical track or a contextually relevant medical report, in which a final file recommendation reflects semantic context aligned with that of an initial query.

2.2 To achieve an acknowledged "better recommendation" using a simplified CII-implemented architectural approach[26], the system's ANN is trained according to conceptual high-level '***learning objectives***' in which, ultimately, the weights and biases of its individual neurons are manipulated by a feedback process, termed '***backpropagation***.' This backpropagation process reduces the error between the expected output and the current output. Once acceptable correlation is achieved, the weights and biases are frozen to define synaptic pathways through the ANN. In developing these learning objectives, the inventors appreciated that otherwise lost (but important) semantic information for a file could be retained and then derived from physically measured parameters of the initial query, and that semantic information was more closely aligned with human thought processes. The learning objectives identified that a pairwise separation distance for each selected file pair in multi-dimensional property space [where each data point is representative of multiple file qualities such as timbre and tonality or something else] should, in the limit, converge onto the corresponding measured pairwise separation distance for the same pair of files in a multi-dimensional semantic embedding space[2],[5],[10].[13],[21], thereby improving the system by effectively closing the semantic gap between the AI/ANN environment and reality. During training of the ANN, data points in the complementary and corresponding semantic embedding space for each of the selected files of each of the numerous file pairs were produced using Natural Language Processing "NLP" of their respective semantic descriptions, e.g., "happy", "sad", "sunny spring day", or "mural thrombus descending thoracic aorta" for each file of each assessed pair.

2.3 These learning objectives are the so-described "trick"[23],[74] of Birss LJ.

2.4 Although computer-implemented, hardware and software implemented ANNs are identical since the "implementations are the same in terms of architecture, weights and so on"[18]. The process applied to produce the computer code used during training of the ANN is, according to the decision, irrelevant[64]-[66] regardless of whether the underlying problem is intractable and cannot be coded as a computer program.

2.5 An observation, at this point, from the author is that learning objectives are not generally developed by computer programmers but rather computer scientists [having a different skill set] because learning objectives are, in fact, at a different level of generality to any implementing code for the '***loss function***' and backpropagation utilised by the ANN during training. Whether the de-coupled and conceptual nature of the specific learning objectives was truly appreciated by the court is open to some considerable debate, especially since the technical problem addressed by the invention could potentially be expressed [perhaps even as '*an aim to be achieved in a non-technical field*'] as either:

2.5.1 '*How can you provide a semantically better file recommendation using an ANN?*' This follows, to some extent, Mann J's original first instance finding at [76] that,

> "*It 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*,"

or is the nature of the question more directed and expressible as

2.5.2 '*How do you train an ANN to provide a semantically relevant file output when there is uncertainty surrounding the nature of a variable input to the ANN and, indeed, how any such unknowable input maps to the semantically relevant file output [which could itself take any number of differing forms]?*'

This latter formulation is essentially representative of the nature of a truly intractable problem (e.g., any song to any other song whether you know the artist or not), which then contrasts with training of an ANN for a banking application where the inputs are always within a range of known variables and map to a known output result, e.g., whether your credit score, age and income together are sufficient to justify providing a requested level of monetary loan.

2.6 As a further observation by the author, an FIR filter is, in a similar vein to an ANN, an approximation machine and is developed and structured using similar techniques. And FPGAs are inherently patentably, such as in EP 3407145 having claims to an FPGA-based square wave generator. So does the decision produce inequality? Also, the EPO has granted claims to "a method of automatically creating a soundtrack to accompany a video work…," so is the nature of the output being considered differently by the EPO relative to the Court of Appeal in this decision?

3. Further Important Detail of the CoA Decision

3.1 What amounts to a program for a computer ("computer program") is a statutory question of law[59] whilst its interpretation develops following the principles in ***News Corp UK & Ireland Ltd v HMRC [2023] UKSC 7***[60].

3.2 The decision provides the following **definitions**:

3.2.1 A **computer** is "***a machine which processes data***";

3.2.2 A **computer program** is "***a set of instructions for a computer to do something***".

3.3 These two definitions are incredibly broad.

3.4 These definitions would seemingly apply to a set of scales, a sextant and, given the equivalence of fixed value weights and biases applied to specific neurons[9],[16,].[17],[68], the values of a resistor network within an amplifier in an analog computer, the factors defining the

operation of a finite impulse response “FIR” filter or the set-up of a field programmable gate array “FPGA.” The reference to a “machine” and “program” could also well apply, on the interpretation that component values in aggregation amount to instructions for a program that brings about a signal processing function, to a MHz radio amplifier circuit suited for low noise amplifiers with high linearity demands, such as used in a Code Division Multiple Access “CDMA” transmitter. This would be concerning and opens a can of worms.

3.5 The decision makes reference[69] to an EPO Technical Board of Appeal decision ***T702/20 Mitsubishi: Sparsely connected neural network*** to support its statement that “a neural network relates to both programs for computers and to mathematical methods.” With any decision and its longer-term applicability, the context requires consideration. In this instance, the invention in T702/20 related to a concept of neuron and pathway ‘***dropout***’ during successive training epochs for any ANN. The claims in the T702/20 application had no practical application but rather reflected an idea. The specification described, and claim features dictated, that during set-up the ANN system remove, on a random basis, neurons, or synaptic pathways to test the efficacy of the developing network to eliminate sub-optimal pathways which sometimes develop during training purely from unjustified statistical favouritism. Dropout is expected to force a neural network to explore different computational pathways to achieve the same task during the training stage.

3.6 ‘*Pruning*’ of an ANN is slightly different to dropout in that pruning reduces the size of the ANN matrix by removing pathways, neurons, and/or neuron weights, thereby making the ANN smaller and faster and requiring fewer processing resources whilst not significantly compromising the performance of the network. It is mentioned here simply because the term prune[9] was used by Birss LJ to introduce ANN technology.

3.7 The EPO’s Guidelines for Examination, however, indicate that patentability for ANNs is acquired with their practical application, even in classifiers. At G-II-3.3 they state:

> *When assessing the contribution made by a mathematical method to the technical character of an invention, it must be taken into account whether the method, in the context of the invention, produces a technical effect serving a technical purpose…*
>
> *The claim is to be functionally limited to the technical purpose, either explicitly or implicitly. This can be achieved by establishing a sufficient link between the technical purpose and the mathematical method steps, for example, by specifying how the input and the output of the sequence of mathematical steps relate to the technical purpose so that the mathematical method is causally linked to a technical effect.*

3.8 And in terms of AI, the Guidelines at G-II-3.3.1 go on to say [even in the context of a technically more limited classifier]:

> *Where a classification method serves a technical purpose, the steps of generating the training set and training the classifier may also contribute to the technical character of the invention if they support achieving that technical purpose.*

4. Where Next? The Significant Issues that this Decision Throws Up

4.1 EPAI has sought permission to appeal to the Supreme Court because, amongst other reasons, the issues are a matter of general public importance requiring final resolution. Permission to appeal is presently undecided by either the Court of Appeal itself or on further application to the Supreme Court (which will likely be required).

4.2 Surprisingly, to some extent, the UKIPO has objected to the matter being referred to the Supreme Court, although at the appeal hearing its counsel's introduction stated (taken from transcript),

> *"As the court may appreciate, this is the first case in which the relevance of the exclusions to artificial neural networks has gone beyond the UK Intellectual Property Office, and it is common ground that the extent to which the exclusion applies to ANNs and, if so how, is a matter of some significant public importance, having regard to the proliferation of AI techniques in today's world.*
>
> *In that context I should make clear from the outset that my client, the Comptroller's, interest in this appeal is simply to determine the law and its proper application in this area. The respondent just happens to be the first entity whose patent application brings this new legal point to the courts. And apart from wishing to correctly apply the law, the Comptroller has no interest in whether or not Emotional Perception, or any other applicant, is granted or refused a patent."*

4.3 In its present submissions, EPAI asserted that the approach of the English Courts to the construction of terms and the correct approach to the objective assessment of patentable exclusions required by operation of s.1(2) UKPA - and in particular the exclusions relating to programs for a computer, mathematical methods and the presentation of information - is a matter which is presently uncertain and likely flawed.

4.4 EPAI asserted that English patent jurisprudence is demonstrably out-of-line with the apparently now finally settled (a) "any hardware" test, (b) the indication from G1/19 that a broad construction to the exclusions to patentability is wrong and barred, and (c) application of the inventive step assessment approach of ***T641/00-Comvik*** for mixed inventions [even if, on a practical day-to-day basis, this assessment is sometimes harshly applied to the detriment of the actual invention through using artificial constructs, such as the 'requirement specification' argument]. The assertions, in sum, are that English patent jurisprudence is now, if it was not already before, clearly inconsistent with the requirement to provide protection for 'all fields of technology' as legislated in and by Art.27(1) TRIPS and Art.52(1) and (2) EPC, and a stepwise and objective approach to the assessment of exclusion and patentability, especially for CIIs.

4.5 That loss of focus on the statutory test is thus apt to lead the Court to approach the question of patentable exclusion under the UKPA in an erroneous and overly broad manner. Referencing Lewison LJ comments in ***HTC v Apple [2013] EWCA Civ. 451*** (at [143] to [147]), the statutory words are ignored in favour of a search what amounts to an undefined 'technical contribution' or a 'technical effect'. Indeed, Lewison JL's articulated concern was that, instead of arguing about what the legislation means, there is an argument about what the gloss means, with this being "a singularly unhelpful test." Consideration of the appropriateness of a

generally holistic approach has never been before the Supreme Court (or House of Lords), so its intervention appears long overdue.

4.6 Basis for adopting the EPO approach flows from s.130(7) UKPA and its stipulation that "it is hereby declared that the following provisions of this Act, that is to say, sections 1(1) to (4), 2 to 6…, are so framed as to have, as nearly as practicable, the same effects in the United Kingdom as the corresponding provisions of the European Patent Convention, the Community Patent Convention and the Patent Co-operation Treaty have in the territories to which those Conventions apply."

4.7 Further principal issues now arise from this decision.

4.8 For example, are the enormously broad constructions of the terms 'computer' and 'program for a computer' appropriate when, on no reasonable basis, can these have been within the contemplation of the framers of the exclusions? Can the sending of the recommendation message and file be legitimately described as 'the presentation of information' in what is now a much-broadened sense, especially since the CoA has construed the exclusion as biting on a claim which defines only the nature of the content of the information but nothing about the manner of presentation?

4.9 If the Supreme Court fails to grasp the opportunity now presented to provide definitive guidance on the questions of (a) what is a technical contribution, (b) how do you identify one, (c) what is the objective test if there is one, and (d) should the UK approach align with the EPO approach, then is a generational opportunity lost and has the CoA hamstrung both the UK computing and AI industries by denying protection? Time will tell!

Biography

Bruce C. Dearling represents Emotional Perception AI, is a shareholder at Hepworth Browne and is responsible for CIIs, AI, communications, and business technologies. He has over 30-years of private practice and industrial practice experience both in the UK and internationally and is multi-nationally qualified. His previous work has secured leading decisions in litigation in Germany and other European countries, including for trade secret and database theft and cross-border evidence seizures.