Hilary Term
[2026] UKSC 3
On appeal from: [2024] EWCA Civ 825

JUDGMENT

Emotional Perception AI Limited (Appellant) *v* Comptroller General of Patents, Designs and Trade Marks (Respondent)

before

Lord Briggs
Lord Hamblen
Lord Leggatt
Lord Stephens
Lord Kitchin

JUDGMENT GIVEN ON
11 February 2026

Heard on 21 and 22 July 2025

Appellant
Mark Chacksfield KC
Edmund Eustace
(Instructed by Hepworth Browne Ltd (Leeds))

Respondent
Brian Nicholson KC
Anna Edwards-Stuart KC
(Instructed by Government Legal Department)

Interveners – (1) The Chartered Institute of Patent Attorneys, (2) IP Federation

LORD BRIGGS AND LORD LEGGATT (with whom Lord Hamblen, Lord Stephens and Lord Kitchin agree):

Introduction

1. This appeal is about whether it is possible to patent a particular type of what may loosely be called artificial intelligence, specifically that which consists of, resides in, or is centred around, an artificial neural network ("ANN"). Emotional Perception AI Ltd, the appellant and applicant for a patent, claims to have invented a system or method which uses an ANN to replicate the similarities and differences which a human being might subjectively perceive between different files of information by reference entirely to objectively measurable physical properties of those files. The commercial purpose of the system or method is to enable a person who likes or is interested in a particular media file (which might be a music track, a video or a text) to obtain the recommendation of a file calculated to elicit a similar emotional response. Anyone who regularly obtains news items from a mobile phone, or watches films on a modern television, or uses a music streaming service, will appreciate that recommendation services of this type are already widely available. But the applicant says that its invention enables that service to be provided more quickly and simply and to make better recommendations than anything else currently available.

2. It will assist in understanding the issues in this appeal to provide an outline description of an ANN, the system or method which is the subject of the patent application and the principal issues in dispute. It will be necessary to elaborate upon aspects of this outline later, but what follows is intended to serve as a general introduction.

Basic nature of an ANN

3. An artificial neural network or ANN is, as its name implies, a network of artificial neurons, loosely akin to the neurons in a human brain. These "neurons" are nodes arranged in layers, with each neuron, and each layer, connected to others. Data presented to the first (input) layer of neurons are processed through each layer in turn until the final (output) layer of the network generates an output. The neurons in a layer below the input layer will each receive inputs from one or more neurons in the layer above. Each input value to a neuron is assigned a separate weight. The weighted input values are aggregated together and adjusted with a bias. A mathematical function (usually a non-linear function such as the sigmoid function), known as an "activation function", is applied to this aggregated value to generate the neuron's output value. That value is then transmitted as an input to each connected neuron in the next layer.

4. An important feature of an ANN is its capacity to engage in machine learning: that is, it can be trained to perform a task, and to improve the quality of its performance, by

an iterative process of adjustment. The training process typically involves repeatedly inputting a set of data for which desired (or target) outputs have been independently identified. On each iteration the output generated by the ANN is compared with the target output using a "loss function" to measure the difference (or degree of error) between the actual output and the target output. This information is then used to adjust the variable parameters of the network (the weights and biases) to reduce the likelihood of future error. A commonly used technique is called backpropagation. In essence this involves calculating how much each weight and bias contributed to the total error and adjusting the weights and biases accordingly.

5. Once the performance of the ANN is perceived to have been optimised by this training process, the ANN is ready to use for its intended task. At this stage the weights and biases are frozen, so that they are static and no longer subject to adjustment. New data (not included in the training set) can then be presented to the ANN, which will process the data and generate an output applying the weights and biases arrived at through training.

6. As discussed in more detail later, an ANN can be implemented on a conventional digital computer or on a dedicated piece of hardware which has a particular network architecture embedded in it.

The claimed invention

7. There is nothing new about the concept of an ANN. It dates back in simple form to the 1950s. Machine learning is a more recent phenomenon, but the applicant does not claim to have invented that. Rather its claimed invention lies in the system and method by which an ANN is trained to replicate the subjective or emotional human perception of the degree of similarity or difference between files of the same genre (music or text for example) by reference to objectively measurable physical properties of the files.

8. The two relevant claims (1 and 4) are set out in the Appendix to this judgment. Claim 1 is for a system for providing file recommendations. Claim 4 is for a method for providing the same recommendations. The analysis in the lower courts focussed on claim 4, and we will follow the same approach.

9. In outline, the method involves training an ANN using a series of pairs of files as training data. The files in each pair have been independently compared with each other using two different measures. One is a measure of their semantic similarity derived from how they have been described by human beings in words. The other is a measure of their physical similarity. Using music files as an example, at a very basic level one file in a pair might be described as happy and exciting and the other as sad and relaxing, although the descriptions are usually more complex than that. Using a natural language processing

system, the textual descriptions are given numerical expression as vectors in what is described as the semantic space. The semantic similarity or difference between the two files is represented by the distance between the two vectors (referred to as the "separation distance") in the semantic space. This analysis is in fact performed by an ANN, but it is not the ANN the subject of the claims.

10. The same pairs of files are separately analysed by measuring physical properties, such as (in music files) tempo, tone, volume and rhythm, and converting these into vectors in a notional "property space". The separation distance between the two files in the property space is then measured.

11. The next step is what the judge and the Court of Appeal (at para 23 of the judgment) described as the significant "trick" in the invention. The ANN which is the subject of the claims is trained to make the distances between the pairs of files in the property space align more closely with the distances between those pairs in the semantic space. This is done using the technique of machine learning described above. In the data set used for training, the separation distance between pairs of files in the property space is compared with the separation distance between the same pairs of files in the semantic space to measure the extent of the difference or "error". The internal weights and biases within the ANN are then adjusted using backpropagation to eliminate or reduce that error by iterative review of the same pairs of files. The aim is to make the distance between file vectors in the property space correspond as closely as possible to the distance between the vectors for the same file in the semantic space.

12. Once the training process has been carried out to the extent desired to optimise the performance of the ANN, the weights and biases in the ANN are frozen. The ANN is now ready to be used to analyse the physical properties of (say) a music track presented to it and attribute a vector to the track. This vector can then be compared with the vectors of other tracks in a database from which recommendations are to be drawn. Recommendations are made by identifying tracks with proximate vectors. The comparison is made without recourse to any semantic comparisons. The ANN has been trained to measure similarities and differences between files and to identify music to which a human being would give a semantically similar description of their emotional response, but solely by reference to the physical properties of the files.

The law and the issues

13. The availability of a patent for an invention is governed in the United Kingdom by the Patents Act 1977, which aimed (among other things) to bring UK patent law into conformity with the provisions of the European Patent Convention (the "EPC"). Section 130(7) of the 1977 Act declares in terms that specified sections of the Act (including those with which this appeal is concerned) "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 … [and two other Conventions] have in the territories to which those Conventions apply." In these circumstances we will adopt the same approach as the Court of Appeal in the leading case of *Aerotel Ltd v Telco Holdings Ltd* [2006] EWCA Civ 1371; [2007] Bus LR 634; [2007] RPC 7 ("*Aerotel"*) of working directly from the underlying source, without troubling with the minor (and immaterial) differences in wording between the two texts.

14. This appeal is mainly concerned with the interpretation and application of section 1 of the 1977 Act, for which the source provision is article 52 of the EPC. In its amended form article 52 provides (in the English version of its text) as follows:

> "Patentable inventions
>
> (1) European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.
>
> (2) *The following in particular shall not be regarded as inventions within the meaning of paragraph 1*:
>
> (a) discoveries, scientific theories and mathematical methods;
>
> (b) aesthetic creations;
>
> (c) schemes, rules and methods for performing mental acts, playing games or doing business, and *programs for computers*;
>
> (d) presentations of information.
>
> (3) Paragraph 2 shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities *as such*." (emphasis added)

15. The applicant has thus far failed to obtain a patent for its claimed invention on the ground that it falls foul of the exclusion from patentability of "programs for computers … as such" specified by the combination of article 52(2)(c) and (3) of the EPC, loosely replicated but with no intentionally different meaning in section 1(2)(c) of the 1977 Act. The Hearing Officer in the UK Intellectual Property Office (the "UKIPO") rejected the application on this basis. On appeal to the High Court, the judge (Sir Anthony Mann) allowed the applicant's appeal, holding that an ANN is not a program for a computer at all so that the exclusion has no application; and that, even if that is wrong, the subject matter of the invention is not excluded: [2023] EWHC 2948 (Ch); [2024] Bus LR 14; [2024] RPC 2. The Court of Appeal (Birss LJ, with Arnold and Nicola Davies LJJ agreeing) allowed an appeal by the Comptroller General of Patents, Designs and Trade Marks and restored the decision of the Hearing Officer that the claimed invention is excluded from patentability: [2024] EWCA Civ 825; [2024] Bus LR 1589; [2024] RPC 25.

16. The Hearing Officer and the courts below reached their differing conclusions as to patentability by following the established guidance on the interpretation and application of article 52 of the EPC given by the Court of Appeal in *Aerotel*. No argument was advanced at any stage before the appeal to this court that this guidance should not be followed.

17. *Aerotel* was decided at a time when, in the view of the Court of Appeal, the approach to be adopted in applying article 52 had not yet been settled at the level of the Board of Appeal of the European Patent Office (the "EPO"). Various different approaches had been adopted by different panels of the Board of Appeal, some of which appeared to be irreconcilable with others. It was therefore legitimate for the English courts to form their own view on those matters, rather than follow EPO jurisprudence, until the position had been clarified by a decision of an Enlarged Board of Appeal. But Jacob LJ (giving the judgment of the court) warned in *Aerotel*, at para 29, that, if and when an Enlarged Board did rule on the question, the approach in the UK might have to be reconsidered, if necessary by means of a leap-frog appeal to the Supreme Court. The Court of Appeal even went so far as to suggest, at para 76 of the judgment, questions which might usefully be asked of an Enlarged Board, starting with: "What is the correct approach to adopt in determining whether an invention relates to subject matter that is excluded under Art.52?"

18. In March 2021, an Enlarged Board did for the first time rule on the interpretation of article 52 in *Bentley Systems (UK) Ltd/Pedestrian Simulation (Decision G1/19)* [2021] EPOR 30 ("*G1/19*"). This decision approved earlier dicta of the EPO Board of Appeal to the effect that the approach endorsed in *Aerotel* was not a good faith implementation of article 52, was incompatible with it and was based upon a misunderstanding of the meaning of the word "invention" as used in the EPC. The Enlarged Board went on to lay down an approach to the interpretation and application of article 52 which had been expressly rejected in *Aerotel*. Accordingly, as Jacob LJ had foreseen might happen, the occasion has now arisen for this court to consider whether *Aerotel* adopts a correct

interpretation of article 52 or an appropriate procedure for its implementation. That gives rise to the first issue arising on this appeal ("issue 1").

19. As Brian Nicholson KC, leading counsel for the respondent Comptroller General was at pains to point out, it would not be enough for this court merely to rule (if so persuaded) that *Aerotel* was wrong and should not be followed. All the officers in the UKIPO and, in all probability, most patent lawyers in the UK have been trained or become accustomed to applying the *Aerotel* methodology as a matter of course, and would need to be told what different approach should now be followed, to the extent that the facts of, and issues raised by, this appeal make it possible or appropriate for this court to do so. This is not as straightforward as just saying that courts in the UK should now follow *G1/19*. The guidance which the Enlarged Board laid down or approved in that case contains an undifferentiated mixture of matters which may fairly be said to have been dictated by the Enlarged Board's interpretation of article 52 and matters which simply reflect current EPO practice, procedure and methodology. The latter may not be mandated by an interpretation of the EPC, and neither the UKIPO nor the UK courts are bound to apply EPO practice and procedures, or even methodologies.

20. As set out at paras 25-67 below, our conclusion is that the *Aerotel* approach should not be followed, in the light of *G1/19*, and that the UK should adopt the same interpretation of article 52 as the Enlarged Board. For reasons that we will explain, this does not in our view require UK courts to change their approach to the analysis of what amounts to an inventive step although it may require some modification.

21. This is in a sense a preliminary issue, since a correct interpretation of article 52 affects the approach to the other issues, all of which have thus far been decided by the Hearing Officer and the courts below by applying *Aerotel*.

22. The remaining issues on this appeal concern whether the claimed invention falls within the exclusion from patentability of "programs for a computer … as such". At its highest the applicant's case is that an ANN is not and does not involve a program for a computer at all. This is the subject of issue 2. The applicant's alternative case is that in any event, as the first instance judge Sir Anthony Mann concluded, the claims in the application are not for a program for a computer as such. If either submission is correct, it is decisive of this appeal, because it is only the application of the computer program exclusion which has thus far been held to prevent the grant of the sought-after patent.

23. We have concluded that the applicant's primary case should be rejected and that ANNs of the kind with which this appeal is concerned (including therefore the ANN which is the subject of the claims) are "programs for computers" within the meaning of article 52(2)(c). Our reasons are set out in paras 68-96 below.

24. That conclusion makes it necessary to decide whether the claimed invention is a program for a computer "as such". It follows from our answer to issue 1, and our adoption of the EPO Enlarged Board's interpretation of article 52, that the answer to this question is "no" just because the invention involves a computer (and other hardware). We discuss whether we are in a position to go further in examining the implications of this interpretation of article 52 but explain why we have concluded that we should not venture far in this regard.

Issue 1: Should *Aerotel* no longer be followed?

Aerotel

25. In *Aerotel* the Court of Appeal considered the previous UK and EPO case law on the application of article 52(2) and identified three different approaches which had been adopted. These were summarised, at para 26, as follows:

> "(1) *The contribution approach*
>
> Ask whether the inventive step resides only in the contribution of excluded matter – if yes, Art 52(2) applies. …
>
> (2) *The technical effect approach*
>
> Ask whether the invention as defined in the claim makes a technical contribution to the known art – if no, Art 52(2) applies. A possible clarification (at least by way of exclusion) of this approach is to add the rider that novel or inventive purely excluded matter does not count as a 'technical contribution'. …
>
> (3) *The 'any hardware' approach*
>
> Ask whether the claim involves the use of or is to a piece of physical hardware, however mundane (whether a computer or a pencil and paper). If yes, Art 52(2) does not apply. …"

26. The Court of Appeal noted that the third, "any hardware" approach appeared to have three variants, reflected in a trio of EPO Board of Appeal cases: *PBS Partnership/Controlling pension benefits system* (Decision T 931/95) [2002] EPOR 522 ("*Pension Benefits*"); *Hitachi/Auction method* (Decision T 258/03) [2004] EPOR 548

("*Hitachi* "); and *Microsoft/Clipboard formats I* (Decision T 424/03) [2006] EPOR 414 ("*Microsoft/Data Transfer*"). Nonetheless they all shared the approach that a claim involving any hardware is not excluded by article 52(2).

27. The Court of Appeal was scathing about the "any hardware" approach. It was said, at para 26(3), to have been specifically rejected by the previous decision of the Court of Appeal in *Gale's Application* [1991] RPC 305 and, in any event, to be plainly wrong (para 27) on the ground that it would fail to exclude claims to a new story in a book or to a new music track on a CD player - examples of excluded matter presented on hardware. The solution to that problem adopted by the EPO in *Pension Benefits* and *Hitachi* (treating the excluded matter as part of the prior art at the inventive step stage) was described as "not intellectually honest". Added to that, the variants of the "any hardware" approach were said to be clearly in conflict with each other (para 28). It was also said, at para 30, that the trio of cases were based upon an assumption that the various excluded categories in article 52(2) all had a common factor of being limited to something abstract or intangible, which the Court of Appeal considered to be mistaken.

28. The Court of Appeal in *Aerotel* would have preferred to adopt the contribution approach: that is, if the inventive step resides only in the contribution of excluded matter, then article 52(2) applies to defeat the claim. They said, at para 32:

> "Patents are essentially about information as to what to make or do. If all the patentee has taught new is something about an excluded category, then it makes sense for the exclusion to apply."

But they regarded themselves as bound by UK precedent (*Merrill Lynch's Application* [1989] RPC 561*, Gale*, and *Fujitsu Ltd's Application* [1997] RPC 608) to apply what they called "the technical effect approach with the rider" (para 38). This was (see the summary quoted at para 25 above) to ask whether the invention as defined in the claim makes a technical contribution to the known art, with the rider that novel or inventive purely excluded matter does not count as a technical contribution. If the answer is "no", then article 52(2) applies.

29. The Court of Appeal went on, at paras 40 and 48-49, to lay down the following four step structured approach to the application of article 52(2):

(1) properly construe the claim;

(2) identify the actual contribution;

(3) ask whether it falls solely within the excluded subject matter;

(4) check whether the actual or alleged contribution is actually technical in nature.

30. The Court of Appeal added some commentary on these steps at paras 42 to 47. The following points deserve notice. First, step 2 (identify the contribution) was said to involve asking what, as a matter of substance rather than form, the inventor has really added to human knowledge (para 43). While acknowledging that at the application stage the search might have to be for the alleged contribution, the Court of Appeal nonetheless said that it was the actual contribution that really mattered (para 44). Step 3 (asking whether the contribution is solely of excluded matter) was described as "merely an expression of the 'as such' qualification of Art 52(3)" (para 45). Finally, it was said that step 4 "may not be necessary because the third step should have covered that". But it was said to be required by *Merrill Lynch*.

Background to G1/19

31. It is now necessary to spell out in a little detail the approach to the interpretation and application of article 52(2) approved in the decision of the EPO Enlarged Board in *G1/19*. It is common ground that the Enlarged Board approved an "any hardware" approach, meaning that if the subject matter of the claim involves the use of any hardware, then article 52(2) is at least prima facie inapplicable. But the Comptroller General submits that "any hardware" is not an approach which deals comprehensively with the effect of article 52(2). It is said that what the Enlarged Board really approved was a combination of "any hardware" and the principles laid down by the Board, before *Aerotel*, in *Comvik GSM AB (Decision* T 641/00) [2004] EPOR 10 ("*Comvik*"). To address that submission, and also to see how the EPO has reacted to *Aerotel,* it is necessary to look both at *Comvik* itself, and at another decision of the EPO Board of Appeal approved in *G1/19*, namely *Duns Licensing Associates* (Decision T 154/04) [2004] EPOR 10 ("*Duns*").

Comvik

32. *Comvik* (decided in September 2002) concerned the requirement for an inventive step, mentioned in article 52(1) but dealt with in more detail in article 56. Article 56 provides (in its English text) that:

> "An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art …"

In *Comvik* the Board of Appeal examined how the by then established approach in the EPO to dealing with inventive step known as the "problem and solution method" should be applied to mixed claims: that is, claims including both technical and non-technical features. What the Board decided is well summarised in the headnote as follows:

> "1. An invention consisting of a mixture of technical and non-technical features and having technical character as a whole is to be assessed with respect to the requirement of inventive step by taking account of all those features which contribute to said technical character whereas features making no such contribution cannot support the presence of inventive step.
>
> 2. Although the technical problem to be solved should not be formulated to contain pointers to the solution or partially anticipate it, merely because some feature appears in the claim does not automatically exclude it from appearing in the formulation of the problem. In particular where the claim refers to an aim to be achieved in a non-technical field, this aim may legitimately appear in the formulation of the problem as part of the framework of the technical problem that is to be solved, in particular as a constraint that has to be met."

33. The context of this holding is that the Board of Appeal recognised that the general principles reflected in the EPC require patents to be available for inventions "in all fields of technology" and that "technical character is a sine qua non for an invention in the sense of the EPC": para 3 of the reasons. Nonetheless claims can qualify as an invention even if they contain predominantly non-technical features. This is an inevitable consequence of the "any hardware" approach to article 52(2): see para 4 of the reasons. The "problem and solution" approach is introduced at para 5 of the reasons as a method or test developed by the Boards of Appeal for meeting the requirements of article 56. In essence it involves identifying, by reference to the closest prior art in the technical field of the invention, a technical problem which the invention claims to solve, and then assessing whether the technical feature(s) which form the claimed solution could be derived by the skilled person in that field in an obvious manner from the state of the art. This method is not described as the only legitimate test, or one dictated by the true interpretation of the EPC.

Duns

34. In *Duns* (decided in November 2006) the Board of Appeal had an opportunity to comment on *Aerotel.* The gist of the Board's reasoning was that: (i) the four conditions of patentability set out in article 52(1) - invention, novelty, inventive step and susceptibility to industrial application - are separate, independent requirements; (ii) an

implicit requisite of an invention is that it should have technical character; (iii) article 52(2) does not exclude any subject matter having technical character even if it is related to any of the (non-technical) items specified in article 52(2), since these items are only excluded "as such" (see article 52(3)); (iv) the requirement of technical character implicit in an invention is an absolute requirement that does not imply any novel and inventive contribution relative to the prior art; and (v) the requirement that the claim discloses an invention must be satisfied before the other requirements for patentability become relevant (as recognised by Mustill LJ in *Genentech Inc's Patent* [1989] RPC 147, 262). The Board concluded, at para 12:

> "These views are entirely consistent with the legal concept of 'invention' applied by the Board in the context of Art 52(1) to (3) EPC, which should not be mixed up with the layman's ordinary understanding of invention as a novel, and often also inventive contribution to the known art. Using these two very different concepts of invention in one breath would be a legal fallacy."

35. The Board then directly addressed *Aerotel* and said, at para 12, that the "technical effect approach" endorsed in that case "seems to be rooted in this second ordinary meaning of the term invention, a practice which might be understandable 'given the shape of the old law' … but which is not consistent with a good-faith interpretation of the European Patent Convention in accordance with Art 31 of the Vienna Convention on the Law of Treaties of 1969". The Board reasoned that any reference to the prior art in the context of article 52(2) would lead to insurmountable difficulties and could not have been intended by the parties to the Convention, as the concept of the "state of the art" in the EPC is a complex one, finely tuned by the combination of articles 54 to 56, and there is no definition of it capable of being applied in the context of article 52(2). Therefore, both the "contribution" and "technical effect" approaches which involved such reference should be abandoned.

36. At para 13 the Board gave a further reason why the "technical effect with rider" approach adopted in *Aerotel* was irreconcilable with the EPC. It said that the presupposition that "novel and inventive purely excluded matter does not count as a 'technical contribution'" has no basis in the Convention. In fact, a purely excluded (non-technical) matter can count as a contribution to the technical character of an invention. It is only to the extent that non-technical features do not interact with technical features to produce a technical effect that they cannot establish novelty or inventive step. The Board said that the judgment in *Aerotel* missed this point when making the assertion that the deemed inclusion of non-technical features in the prior art was not intellectually honest. The Board regarded its interpretation of the EPC and the case law of the EPO as so clear that reference to the Enlarged Board was unnecessary.

37. It took almost a further 15 years before these issues finally reached the Enlarged Board in *G1/19.* The questions referred were concerned with inventive step and the problem and solution method of addressing it, in the context of computer-implemented simulations. But the Enlarged Board went out of its way to review and affirm the earlier jurisprudence of the Boards of Appeal, specifically by endorsing the *Comvik* approach and the principles set out in *Duns*.

38. The Enlarged Board, at para 28, gave its unqualified imprimatur to the "any hardware" approach, stating that:

> "A method involving technical means is an invention within the meaning of Art 52(1) EPC."

It followed that "a claim directed to a computer-implemented invention avoids exclusion under Art 52 EPC merely by referring to the use of a computer, a computer-readable storage medium or other technical means".

39. The reasoning in *Duns* was approved by the Enlarged Board's adoption, word for word, of seven principles set out in that decision ("the *Duns* principles"), as follows:

> "(A) Article 52(1) EPC sets out four requirements to be fulfilled by a patentable invention: there must be an invention, and if there is an invention, it must satisfy the requirements of novelty, inventive step, and industrial applicability.
>
> (B) Having technical character is an implicit requisite of an 'invention' within the meaning of Article 52(1) EPC (requirement of 'technicality').
>
> (C) Article 52(2) EPC does not exclude from patentability any subject matter or activity having technical character, even if it is related to the items listed in this provision since these items are only excluded 'as such' (Article 52(3) EPC).

(D) The four requirements - invention, novelty, inventive step, and susceptibility of industrial application - are essentially separate and independent criteria of patentability, which give rise to concurrent objections. Novelty, in particular, is not a requisite of an invention within the meaning of Article 52(1) EPC, but a separate requirement of patentability.

(E) For examining patentability of an invention in respect of a claim, the claim must be construed to determine the technical features of the invention, i.e. the features which contribute to the technical character of the invention.

(F) It is legitimate to have a mix of technical and 'non-technical' features appearing in a claim, in which the non-technical features may even form a dominating part of the claimed subject matter. Novelty and inventive step, however, can be based only on technical features, which thus have to be clearly defined in the claim. Non-technical features, to the extent that they do not interact with the technical subject matter of the claim for solving a technical problem, i.e. non-technical features 'as such', do not provide a technical contribution to the prior art and are thus ignored in assessing novelty and inventive step.

(G) For the purpose of the problem-and-solution approach, the problem must be a technical problem which the skilled person in the particular technical field might be asked to solve at the relevant priority date. The technical problem may be formulated using an aim to be achieved in a non-technical field, and which is thus not part of the technical contribution provided by the invention to the prior art. This may be done in particular to define a constraint that has to be met (even if the aim stems from an a posteriori knowledge of the invention)."

40. Even though the criticisms of the judgment in *Aerotel* made in *Duns* were not expressly endorsed by the Enlarged Board, it must be taken by implication to have adopted them by its wholesale approval of the summary of the *Duns* principles set out above.

41. The contribution made by *Comvik* as the source of *Duns* principles (F) and (G) was also endorsed by the full citation of its headnote (which we have quoted at para 32 above), and by referring to the principles set out in its headnote as "the *Comvik* approach".

42. The Enlarged Board went on, at paras 32-33, to make some additional comments on principle (F) and how technical and "non-technical" features can interact:

> "32. In this context, the term 'non-technical features' refers to features which, on their own, would be considered 'non-inventions' under Article 52(2) EPC. Whether such features contribute to the technical character of the invention has to be assessed in the context of the invention as a whole.
>
> 33. The same manner of assessment applies to features which can be considered to be technical per se: they do not necessarily contribute to the technical solution of a technical problem. An invention may have (i) technical features which contribute, (ii) technical features which do not contribute, (iii) non-technical features which contribute and (iv) non-technical features which do not contribute to the technical solution of a technical problem and thereby potentially to the presence or not of an inventive step. While (i) and (iv) are self-evident, features according to (iii) have been established by the case law described above (principle (F): non-technical features interacting with the technical subject matter of the claim for solving a technical problem). Case (ii) occurs if features that per se qualify as technical cannot contribute to inventive activity because they have no technical function within the context of the claimed invention. Even before the *Comvik* approach was established, technically non-functional modifications (even if they could per se be considered technical) could be considered irrelevant in the assessment of inventive step." (citations omitted)

43. The Enlarged Board added this commentary on the steps of particular relevance to this appeal, at paras 37-39, under the heading "Two-hurdle approach":

> "37. To be patentable, any invention has to pass the eligibility test under Art 52 EPC (i.e. it must not fall under the 'non-inventions' mentioned there) and also fulfil the other criteria listed in that article (novelty, inventive step, etc). For computer-implemented inventions, the twofold test

> for patent eligibility and for inventive step (using the *Comvik* criteria) is often referred to as the 'two-hurdle approach'.
>
> 38. It may be that a shift has taken place in the relative level of each of these two hurdles in the sense that it has become easier to clear the eligibility hurdle of Art 52 EPC … and more difficult to pass the inventive step hurdle of Art 56 EPC. As result of this shift, it could be said that there is now in effect an additional intermediate step to assess the 'eligibility of the feature to contribute to inventive step'.
>
> 39. The two-hurdle approach for computer-implemented inventions actually entails three steps. Establishing whether a feature contributes to the technical character of the invention constitutes an intermediate step between assessing (i) the invention's eligibility under Art 52 EPC, and (ii) whether the invention is based on an inventive step vis-à-vis the closest prior art. This additional intermediate step serves as a filter for features contributing to a technical solution of a technical problem in view of the closest prior art. Only those distinguishing features can contribute to inventive step."

Status of EPO case law

44. The starting point in any analysis of the question whether the *Aerotel* approach should now be treated as overtaken by *G1/19* lies in the principles which courts in the UK have adopted in deciding how closely to follow the case law of the EPO on the meaning and effect of the EPC. On this, the authoritative dicta speak with one voice. These courts are not strictly bound by decisions of the Boards of Appeal of the EPO, even of the Enlarged Board, but they should respect and follow the Enlarged Board's decisions and any uniform jurisprudence of the Boards of Appeal unless convinced that they are wrong or beyond the ambit of reasonable difference of opinion. This is essentially for good policy reasons. The national courts of all the contracting states should seek a uniform interpretation of the EPC, and of domestic legislation passed to implement it.

45. In *Conor Medsystems Inc v Angiotech Pharmaceuticals Inc* [2008] UKHL 49; [2008] RPC 28, para 3, Lord Hoffmann said that "when the question is one of principle, it is desirable that so far as possible there should be uniformity in the way the national courts and the EPO interpret the [EPC]". In *Generics (UK) Ltd v H Lundbeck A/S* [2009] UKHL 12; [2009] Bus LR 828; [2009] RPC 13, para 35, Lord Walker of Gestingthorpe referred to "the importance of UK patent law aligning itself, so far as possible, with the jurisprudence of the EPO (and especially decisions of its Enlarged Boards of Appeal)".

In *Human Genome Sciences Inc v Eli Lilly & Co* [2011] UKSC 51; [2012] RPC 6 Lord Neuberger of Abbotsbury MR gave a judgment (with which all the Justices agreed) in which he stressed the importance of generally following the Board's jurisprudence. He said, at para 83:

> "In all cases, however, the EPO and each national court are, of course, applying the principles contained in the EPC. It is plainly appropriate in principle, and highly desirable in practice, that all these tribunals interpret the provisions of the EPC in the same way."

And at para 87:

> "… where the Board has adopted a consistent approach to an issue in a number of decisions, it would require very unusual facts to justify a national court not following that approach."

46. This is not to say that decisions of the EPO Board are binding on UK courts. In *Human Genome Sciences*, para 87, Lord Neuberger also observed that a national court may think it right not to apply the reasoning in a particular Board decision which it considers may take the law in an inappropriate direction, misapplies previous EPO jurisprudence, or fails to take a relevant argument into account; and that "[w]hile consistency of approach is important, there has to be room for dialogue between a national court and the EPO". Perhaps the most memorable dictum on this subject is that of Jacob LJ in *Actavis UK Ltd v Merck &Co Inc* [2008] EWCA Civ 444; [2009] 1 WLR 1186, para 48:

> "In saying our courts would and should normally follow the settled jurisprudence of the European Patent Office it should be understood, of course, that they are not bound do so. In the unlikely event that we are convinced that the commodore is steering the convoy towards the rocks we can steer our ship away."

47. Where there is an apparent conflict between the settled jurisprudence of the EPO and a prior decision of the Court of Appeal, all English courts below the Supreme Court face the difficulty that the established rules of precedent in the domestic courts do not easily accommodate the policy and principled reasons for following the EPO. This problem is considered at length in *Symbian Ltd v Comptroller General of Patents* [2008] EWCA Civ 1066; [2009] Bus LR 607; [2009] RPC 1, paras 33-36. It was no doubt for this reason that in *Aerotel* itself Jacob LJ advised that, in the event of a relevant decision of the Enlarged Board taking a different view from the Court of Appeal, the matter might

best be addressed by a leap-frog appeal to this court. In the event, the decision of the Enlarged Board in *G1/19* has not led to a leap-frog appeal, but the conflict between that decision and the guidance given in *Aerotel* was not made the subject of any submissions in the courts below. Whether or not it would have been open to the Court of Appeal to depart from *Aerotel*, if persuaded that it is plainly inconsistent with *G1/19*, this court does not face any such difficulty, being of course free to overrule previous decisions of the Court of Appeal.

48. That does not mean that this court should simply ignore the case law of the UK courts, in particular where a particular approach to the EPC has become settled English law up to the level of the Court of Appeal. That will have engendered a particular way of addressing patent problems by practitioners, judges and officers of the UKIPO. In such a situation, it will be necessary to take into account, as counsel for the Comptroller General rightly urged us to do, the potentially disruptive effect of a change to follow the EPO. Nonetheless the applicable principles are clear, and the fact that a change may be disruptive cannot by itself justify maintaining an idiosyncratic approach which is inconsistent with established jurisprudence of the EPO.

49. At the same time there is a real difference between adhering loyally to the authority of the EPO on matters of interpretation of the EPC and slavishly following EPO practice in terms of its day to day application. There may be a range of different methods and procedures for implementing the Convention, once its meaning and effect have been determined. This is of particular importance in the present appeal, on the question whether adopting the EPO's interpretation of article 52(2) and (3) and what is to be regarded as an invention also requires UK courts to adopt the problem and solution approach of the EPO to the resolution of issues about inventive step or obviousness. This court thought not in *Actavis Group PTC EHF v ICOS Corpn* [2019] UKSC 15; [2019] Bus LR 1318; [2019] RPC 9, para 93. That was before the decision in *G1/19* but, as will appear, we consider that the view taken in *Actavis v ICOS* continues to hold good.

Reasons advanced for adhering to the Aerotel approach

50. It is convenient first to consider the main submissions made on behalf of the Comptroller General for continuing to follow the four-step *Aerotel* approach (set out at para 29 above). The first is that we have not been pointed to a single case in which it is said that applying the *Duns* principles endorsed by the Enlarged Board in *G1/19* rather than the *Aerotel* approach would have led to a different outcome. The interveners have asserted that some cases would have been differently decided but have provided no details. Thus it is said that to reject the *Aerotel* approach without any evidence that this would make any difference to outcomes would be to cause, or at least risk, a major disruption to the work of the UKIPO without any good reason for doing so.

51. We consider that this submission approaches the problem from the wrong end of the telescope and reverses what ought at least to be the persuasive burden of proof. The grant of patents in the UK is regulated by the Patents Act 1977. That is the law which must be followed. The relevant provisions of the Act are to be interpreted as implementing the corresponding provisions of the EPC, here article 52, and the decisions of the Enlarged Board of the EPO about the meaning of those provisions should be followed unless there is a compelling reason not to do so. Thus, unless we are persuaded that the approach to the meaning and application of article 52(2) endorsed in *G1/19* is based upon a misinterpretation of the EPC, or is irreconcilable with the EPC, or falls short of a good faith application of article 52, then considerations of consistency and comity require a national court to follow it. It is not for a party that argues for alignment with the EPO's interpretation of the EPC to show that such alignment will produce a different outcome in particular cases. Nor, even if it could confidently be done, can a party seeking to persevere with a discordant approach obtain the court's approval to do so by proving that the current habitual non-compliance with the EPO's approach makes no difference to outcomes.

52. The infinite variety of subject-matter of patent applications makes it practically impossible to be sure whether a departure from the *Aerotel* approach will or will not affect outcomes. If it does, then justice to those affected by the difference requires the necessary change to be made. If it does not, then no harm will have been done (beyond the need for some re-training) by a determination to comply with the law. And a lack of demonstrably different outcomes will at least mitigate the problems arising from the inevitably retrospective effect of reversing a long line of settled English authority.

53. The Comptroller General's second main submission is that, if the *Aerotel* approach is to be replaced by the approach endorsed in *G1/19*, then this will not merely alter settled English law and practice in relation to the application of article 52(2), but will also overturn the equally long-settled approach to the assessment of inventive step, laid down in *Pozzoli SpA v BDMO SA* [2007] EWCA Civ 588; [2007] FSR 37 and approved by this court in *Actavis v ICOS*, by requiring the adoption of the EPO's technique of problem and solution. The Comptroller General criticised any attempt to try to combine the approach in *G1/19* with the settled English approach to inventive step as creating a Frankenstein monster.

54. If rejecting the *Aerotel* approach did require a wholesale adoption of the EPO's problem and solution approach to inventive step, there would be real force in the Comptroller General's concern, not least because this court was not assisted by any submissions about reforming the English approach to inventive step, nor given advance warning that the court might be asked to consider departing from *Actavis v ICOS*, which might have called for a panel of seven Justices to hear the appeal. But we do not agree with the submission that adopting the same interpretation of article 52 of the EPC as the EPO Board of Appeal necessitates changing in any significant way the received approach to assessing whether there is an inventive step. We will shortly set out how we consider

that consistency in interpretation of the EPC may be achieved. But, in short, we do not regard *Comvik, Duns* and *G1/19* as deciding or suggesting that the problem and solution approach of the EPO is the only way of assessing inventive step, or the only way of factoring the exclusions in article 52(2) into the overall appraisal of patentability.

55. A third main submission of the Comptroller General was that, in reality, the *Aerotel* approach does indeed accommodate the substance of the interpretation of article 52(2) found in *Comvik*, so that it is not inconsistent with the approach of the EPO. The submission was that the "any hardware" test is really no more than window-dressing, because of the ease with which any competent patent drafter can satisfy it by including some piece of hardware in the claim. The real test was said to be that applied in identifying the technical parts of a mixed invention as part of, or as an intermediate step before, undertaking the analysis of novelty and inventive step. It was submitted that the EPC does not prescribe the order in which the conditions for patentability have to be assessed, and that the *Aerotel* approach just carries out the same exercise in substance as the approach in *Comvik*, but in a different order. Again, we reject this submission, but our reasons for doing so are bound up with our appraisal of the arguments in favour of rejecting the *Aerotel* approach, to which we now turn.

Our reasons for rejecting the Aerotel approach

56. The strongest reason for rejecting the *Aerotel* approach is that it has been emphatically rejected as a means of applying article 52(2) and (3) by the Enlarged Board in *G1/19*. That rejection has two aspects. First, the "any hardware" approach was firmly approved as the first, necessary, stage in identifying whether there is an invention at all, before moving on to consider novelty, inventive step, and industrial application (para 28). By contrast, the "any hardware" approach had been equally firmly rejected in *Aerotel*. Second, as already explained, the Enlarged Board impliedly endorsed the criticisms of the *Aerotel* approach in *Duns,* as being incompatible with the EPC and based upon a misunderstanding of the meaning of the term "invention" in article 52(1).

57. Thus, leaving aside the references to problem and solution, the rejection of the *Aerotel* approach by the EPO cannot sensibly be described as just a preference for a different methodology or practice among a range of options potentially available. It is a rejection firmly based upon a determination that the Court of Appeal in *Aerotel* misinterpreted the EPC, and that its approach was both irreconcilable with the EPC and indeed not to be regarded as a good faith attempt to implement it.

58. Nor can it be said that the basis for rejecting the *Aerotel* approach involved an error of reasoning or was outwith the bounds of reasonable difference of opinion. As we have emphasised, the principles which determine whether or not to follow the jurisprudence of the EPO do not require us to decide, as between an established approach of the Board and

a different approach taken by the English courts, which of the two we think more persuasive.

59. That said, there is, we consider, real force in the EPO Board's criticism of the *Aerotel* approach as an application of the requirements of the EPC. The plain (Vienna Convention compliant) reading of article 52(2), in its context, is that it goes solely to the question whether the subject matter of the claim for a patent is an invention. The matters enumerated shall "not be regarded as inventions within the meaning of paragraph (1)". Yet the *Aerotel* approach does not address this question. After construing the claim, it goes straight to identifying the actual contribution made by the claim, and then asks whether the contribution, rather than the invention, falls solely within the subject matter excluded by article 52(2). This is what the Board criticised in *Duns* as revealing a misinterpretation of "invention" as used in the EPC, as if it had to be novel or involve an inventive step. As noted earlier (see para 28 above), the Court of Appeal used the term "contribution" to denote "a technical contribution to the known art" and said that this involves assessing what, in substance, the inventor "has really added to human knowledge". That surely raises considerations of novelty and inventive step, both of which (as the EPO Board has rightly emphasised) are separate and independent requirements of patentability within the scheme of the EPC from the requirement of an "invention" which is the subject of article 52(2). As Mustill LJ had already pointed out in *Genentech* (see para 34 above), under the scheme of the EPC the question whether the claim discloses anything that can be regarded as an invention must be answered in the affirmative before the other requirements for patentability become relevant.

60. By contrast, the approach finally approved in *G1/19* does squarely address the question whether the claim amounts to an "invention", uncluttered with any assessment of contribution, novelty or inventive step. It construes that term in light of the basic requirement that patents are to be extended only to that which is technical, as enshrined generally in article 52(1) and treating article 52(2) as providing a non-exhaustive list of examples of matters which are non-technical. It is fair comment that the "any hardware" test imposes only a low hurdle, but this is justified by the EPO as stemming from the addition of "as such" to each of the excluded items by article 52(3). Describing this clearly expressed first test as mere window dressing, as the Comptroller General does, fails to engage with the analysis in *G1/19* or to offer any alternative interpretation of the language of article 52.

61. In any case, contrary to the Comptroller General's submission that the EPC is agnostic about the order in which the requirements for patentability are addressed, the interpretation of article 52 endorsed by the Enlarged Board in *G1/19* does, we consider, identify a requirement, or at least clear guidance, from its interpretation of the EPC that the question whether the claim discloses an "invention" must be considered first, ahead of and separately from the other three conditions of novelty, inventive step and industrial application. This is implicit in the *Duns* principles and is emphasised in the passage ending with para 39 of the Enlarged Board's reasons in *G1/19*, quoted at para 43 above.

62. Again, although we do not have to decide this question, there is real force in the analysis of the Enlarged Board. Article 52(1) speaks of inventions in all fields of technology being patentable provided the further conditions (novelty, inventive step and industrial application) are satisfied. Article 52(2) and (3) then tell you what is or is not an invention. The following provisions of the EPC (including the exceptions in article 53) all proceed by applying further conditions to something already qualifying as an invention: see article 54 (novelty), 56 (inventive step) and 57 (industrial application).

63. The *Aerotel* approach at best jumbles up the test of an invention with the other requirements for patentability (if indeed it mentions that first question at all) and reverses the logical order of analysis by starting with contribution to the known art (step 2), then addressing the article 52(2) exclusions (step 3), and then finally going back at step 4 to the "technical in nature" question, which is really an aspect of article 52(1).

64. For those reasons we consider that there is a compelling case, in the light of *G1/19*, for rejecting the *Aerotel* approach which is not met by any of the objections to doing so advanced on behalf of the Comptroller General. Of course, there is nothing wrong with step 1 in the *Aerotel* approach (construe the claim), nor has the EPO suggested that there is. But steps 2 to 4 cannot be maintained.

65. The question remains: what method, approach or guidance should this court provide by way of replacement? We have already made it clear that this should not be what the Comptroller General has labelled "any hardware" + *Comvik*, if by that is meant everything in *Comvik*, including its guidance on how to carry out the problem and solution method when assessing inventive step. It was perfectly understandable that the Board in *Comvik* should have given that guidance, and that the Enlarged Board approved it in *G1/19*, because the problem and solution method of assessing inventive step was already well-established in the practice the EPO. But it is a matter of practice rather than something dictated by the EPC on its true interpretation. Subject to an irrelevant exception relating to certain documents, all that the EPC tells you about how to decide whether the claim involves an inventive step is (in article 56) that a step is inventive if it is not obvious to a person skilled in the art. We see no reason to doubt that, as confirmed by this court in *Actavis v ICOS*, the approach to inventive step laid out in *Pozzoli* remains a legitimate approach.

66. In our view, the approach which should be adopted by courts in the UK is that contained in the *Duns* principles other than principle G (and the second paragraph of the *Comvik* headnote), as explained by the further reasoning in *G1/19,* in particular about the need for an intermediate step between "any hardware" and inventive step to determine which features in a "mixed" invention contribute to its technical character: see again para 39 of the Board's reasons. This is for the purpose of excluding non-technical features (ie features which do not contribute to the technical character of the invention) when

assessing at the next stage whether the invention involves an inventive step in relation to the prior art.

67. We do not accept that this approach, which continues to recognise the validity of the *Pozzoli* method for identifying an inventive step, will create a Frankenstein monster, as suggested on behalf of the Comptroller General. This appeal, and the question whether to reject the *Aerotel* approach, are concerned entirely with how article 52 of the EPC is to be interpreted and applied. That involves examining a claim to ascertain whether it amounts to an "invention", coupled with the need to exclude, in advance, non-technical features of the invention (as explained above) from the assessment of inventive step and novelty. It is not concerned with whether the claim satisfies those requirements. The UKIPO rejected these claims before reaching that question. Whether the conclusions reached on this appeal have any repercussions for and give rise to any need to adjust the methodologies currently used in the UK for assessing novelty or inventive step is not something about which the court has received any submissions. It will have to be left to a case where it arises.

Issue 2: Is an ANN (or does it contain) a "program for a computer"?

68. The next issue is whether the exclusion in article 52(2)(c) of "programs for computers" is relevant to the applicant's claims at all. The applicant argues that it is not, because ANNs - such as the ANN described in the claims - are not and do not contain programs for computers. So there is no excluded matter. If correct, this argument would provide a short answer to the appeal. It would make the answer to issue 1, discussed above, immaterial to the outcome, and the remaining issues would fall away.

The competing arguments

69. As developed by Mr Mark Chacksfield KC on this appeal and in the courts below, the applicant's argument draws a distinction between what he calls a "hardware ANN" or "physical ANN" on the one hand and a "software ANN" or "emulated ANN" on the other. According to this distinction, a "hardware ANN" is a physical machine: in essence a box containing a network of standard electronic components connected by wires or circuit boards. Inputs are fed in by electronic signals at one end of the box, and the outputs emerge as electronic signals at the other end. A "software ANN" emulates a hardware ANN by means of a software program operated by a conventional computer - that is to say, a digital computer with a central processing unit (CPU), memory and registers.

70. Mr Chacksfield submitted that it is wrong to regard a hardware ANN as a "computer" at all, as it has no component (a CPU) capable of receiving, interpreting and executing instructions which constitute a "program for a computer". At all events it has no "program". This he defined as a sequence of logical instructions, each commanding

the computer (or, more accurately, its CPU) to execute a specific logical function. He submitted that, as a hardware ANN neither is, nor contains, a program for a computer, the same must apply to an "emulated ANN", as it is functionally the same and operates in the same manner.

71. In the High Court the applicant's case was assisted by the fact that counsel for the Comptroller General did not challenge the basic description of a "hardware ANN" and, while maintaining that a hardware ANN is a computer, conceded that it has no program. The judge understood the basis for the concession to be that, in the case of a trained ANN, "the hardware is not implementing a series of instructions pre-ordained by a human". Yet, as the judge observed, exactly the same can be said of an "emulated ANN": "It is not implementing code given to it by a human. … It is created by the ANN itself" (para 54). On that basis the judge held that neither type of ANN is or contains a program for a computer.

72. In the Court of Appeal, the Comptroller General's case was put differently. It was now said that an ANN, in whatever form it is implemented, is a (programmable) computer and has a program, which consists in a set of adjustable parameters which instruct the machine to perform a specific task. These adjustable parameters are the weights and biases of the ANN. They are a program which makes the trained ANN perform the task for which it has been programmed through the process of training.

73. The Court of Appeal accepted the Comptroller General's analysis. They defined a computer as "a machine which processes information" and a computer program as "a set of instructions for a computer to do something": more specifically, a set of instructions which causes the machine to process information in a particular way (para 61). They characterised an ANN as "a machine which processes information" (para 9) and therefore a computer (para 68). And they identified the weights and biases of an ANN (which they referred to for short simply as "weights") as a computer program. Their reasoning, as explained at para 68, was that:

> "[The weights] are a set of instructions for a computer to do something. For a given machine, a different set of weights will cause the machine to process information in a different way. The fact the set does not take the form of a logical series of 'if-then' type statements is irrelevant. The weights for a given artificial neuron are what cause the neuron, if the inputs are of a given type, to then produce an output of a given type. Aggregated up to the ANN as a whole, these weights work that way in parallel with one another to a significant extent and not just in a logical series, but that is not a relevant distinction. The set of weights as a whole instruct the machine to process information it is presented with in a particular way."

74. On this appeal the Comptroller General defends this analysis and conclusion. The applicant takes issue with it and maintains its case that the term "computer" should be interpreted more narrowly to mean a device with a CPU, which can manipulate data by receiving and executing a sequence of logical instructions. A "program for a computer" is such a sequence of logical instructions. Applying these definitions, an ANN is not a computer, in particular because it has no CPU. Critically, the applicant submits, there is no program for a computer within an ANN, even when it is implemented on a computer of a conventional kind, because there is no series of instructions stored or executed anywhere in the system, and no coded command instructing any part of the computer (let alone a CPU specifically) to execute any particular logical function.

75. The interveners (the Chartered Institute of Patent Attorneys and the IP Federation), in written submissions which we have found helpful, also dispute the Court of Appeal's analysis but for somewhat different reasons. They too submit that the description of a computer as "a machine which processes information" is too broad. But they also argue that the Court of Appeal was wrong to describe an ANN as a (physical) machine. They say that an ANN is generally regarded in the computing field as akin to a function, which maps an input to some output. This functionality may either be implemented on a conventional computer (with a CPU, memory etc) or on a dedicated physical machine. In either case the ANN is not itself a computer. Nor are the weights within an ANN a program for a computer, as the Court of Appeal held. They differ from a conventional computer program because they do not tell a computing device what to do; rather they are data which are used in the operation of the ANN. This is so whether the weights are variables which may be altered during training or have been fixed after the training has been completed. See also, for a similar analysis, an article by Hannah Yee-Fen Lim, "Complexities of AI and Artificial Neural Networks in Patent Law Decisions (2025) 47(8) EIPR 447-452, asserting that ANNs are not machines but are computational models and that weights and biases are data and not programs. The description of ANNs as "computational models" is also used in the *Guidelines for Examination in the EPO* (April 2025), para 3.3.1 (Artificial intelligence and machine learning).

What counts as a computer and a computer program

76. We agree with the applicant and the interveners that the description of a computer as "a machine which processes information" is too broad, in that it encompasses many devices which are not generally considered to be computers. Examples given in argument include a basic oven, a smoke detector, an analogue radio or record player with a volume control, and an old-fashioned jukebox that plays a song selected by a user. Each of these devices receives and processes information to generate an output. What differentiates them from a "computer", as that term is ordinarily used and understood, is - as it seems to us - that they are not used to perform computations.

77. On the other hand, we see no reason to confine the term "computer" to conventional digital computers of the kind described by the applicant. It is unreasonable to interpret the EPC in a way that ties its application to a particular technology which happens currently to be prevalent. The presumption must be that the concepts used in the Convention are intended to accommodate technological change - all the more so when its subject matter is the grant of patents. As counsel for the Comptroller General pointed out, before the development of digital computers, electronic analogue computers were used for various applications; and, looking to the future, quantum computers are now being developed which use the principles of quantum physics to process information in a fundamentally different way from conventional computers. There is no warrant for excluding devices of either of these kinds from the scope of article 52(2)(c).

78. The same applies to the applicant's attempt to limit the concept of a "program for a computer" to a set of instructions addressed to a conventional digital computer. Counsel for the applicant cited the following statement of Nicholls LJ in *Gale*, at p 324:

> "The Act contains no definition or description of what is meant by the expression 'program for a computer'. For present purposes it is sufficient to note that a computer program is essentially a series of instructions capable of being followed by a CPU to produce a desired result."

This statement needs to be read in context. It recapitulates a longer description given in a section of the judgment headed "Outline of a digital computer" which was an "attempt to outline the basic equipment and manner of working of a digital computer". Nicholls LJ there said, at p 321:

> "A sequence of instructions is called a program. 'Program' is a flexible term, covering anything from a sequence of binary numbers intended to be stored in the memory of a computer and to be acted on directly, to a representation of such instructions in languages which bear some resemblance to natural languages. What distinguishes a computer program is that it either is, or can be translated unambiguously into, a sequence of instructions capable of being followed by a CPU to produce desired manipulations of data in a predictable manner."

79. A conventional digital computer was the only type of computer that was relevant in *Gale*. The description of a "program" given by Nicholls LJ when explaining how such a computer works cannot reasonably be taken to mean or imply that a conventional digital computer with a CPU is the only type of device capable of falling within the scope of the legislation and that only a series of instructions capable of being followed by such a

device can count as a "program for a computer" within the meaning of article 52(2)(c). To allow for the fact that there are computers which are not conventional digital computers, the description of a "program" must be correspondingly broadened to include a set of instructions capable of being followed by a computer (of any kind) - which may or may not have a CPU - to produce desired manipulations of data. These manipulations of data are "predictable" in the sense that they are determined by the instructions which the computer is "programmed" to follow. They may well not be predictable in the sense that the results of the manipulations can be foreseen in advance. Much of the utility of computers derives precisely from their ability to perform calculations and produce results that far exceed the capabilities of any human brain.

Application to an ANN

80. In our opinion, the Court of Appeal was right to hold that the expression "program for a computer" in article 52(2)(c) of the EPC is applicable to an ANN. But we think that the Comptroller General and the Court of Appeal conceded too much by accepting the applicant's characterisation of an ANN as a (physical) machine, in drawing a conceptual distinction between a "hardware ANN" and a "software emulation of an ANN" and in describing a "hardware ANN" as a physical box with electronics in it.

81. This characterisation of an ANN is not supported by the expert report relied on by the applicant. It is true that Professor Pardoe uses the word "machine" when explaining methods of machine learning (see para 22 of his report). But he makes it clear that he is referring to an "abstract machine" and not a physical piece of apparatus. He refers to an ANN as a "model" (para 23). Professor Pardoe explains that an ANN is made up of a collection of neurons, arranged in layers, and that each neuron generates an output value by applying a separate weight value to each input value, aggregating the weighted input values with a bias value and applying an activation function (para 27). What he describes is a series of mathematical operations. As succinctly stated by the Hearing Officer, at para 63 of the UKIPO decision, an 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". An ANN can be depicted diagrammatically, as illustrated in the Court of Appeal's judgment, at para 5. All this shows that an ANN is an abstract entity, and not a physical object.

82. An ANN can of course be *implemented* in hardware (ie in a physical machine). But, as Professor Pardoe explains, such hardware may take a variety of forms. The hardware used may be neuromorphic hardware specially designed to incorporate an ANN, or field programmable gate arrays which can be configured and reconfigured after manufacturing, or a conventional computer (with a CPU). The Court of Appeal makes the point, at para 15, that an ANN can be implemented in hardware in which the weights and biases are adjustable, or in hardware in which the weights and biases are fixed. The fact

that the same ANN can be implemented in any of these different types of hardware demonstrates than an ANN is not and cannot be identified with a type of hardware.

83. The applicant seeks to avoid this conclusion by distinguishing between a "hardware ANN" and what it calls an "emulated ANN" implemented through software run on a conventional computer. The implication is that only certain types of hardware can be a "real" ANN and that, when a conventional computer is used, it is merely mimicking what a "real" ANN does. In our view, this is an untenable distinction. There is no conceptual justification for privileging one form of implementation over another: the choice between them is merely practical. As Professor Pardoe notes in his report, at para 43:

> "Software and hardware implementations are the same in terms of the architecture, weights and biases, and the outputs produced. It is just a question of which is more convenient or efficient to use in any particular scenario."

The same point was made more generally by the EPO Board of Appeal in *Vicom/Computer-related invention* (Decision T 208/84) [1987] 2 EPOR 74 ("*Vicom*"), para 16, in a passage quoted by the applicant stating that:

> "making a distinction between embodiments of the same invention carried out in hardware or in software is inappropriate as it can fairly be said that the choice between these two possibilities is not of an essential nature but is based on technical and economical considerations which bear no relationship to the inventive concept as such."

84. For this reason, it is not relevant that an ANN can be implemented using various different types of physical machine. That, as counsel for the applicant themselves put it, is "a mere implementation choice". What matters is the arrangement of artificial neurons, each characterised by its links to other neurons in the network, weights, bias and activation function. The network is an abstract entity or model. It is not a physical object. It is therefore not itself a computer (which is a physical object) and the Court of Appeal was in our view mistaken in describing it as such.

85. We would add that the analysis is not illuminated by saying that a "hardware ANN" is simply a box with electronics in it. Exactly the same can be said of a conventional computer. Any type of hardware on which an ANN is implemented consists of a box with electronics in it. Nor do we accept the applicant's assertion (see para 74 above) that, even when an ANN is implemented on a computer of a conventional kind, there is no series of instructions stored or executed anywhere in the system, and no coded

command instructing any part of the computer (let alone a CPU specifically) to execute any particular logical function. Since the only way in which a conventional computer can operate is by utilising a CPU to read and execute a series of coded instructions, the very fact that an ANN can be implemented on a conventional computer shows that the assertion must be wrong. What the applicant refers to as a "software ANN" is an ANN translated into machine readable code which can be executed by a conventional digital computer to produce results which are identical to those generated by any other embodiment of the ANN.

86. What then is the relationship of an ANN to a computer? We think it apt to describe the machine on which an ANN is implemented as a computer. That is uncontroversially so where a conventional computer is used. But it can make no difference that the hardware used is a dedicated item which embodies a particular network architecture or a set of field programmable gate arrays which is configured to embody that architecture. As discussed above, what characterises a computer as a physical machine is its functionality, not the specific technology used to achieve that functionality. Regardless of how an ANN is implemented, data presented as an input is processed in a particular way by computations performed on the data as it is propagated through the network until it produces an output. The machine on which the ANN is implemented is thus functioning as a computer. It matters not whether operating the ANN is the only function which the machine is capable of performing or whether it is a multi-purpose machine (such as a conventional digital computer with a CPU) which can also be used for other data processing operations.

87. Whatever the specific form of the machine on which an ANN is implemented, the ANN constitutes, in essence, a set of instructions to manipulate data in a particular way so as to produce a desired result. In other words, an ANN is a program for a computer.

88. The instructions include the weights and biases of the ANN, which the Court of Appeal characterised as such a program. But the weights and biases are not the only features of an ANN which cause the machine on which it is implemented to process data in a particular way. The output of the ANN depends not only on the set of weights and biases but on the topology of the network: the number of layers of neurons, the number of neurons in each layer and how the neurons are interconnected. It also depends on the mathematical function applied by each neuron to generate an output value. A network with one arrangement of neurons will cause the machine on which the ANN is implemented to process data in one particular way. A network with a different topology will cause the machine on which the ANN is implemented to process the same input data in a different way. The same is true if neurons within the network apply different activation functions. All these features of the ANN operate in combination to instruct the machine to process data in a particular way which will generate a particular final output. Conceptually, they are a set of instructions to a computer to carry out computations on data presented to it. The reasons given by the Court of Appeal in the passage quoted at para 73 above for identifying the weights as a program, with which we agree, apply

equally to all the elements of an ANN and to the ANN as a whole. Viewed as a whole, an ANN is a program for a computer.

89. The difference between the weights and biases and the other features of an ANN such as its topology is that the former can be changed whereas the latter generally cannot. (In fact, this is not always true, as Professor Pardoe explains that some training regimes have the potential to redefine the topology of the network.) But, as the Court of Appeal points out, the distinction between instructions which can be changed and instructions which are permanent is not a relevant distinction. As Birss LJ said, at para 67:

> "There are some computers with programs which cannot be changed - eg the chips embedded in a payment card or a washing machine - but it remains meaningful to draw the same distinction between the program in that case and the computer itself. Whether the program for a given computer is fixed in a permanent form or not does not … alter the fact that the program represents a set of instructions for a computer to do something."

90. As Birss LJ also noted, the issue in *Gale* turned on an attempt to draw such a distinction, which was firmly rejected by the Court of Appeal. In that case the applicant argued that his application for a patent did not relate to a program for a computer because the relevant instructions were embodied in permanent form in the electronic circuitry of a read-only memory (ROM) disc. The Court of Appeal held that the fact that the ROM was a dedicated piece of apparatus which had been uniquely programmed so that the instructions embedded in it could not be altered made no relevant difference. As Sir Nicholas Browne-Wilkinson VC put it, at p 333: "The mere incorporation of the program in the ROM does not alter its nature: it remains a computer program". The same can be said of a machine in which a trained ANN is incorporated with its weights and biases frozen.

91. Thus, it is irrelevant whether an ANN is implemented on a machine in which the weights and biases are baked into the hardware and cannot be changed; or on a machine in which the network architecture is "hard-wired" but the weights and biases can be altered; or on hardware which can be reconfigured; or on a conventional computer for which implementing an ANN is only one of many possible uses. In each case the ANN - irrespective of whether any of its features (and, if so which) are adjustable - represents a set of instructions to the machine to perform operations. The ANN as a whole is a computer program. That is so even in the extreme case of a trained ANN in which the weights and biases have been frozen and incorporated in hardware that can be reproduced by manufacturing identical copies of the same physical circuit of components, just as it is in the case of an ANN in which the weights and biases can be altered.

92. The Court of Appeal was also correct, in our view, to reject as irrelevant two other features of an ANN. One is that the ANN does not take the form solely of a sequence of logical operations of the type "if X, then Y". One of the features of an ANN - as noted by Birss LJ in the passage we have quoted at para 73 above - is that its components operate in parallel with each other as well as in series (though this is true at the level of the artificial neurons and not just of the weights within each neuron). But that is not a relevant distinction. Computers can (and very often do) process information in parallel and not just in series and can be programmed to do so.

93. The other irrelevant feature is that the instructions embodied in an ANN can use machine learning by which the weights and biases are adjusted through a process of training. As the Court of Appeal observed at para 64, it is commonplace in computing to use computer programs to generate other computer programs. For example, conventional computers work by running machine code which is compiled by a computer program that converts instructions written in a high-level programming language into machine readable form. We agree with the Court of Appeal that there is no justification for drawing a distinction in law between instructions created by a computer and those created by a human being. Once this is recognised, it cannot make a difference what particular method is used to program a computer to generate instructions which themselves constitute a computer program.

94. Nor is it relevant that the weights and biases of a trained ANN are not known in advance. They are wholly determined by the instructions provided by the structure of the initial, untrained ANN (its topology, mathematical functions and initial weights and biases) when it operates on data selected for the purpose of training. The fact that, because of the limited computing power of the human brain, the variable parameters of the trained ANN cannot be predicted by a human being in advance is not significant.

95. In *Mitsubishi/Sparsely connected neural network* (Decision T 702/20) 7 November 2022, the EPO Board of Appeal rejected an argument that an ANN was not a computer program because its functioning was not determined by the programmer but by the data used for training the ANN. We agree with the Board's reasoning, at para 16.1, that what was material was that:

> "whilst the functioning of a neural network may not be foreseeable prior to training and the programmer may not understand the significance of its individual parameters …, the neural network still operates according to the programming of its structure and learning scheme. Its parameters and provided results are fully determined, given the training data and the training procedure …".

96. Accordingly, we conclude that the Hearing Officer was right to hold that an ANN is a program for a computer. It follows that, as the Court of Appeal correctly held, the exclusion from patentability for "programs for computers" provided by article 52(2)(c) of the EPC is engaged in this case.

Issue 3: Is the entire subject matter of the claims excluded?

97. Our conclusion on issue 2 makes it necessary to consider whether the entire subject matter of the applicant's claims falls within the scope of the exclusion of "programs for computers … as such" or whether it includes technical features and so qualifies as an "invention" within the meaning of article 52(1).

98. This question was addressed by the Hearing Officer and in the courts below applying the *Aerotel* approach. We have rejected that approach and concluded, in relation to issue 1, that the EPO's "any hardware approach" should be applied. It is beyond dispute that on this approach the claims are to an "invention" and are not excluded by article 52(2)(c). Although the claimed method involves an ANN which is a program for a computer, it also involves technical means because the ANN can only be implemented on some form of computer hardware. In addition, the claims refer to a database for storing data files, a communications network and a user device - all of which require or constitute hardware. That is sufficient to show that the subject matter of the claims has technical character and is not to a computer program "as such". It follows that the UKIPO was wrong to decide, for the reason it did, that the application for a patent should be refused.

99. It would be possible to stop at this point and simply decide that the case should be sent back to the UKIPO to consider whether the invention satisfies the requirements of novelty and inventive step. No assessment has yet been made, or view expressed, by the UKIPO in relation to those matters. But we are apprehensive that to say nothing further about the merits of the claims would be unhelpful to the parties and would result in a great deal of further cost and delay. We also recognise that, in the interests of the UKIPO and of patent applicants generally, we should try to give any further assistance that we properly can regarding how applications for computer-implemented inventions should be approached once they have cleared the first, very low hurdle of satisfying the "invention" test through the use of "any hardware". As will appear, that further assistance is limited by the way in which the matter has reached this court.

The intermediate step

100. Following the guidance in *G1/19*, the next stage would be to undertake what the Enlarged Board called the "intermediate step" lying between steps (1) and (2) of what had until then been described as "the two-hurdle approach" for computer implemented inventions: see paras 37-39 of *G/19*. Step (1) is to decide whether the subject matter of

the claim qualifies as an invention, by applying article 52 of the EPC. Step (2) requires a consideration of whether the invention qualifies as novel under article 54 of the EPC and involves an inventive step under article 56 of the EPC. We have concluded that the claims in issue satisfy step (1). The subject matter of the claims constitutes an invention within the meaning of article 52 of the EPC.

101. Understanding what the "intermediate step" involves begins with principle F in the *Duns* principles (approved in *G/19*) which recognises that a claim may legitimately consist of a mix of technical and non-technical features, in which the non-technical features may even predominate. Non-technical features "as such" do not provide a contribution to the prior art and are therefore to be ignored in assessing novelty and inventive step at stage (2). But the phrase "non-technical features as such" means (and means only) "non-technical features which do not interact with the technical subject matter of the claim": see *G1/19* citing *Duns* principle F and quoted at our para 39 above. Non-technical features which do interact with the technical subject matter of the claim are therefore to be included in step (2). The distinction there made between features of the claim which are to be included and those which are to be excluded at step (2) depends upon "interaction", as described.

102. This is fleshed out at some length in paras 32 and 33 of *G1/19*. In para 32 "non-technical features" are defined as features which would be considered non-inventions if viewed on their own under article 52 of the EPC. It is further said that: "Whether such features contribute to the technical character of the invention has to be assessed in the context of the invention as a whole". At the beginning of para 33 it is said that even features which can be considered technical per se need to be assessed in the same way: ie by asking whether they contribute to the technical character of the invention as a whole.

103. Para 33 then divides the features of an invention into four potential classes, of which class (ii) is "technical features which do not contribute" and class (iii) is "non-technical features which contribute". The Board explains that class (ii) identifies features which, although they qualify as technical per se, "cannot contribute to inventive activity because they have no technical function within the context of the claimed invention". Class (iii) is said to have been established by the case law of the EPO, referring back to *Duns* principle F: "non-technical features interacting with the technical subject matter of the claim".

104. The intermediate step is further described in paras 38 and 39 of *G1/19*. In para 38 its purpose is described as being "to assess the eligibility of the feature to contribute to inventive step". In para 39 it is said that the intermediate step of establishing whether a feature contributes to the technical character of the invention "serves as a filter for features contributing to a technical solution of a technical problem in view of the closest prior art. Only those distinguishing features can contribute to inventive step."

105. A number of significant points emerge from the way in which the Enlarged Board has described this intermediate step. The first is that the intermediate step is not just a part of EPO practice, like its problem and solution approach to inventiveness. It is a necessary part of the process of applying articles 52 to 56 (at least) of the EPC, because the invention threshold provided by the Board's "any hardware" interpretation of article 52 is too low to enable the invention reliably to be tested for novelty and inventive step: see *G1/19* paras 38-39, cited above. The EPC says nothing express about the intermediate step, but the Enlarged Board has held that it is implied by article 52. The effect of article 52(3) and the requirement of technicality inherent in article 52(1) is that the subject matter of an invention is patentable only to the extent that it is technical in character and not excluded by article 52(2). This in turn requires an analysis of the subject matter of an invention to ensure that only eligible features are taken into account in the assessment of inventive step.

106. The second point to note is the requirement, spelt out in para 32 of *G1/19*, to carry out this analysis by reference to the technical character of the invention, viewed as a whole. Only when that has been identified can it be seen whether any particular feature of the invention does or does not contribute to it, or interact with it. Although the discussion of the intermediate step is couched in terms of the technical solution of a technical problem, we have already concluded that the EPC does not mandate the EPO's problem and solution approach as the sole means of resolving any question about patentability. It is just the way the EPO does so as a matter of its practice. But that simply means that it is open to the UKIPO and to the UK courts to adopt any appropriate method of identifying the technical character of the invention, viewed as a whole, as the necessary first part of carrying out the intermediate step. An example of an appropriate method might in a particular case be to identity the alleged "inventive concept" of the claim, as explained in *Pozzoli*.

107. Thirdly, the intermediate step is, in terms of its function, concerned entirely with excluding features of the invention from subsequent consideration rather than with determining the patentability of the invention as a whole. Its object is to filter out features which do not contribute to the technical character of the invention viewed as a whole, so as to exclude those features from consideration at step (2) (inventive step). Or, put in positive terms, it is to allow consideration to be given at step (2) only to those features which do so contribute. It calls for a dissection of the subject matter of the invention into its component features and a review of the contributory role of each feature, by reference to the contribution made by that feature to, or interaction with, the technical character of invention viewed as a whole.

108. Fourthly, this dissection stands in sharp contrast to step 4 of the *Aerotel* approach, which requires a holistic check to see whether the contribution of the claimed invention, viewed as a whole, is technical in nature. If not, it fails to qualify as an invention under article 52(1). This is the very opposite of the feature-by-feature approach required by the intermediate step described in *G1/19*.

109. Fifthly, the intermediate step does not involve assessing each feature of the invention by asking whether the feature is itself, viewed separately, technical or non-technical. The sole criterion is whether the feature contributes to the technical character of the invention as a whole. Thus, technical features may be filtered out because they make no such contribution and non-technical features may be left in because they do make such a contribution.

110. Sixthly, the intermediate step only arises if the invention as a whole is considered to be technical in character, by reason of having passed stage (1) under article 52 of the EPC. Again, this is a significant difference from step 4 of the *Aerotel* approach, which is the concluding stage of deciding whether the subject matter of the claim amounts to an invention at all, within the meaning of article 52 of the EPC.

111. A corollary of this is that it is not relevant, at the stage of the intermediate step, whether the technical character of the invention appears to be novel or inventive. It was one of the principal criticisms of the *Aerotel* methodology by the EPO Board that it impermissibly jumbled up invention with novelty and inventive step by its focus on "contribution": see *Aerotel*, para 43, cited at para 30 above, where the Court of Appeal defined contribution as that which, as a matter of substance rather than form, the inventor has really added to human knowledge; and *Duns*, para 12 (cited at paras 34-35 above), where that approach was criticised by the EPO Board. The question whether the invention adds anything to the sum total of human knowledge is a stage (2) question on the Board's approach, which at the intermediate stage has not yet been reached.

Application to this case

112. The next questions are whether it is appropriate for this court itself (i) further to define the intermediate step for the purposes of its implementation in the UKIPO, or by the UK courts, in cases involving programs for computers or (ii) to carry it out in relation to the claims in issue. There are formidable difficulties in our way in doing either.

113. This appeal originated from a decision of the Hearing Officer that the claims fell foul of the exclusion from patentability of "programs for computers … as such", applying the *Aerotel* analysis of article 52. The question whether the subject matter of the claims amounted to a program for a computer or to a program for a computer as such were fully argued at all levels, but solely through the lens of the *Aerotel* approach. We have concluded that this was the wrong approach, and that the approach set out by the Enlarged Board in *G1/19* should be applied, adopting all but the last of the *Duns* principles. We have concluded that, even on that different approach to the interpretation and application of article 52 of the EPC, the claims do comprise, as the Court of Appeal held, a program for a computer; but that the claimed invention is not a program for a computer "as such" within the meaning of article 52(2) and (3) of the EPC read together. The result is that,

contrary to the decision of the Hearing Officer and the judgment of the Court of Appeal, the claims do not fall foul of article 52. Their subject matter is an invention so that under the EPC they qualify for assessment under the headings of novelty, inventive step and industrial application.

114. There was argument in the courts below about whether, in any event, the actual or alleged contribution made by the claims, viewed as a whole, was technical in nature, applying *Aerotel* step 4. But this was treated as an article 52(1) issue, going to the question whether the claims amounted to an invention at all. And it was necessarily addressed by counsel and decided by reference to the *Aerotel* conception of "contribution" which we have held to be unsound, for the reasons discussed above. Those arguments were repeated in this court, expressly against the possibility that we might conclude that *Aerotel* should continue to be followed in the UK. Since we have concluded otherwise, the basis upon which those arguments were advanced has fallen away.

115. We see no merit in expressing views about how we would have applied to the claims made in this case a test which we have concluded is the wrong test to apply. To do so would only risk causing confusion. If we were to attempt to provide further assistance to the parties in this case and in future cases, it would need to be by reference to the intermediate step required by *G1/19*. But we have received no significant submissions or assistance on how this intermediate step should be conducted, nor as to which features, if any, of the invention which is the subject of the claims should be filtered out before the assessment of novelty and inventive step. And we have explained in paras 105 to 111 above how that intermediate step is significantly different from *Aerotel* step 4.

116. We did hear argument about whether replacing the *Aerotel* approach with that set out in *G1/19* would require a departure from the approach to inventive step outlined in *Pozzoli* and approved in *Actavis v ICOS,* because of the supposed need to incorporate the EPO's problem and solution approach to inventive step. But this was directed to the pros and cons of overruling *Aerotel*. We did not hear argument focused on how the intermediate step is to be applied to computer-implemented inventions or on whether or in what way English cases which have considered, in the context of the *Aerotel* approach, whether a computer-implemented invention has a relevant technical effect continue to provide assistance when applying the approach set out in *G1/19*.

117. There are rare occasions when a new question arising for the first time in this court but not addressed in the parties' written cases can be tackled, usually with the help of further written submissions and exceptionally by a further hearing. We do not consider that this case is one of them. This appeal raises issues of fundamental importance for the UK's application of the EPC to computer-implemented claims, particularly in the rapidly expanding field of AI. It would be unwise for us to embark on carrying out the analysis required by the intermediate step - and in doing so to create binding precedent - without

the benefit of both in-depth legal argument and the views of the UKIPO and the specialist judges in the lower courts, none of which are available to us.

118. In the result we have concluded that the right course is to allow the appeal, set aside the decision of the Hearing Officer from which the appeal originates and confine this court's ruling to the matters resolved above, including those aspects of the intermediate step which we have discussed. How it applies to this invention, and whether the features of the invention which contribute to its technical character can be considered to involve an inventive step, are questions to be considered by the Hearing Officer.

Appendix — the principal claims

Claim 1

A system for providing semantically relevant file recommendations, the system containing:

(a) an artificial neural network "ANN" having an output capable of generating a property vector in property space, the ANN trained by subjecting the ANN to a multiplicity of pairs of training data files sharing a content modality and where for each pair of training data files there are two independently derived separation distances, namely: a first independently derived separation distance that expresses a measure of relative distance between a first pair of training data files in semantic embedding space, where the first independently derived separation distance is obtained from natural language processing "NLP" of a semantic description of the nature of the data associated with each one of the first pair of training data files; and a second independently derived separation distance that expresses a measure of relative distance similarity between the first pair of training data files in property embedding space, where the second independently derived separation distance is a property distance derived from measurable properties extracted from each one of the first pair of training data files, and wherein training of the ANN by a backpropagation process uses output vectors generated at the output of the ANN from processing of said multiplicity of pairs to adjust weighting factors to adapt the ANN during training to converge distances of generated output vectors, in property embedding space, towards corresponding pairwise semantic distances in semantic space, and wherein shared content modality is: (i) video data files; or alternatively (ii) audio data files; or alternatively (iii) static image files; or alternatively (iv) text files; and

(b) a database in which is stored a multiplicity of reference data files with content modality with target data and a stored association between each reference data file and a related individual property vector, wherein each related individual property vector is obtained from processing, within the trained ANN, of file properties extracted from its respective reference data file and each related individual property vector encodes the semantic description of its respective reference data file;

(c) a communications network;

(d) a network-connected user device coupled to the communications network;

(e) processing intelligence arranged: in response to the trained ANN receiving target data as an input and for which target data an assessment of relative semantic similarity of its content is to be made, and the ANN producing a file vector (Vpiie) in property space for the target data based on processing within the trained ANN of file properties extracted from the target data; to access the database; to compare the file vector of the target data with individual property vectors of the multiplicity of reference data files in the database to produce an ordered list which identifies relevant reference data files that have property vectors measurably similar to the property vector and thus to identify relevant reference files that are semantically similar to the target data; and to send, over the communications network, relevant reference files to the user device; wherein the user device is arranged to receive the relevant reference files and to output the content thereof.

Claim 4

A method of providing semantically relevant file recommendations in a system including an artificial neutral network "ANN" having an output capable of generating a property vector in property space, the method comprising:

(a) training the ANN by subjecting the ANN to a multiplicity of pairs of training data files sharing a content modality and where for each pair of training data files there are two independently derived separation distances, namely: a first independently derived separation distance that expresses a measure of relative distance between a first pair of training data files in semantic embedding space, where the first independently derived separation distance is obtained from natural language processing "NLP" of a semantic description of the nature of the data associated with each one of the first pair of training data files; and a second independently derived separation distance that expresses a measure of relative distance similarity between the first pair of training data files in property embedding space, where the second independently derived separation distance is a property distance derived from measurable properties extracted from each one of the first pair of training data files, and wherein shared content modality is: (i) video data files; or alternatively (ii) audio data files; or alternatively (iii) static image files; or alternatively (iv) text files; b) in a backpropagation process in the ANN, using output vectors generated at the output of the ANN from processing of said multiplicity of pairs to adjust weighting factors in the ANN, thereby adapting the ANN during training to converge distances of generated output vectors, in property embedding space, towards corresponding pairwise semantic distances in semantic space, and

(b) storing, in a database, a multiplicity of reference data files with content modality with target data and a stored association between each reference data file and a related individual property vector, wherein each related individual property vector is obtained from processing, within the trained ANN, of file properties extracted from its

respective reference data file and each related individual property vector encodes the semantic description of its respective reference data file;

(c) in response to the trained ANN receiving target data as an input and for which target data an assessment of relative semantic similarity of its content is to be made, and the ANN producing a file vector (Vnie) in property space for the target data based on processing within the trained ANN of file properties extracted from the target data;

(d) comparing the file vector of the target data with individual property vectors of the multiplicity of reference data files in the database to produce an ordered list which identifies relevant reference files that are measurably similar to the property vector and thus identifying relevant reference data files that are semantically similar to the target data;

(e) sending, over the communications network, relevant reference data files to the user device; and

(f) at the user device, receiving the relevant reference files and outputting the content thereof.